
DAVID JARDINE JARDINE

THE

CYCLOPÆDIA;

OR,

Universal Dictionary

OF

ARTS, SCIENCES, AND LITERATURE.

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THE

CYCLOPÆDIA;

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UNIVERSAL DICTIONARY

OF

Arts, Sciences, and Literature.

BY

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ARTS and SCIENCES.

DISSIMULATION, in *Morals*, the act of dissembling, by fallacious appearances, or false pretensions.

Good princes regard dissimulation as a necessary vice; but tyrants consider it as a virtue.

It is apparent that secrecy is often necessary, to oppose those who may be willing to circumvent our lawful intentions. But the necessity of precaution would become very rare, were no enterprizes to be formed, but such as could be avowed openly. The frankness with which we could then act, would engage people in our interests. Marshal Biron would have saved his life, by dealing ingenuously with Henry IV.

Lord Bacon very justly observes, in his short essay "De Dissimulatione et Simulatione" (Works, vol. iii. p. 629.) "that the weaker sort of political persons are the great dissemblers." "For," he adds, "if a man possess penetration of judgment, sufficient for enabling him to discern what things are to be laid open, and what to be concealed, and what to be partially disclosed, to whom and at what time, (which, indeed, are acts of state and acts of life, as Tacitus has well denominated them) to him a habit of dissimulation is an hindrance. But if a man cannot acquire that judgment, then it is left to him as the safest course he can pursue, to be generally a dissembler." Lord Bacon distinguishes between dissimulation and simulation: the former being negative, as when any one by signs and tokens leads others to conclude that he is not the person, that he really is; and the latter being affirmative, as when any one openly feigns and pretends that he is the person, that he really is not. Montaigne, in his "Essays" (vol. ii.) has admirably pourtrayed and exposed the vice of dissimulation. "As to this virtue of dissimulation," says he, "I mortally hate it; and of all vices find none that does evidence so much baseness and meanness of spirit. 'Tis a cowardly and servile humour, to hide and disguise a man's self under a vizor, and not to dare to shew himself what he is. By that vice followers are trained up to treachery Being brought up to speak what is not true, they make no conscience of a lye. A generous heart ought not to belye its own thoughts, but will make itself seen within, all there is good, or at least manly. Aristotle reputes it the office of magnanimity, openly and professedly to love and hate, to judge and speak with all freedom; and not to value the approbation or dislike of others in comparison of *truth*. Apollonius said, it was for slaves to lye, and for freemen to speak truth. 'Tis the chief and fundamental part of *virtue;* we must love it for itself. A man must not always tell all, for that were folly; but what a man says should be what he thinks, otherwise 'tis knavery. I do not know what advantage men pretend to by eternally counterfeiting and dissembling, if not, never to be beheved when they speak the truth. This may once or twice pass upon men: but to profess concealing their thoughts, and to say, as some of our princes have done, that "they would burn their shirts if they knew their intentions," and "that who knows not how to dissemble, knows not how to rule," is to give warning to all who have any thing to do with them, that all they say is nothing but lying and deceit.

With respect to dissimulation, three things are to be observed; 1. That the characters of those are not to be esteemed, who are reserved and cautious without distinction. 2. Not to make secrets of unimportant matters. 3. To conduct ourselves in such manner, as to have as few secrets as possible.

DISSIPATION, in *Physics*, an insensible loss, or consumption, of the minute parts of a body: or, more properly, that flux whereby they fly off, and are lost. See EFFLUVIA.

We do not say dissipation, but loss of blood, in speaking of the blood discharged at a wound, or in any other sensible manner: on the contrary, we say dissipation, or expence of spirits: this is more copious than that of the solid parts: and consequently, the reparation ought to be more copious.

Strahan and Preston.

DISSIPATION, *Circle of*, or ABERRATION, in *Optics*, denotes that circular ſpace upon the retina of the eye, which is occupied by the rays of each pencil in indiſtinct viſion: thus, if the diſtance of the object, or the conſtitution of the eye be ſuch, that the image falls beyond the retina, as when objects are too near; or before the retina, when the rays have not a ſufficient divergency, the rays of the pencil, inſtead of being collected into a central point, will be diſſipated over this circular ſpace: and all other circumſtances being alike, this circle will be greater or leſs, according to the greater or leſſer diſtances from the retina of the foculſes of refracted rays. But this circle cauſes no perceptible difference in the diſtinctneſs of viſion, while that circle is not greater than ſome determinate magnitude; as ſoon as it exceeds that magnitude, we begin to perceive an indiſtinctneſs, which increaſes as the circle of diſſipation increaſes, and at length the object is loſt in confuſion. The circle is alſo greater or leſs, according to the greater or leſs magnitude of the viſible object; and though it is not eaſy to aſſign the diameter of the ſaid circle, it ſeems very probable, that viſion continues diſtinct for all ſuch diſtances, or ſo long as theſe circles, or the pencils of light from them do not touch one another upon the retina; and the indiſtinctneſs begins, when the ſaid circles begin to interfere. It has been often obſerved, that a preciſe union of the reſpective rays upon the retina is not neceſſary to diſtinct viſion; but the firſt author that aſcertained the fact beyond all doubt, was Dr. Jurin. See a variety of obſervations and experiments on this ſubject, in his Eſſay on diſtinct and indiſtinct Viſion, in Smith's Optics, Appendix. See MOON and VISION.

DISSIPATION, *Radius of*, is the radius of the circle of diſſipation.

DISSOLENA, in *Botany*, (from δις, *double*, and σωλην, a *tube*, on account of the different ſhapes of the two different parts of the tube of the corolla.) Loureiro Cochinch. v. 1. 137. Claſs and order, *Pentandria Monogynia*. Nat. Ord. *Vitices*, Juſſ.

Gen. Ch. *Cal.* Perianth tubular, inferior, five-cleft; ſegments awl-ſhaped, erect. *Cor.* of one petal, funnel-ſhaped; tube long, in the lower part thickeſt, pentagonal, bearing the ſtamens; in the upper cylindrical: limb five-cleft, ſpreading. *Stam.* Filaments five, capillary, ſhort, inſerted below the top of the inferior portion of the tube; anthers ovate, erect. *Piſt* Germen inferior, ovate; ſtyle thread-ſhaped, ſhorter than the ſtamens; ſtigma ſomewhat ovate, thick, rough. *Peric.* Drupa ſmall, ovate. *Nut* compreſſed, rough, with one ſeed.

Eſſ. Ch. Drupa inferior, with a rough nut. Tube of the corolla of two different ſhapes. Stigma ovate.

D. *verticillata*, the only ſpecies. *Mat ſa* of the Chineſe. Found in the province of Canton in China. A ſmall tree, about eight feet high, with ſpreading branches. *Leaves* lanceolate, entire, ſmooth; the lowermoſt oppoſite; the upper ones ſtellate, three or four together. *Cluſters* terminal, ſubdivided. *Flowers* white. *Drupa* ſmall, black, ſmooth. *Loureiro.*

DISSOLVENT } See SOLUTION.
DISSOLUTION }

DISSOLUTION *of Metals, &c.* by fire, is particularly called *fuſion*.

DISSOLUTION *of the blood*, is an affection of that humour, directly oppoſite to coagulation.

The diſſolution is ſuch a comminution of the fibrous parts of the blood, as diſpoſes it for that ſeparation of the craſſamentum from the ſerous part, which always enſues in healthy blood, on its cooling out of the body.

This diſſolution is frequently the conſequence of malignant and peſtilential fevers, and ſhews itſelf in petechiæ, or purple ſpots; alſo of certain poiſons, particularly the bites of venomous beaſts, &c.

DISSOLUTION *of Parliament*. See PARLIAMENT.

DISSONANCE, ſee DISCORD. This is a remarkable word, half Greek, and half Latin, δις and *ſonans*, ſounding twice. The only perceptible diſſonance, or diſcord, which nature gives in the harmonies to a given baſs, is the flat 7th 1, 2, 3, 4, 5, 6, 7. See HARMONICS, and BASSE *fondamentale*. Syſteme de Paſtini. This term is generally uſed in the ſame ſenſe as diſcord, but a late writer, whoſe MSS. we have peruſed, ſays that if 1, $\frac{a}{b}$, and $\frac{c}{d}$, expreſs the ratios of three ſounds, their harmony will be uninterrupted or the effect of the three ſounded together a concord, if b and d have no common diviſor but 1; and, on the other hand, their harmony will be interrupted or a diſſonance if b and d have a common diviſor; in that caſe, let this diviſor be x; then will $x - 1$ expreſs the order of diſſonancy. Among the examples given of the application of this rule are, the key, octave and double octave, or 1, $\frac{1}{2}$ and $\frac{1}{4}$, where conſequently x is $= 2$ and $x - 1 = 1$; or, according to this rule, this chord is an example of the firſt order of diſſonancy. The common chord minor is next examined by this rule, or 1, $\frac{5}{6}$ and $\frac{2}{3}$, where x being $= 3$, this chord is declared to be a diſſonance of the ſecond order, and the theories of Tartini and Pizzoti are quoted, in juſtification of this degradation of the minor common chord to the rank of diſcords, a doctrine however, to which we are by no means diſpoſed to ſubſcribe, or to admit the propriety of the general rules abovementioned.

DISSONANT TRIAD. This conſiſts of two major-thirds, or the ſuperfluous triad of the chromatic ſcale, as C, E, ♯G (Callicott's Muſ. Gram. p. 147.) The interval C ♯ G is a ſharp or ſuperfluous fifth, which ſee.

DISSONANZE, } *Ital.* Sounds that are diſpleaſing to
DISSONI. } the ear.

DISSYLLABLE, a word of two ſyllables; as *fortune*, *lament*, &c.

The ſpondee, trochee, iambus, and pyrrhichius, are diſſyllabic feet. See SPONDEE, &c.

DISTA, in *Ancient Geography*, a town of Aſia in Aria. Ptol.

DISTAFF, an inſtrument about which flax is tied, in order to the ſpinning of it.

DISTAFF-*thiſtle*, a name ſometimes given to the *atractylis* of authors. See ATRACTYLIS and CARTHAMUS.

DISTANCE properly denotes the ſhorteſt line between two points, objects, &c.

Diſtance, according to an ingenious author, cannot of itſelf and immediately be ſeen. For diſtance being a line directed end-wiſe to the eye, it projects only one point in the fund of the eye, which point remains invariably the ſame, whether the diſtance be longer or ſhorter. Dr. Berkeley, Eſſay on Viſion.

A late eminent mathematician obſerves that the diſtance here ſpoken of is diſtance from the eye; and that what is ſaid of it muſt not be applied to diſtance in general. The apparent diſtance of two ſtars is capable of the ſame variations as any other quantity or magnitude. Viſible magnitudes conſiſt of parts into which they may be reſolved, as well as tangible magnitudes; and the proportions of the former may be aſſigned, as well as thoſe of the latter: ſo that it is going too far to tell us, that viſible magnitudes are no more to be accounted the objects of geometry than words, and that the ideas of ſpace, and things placed at a diſtance, are

are not, ſtrictly ſpeaking, the objects of ſight, and are not otherwiſe perceived by the eye than by the ear. Mr. Maclaurin, in his account of ſir Iſaac Newton's diſcoveries, p. 225.

The word is alſo uſed figuratively for an interval, not only in reſpect of place, but alſo of time or quality.

Thus, we ſay, the diſtance of the creation of the world from the nativity of Jeſus Chriſt, is upwards of four thouſand years: the diſtance between the Creator and the creature is infinite.

For the diviſion of DISTANCES, or the manner wherein we come by the idea of diſtance in objects, ſee VISIBLE.

DISTANCE, in *Aſtronomy*. The ſcience of aſtronomy muſt have arrived at no inconſiderable degree of perfection before any adequate conception could have been formed of the diſtances of the heavenly bodies.

To the firſt uninformed inhabitants of the earth, the ſun, moon, and ſtars would appear to riſe and ſet in their neighbouring hills and foreſts: when they were ſought for there in vain, the next theory would ſuppoſe them riſing from the limits of the extended ocean, and deſcending there again, after having performed their daily courſe. Ages muſt have elapſed, and the ſpherical hypotheſis of the earth's figure have been eſtabliſhed, before it could have been perfectly aſcertained, that the heavenly bodies were inſulated, and entirely detached from the ſurface of the earth.

The phenomena of eclipſes, when the cauſe of them was underſtood, were ſufficient to demonſtrate that the moon was nearer to us than the ſun; and it might have been inferred from the properties of the ſphere, that the ſun was diſtant at leaſt ſeveral diameters of the earth. For as the ſun was, on the day of the equinox, twelve hours above the horizon, it muſt have been ſuppoſed that half the earth was enlightened at one time, which could not have been the caſe if the luminary were not placed at a conſiderable diſtance. The phaſes of the moon would likewiſe indicate the great diſtance of the ſun, by a method we ſhall ſoon have occaſion to explain.

The principle we uſually have recourſe to, when we wiſh to determine the diſtance of an inacceſſible point, is the moſt ſimple that can poſſibly be imagined. An obſerver at A (*Plate* VI. *Geometry*, *fig.* 85.) determines from obſervation that the object in queſtion is ſomewhere in the line A M; he then removes to another ſtation, as B, and by a ſimilar obſervation infers that it is likewiſe ſomewhere in the line B N, it is evident that the place of the object muſt be in the interſection O of theſe two lines, as that is the only point which is common to each of them.

But, to derive any practical advantage from this method, it is neceſſary that the diſtance of the two ſtations A, B, ſhould not be extremely diſproportionate to the diſtance ſought, as in that caſe a very ſmall error in the poſition of the lines A M, B N, would cauſe a very large one in the poſition of the point O.

It is for this reaſon that the above method is with difficulty applied to the heavenly bodies that are neareſt to us, and to thoſe more remote it entirely fails. This being the caſe in the preſent improved ſtate of the ſcience, it is not ſurpriſing that the ancient aſtronomers ſhould have formed ſuch very erroneous conceptions of the diſtances of the heavenly bodies.

Pythagoras eſtimated the diſtance of the moon to be about 5000 leagues inſtead of 80,000, but in the time of Hipparchus, 300 years later, we find that the true diſtance was pretty accurately known.

Ptolemy determined the diſtance of the moon by methods perfectly correct in their theory, and very ſimilar to thoſe employed by modern aſtronomers; theſe will be fully explained under PARALLAX.

By the moſt accurate obſervations made in Europe, and at the ſame time at the Cape of Good Hope, the moon's greateſt diſtance was determined 63.66 ſemi-diameters of the earth, and its leaſt 57.66.

But the law of univerſal gravitation affords us another method of determining the diſtance of the moon independent of all trigonometrical meaſurement whatever: and La Place, who has eſtimated the errors to which the various methods are liable, prefers that reſult which is obtained from theory alone to any other.

To comprehend the poſſibility of this method, we ſhould recollect, that the force of gravity on the earth's ſurface is accurately known by experiments on pendulums; and as this force varies inverſely as the ſquares of the diſtances, the force of gravity is known at any diſtance from the earth; and from the doctrine of central forces we can determine the time in which a ſatellite would revolve at any diſtance from the earth; and inverſely, having given the periodical time of the moon's revolution, we can by the ſame theory compute the diſtance.

It is much more difficult to determine the diſtance of the ſun from the earth, than that of the moon. The ancients before the time of Ariſtarchus, ſeem to have contented themſelves with mere conjecture. Pythagoras ſuppoſed the ſun three times as diſtant as the moon; and even Pliny believed it only twelve times as far, becauſe the time of its revolution was twelve times as long. Ariſtarchus of Samos, finding that the diameter of the earth was too ſmall a baſe to determine the immenſe diſtance of the ſun, aſſumed inſtead of it, the diſtance of the moon from the earth. His method is to be found in a work of his ſtill preſerved, and publiſhed by Commandine in 1752, and afterwards by Wallis in 1688. It ſuppoſes the moment of the quadrature of the moon to be preciſely aſcertained. See ARISTARCHUS and DICHOTOMY.

Kepler, in 1718, recommended it to Galileo, to apply his teleſcopes to theſe obſervations, and thus to determine the diſtance of the ſun more accurately than had been done before.

The inaccuracy of this method in practice, ariſes from the difficulty of determining the preciſe moment when the enlightened part of the moon is terminated by a ſtraight line. But as it has no tendency to give the diſtance either too great or too ſmall, the mean of a number of obſervations ſhould approach the truth; and if Ariſtarchus concluded the diſtance to be not above one-tenth of what it really is, it aroſe probably from the natural repugnance we have to adopt a theory ſo much at variance with the firſt impreſſions of our ſenſes. The diſtances of the heavenly bodies are ſo immenſely greater than could poſſibly have been imagined, that out of a number of reſults, the early aſtronomers have inſenſibly been led to ſelect thoſe which gave the diſtance the leaſt. Vandelinus practiſed this method at Majorca in 1650, and deduced the diſtance of the ſun about one half that which we now ſuppoſe it really to be.

Hipparchus, and afterwards Ptolemy, employed a method founded on obſervations of eclipſes of the moon. This method, like that of Ariſtarchus, was correct in its theory, but defective in practice, on account of the immenſe diſtance of the ſun, which Ptolemy eſtimated at only $\frac{1}{20}$ of what it really is. Tycho employed the ſame means, and found the diſtance even leſs than the above.

Dr. Halley obtained a reſult nearer the truth by a tranſit of Mercury; he made the diſtance $\frac{1}{5}$ of that which was afterwards determined by a tranſit of Venus. He was conſcious of the inaccuracy of his own reſult, and ſtrongly

recommended to future aſtronomers to avail themſelves of the tranſits of Venus, which, as he rightly judged, were better calculated than any other aſtronomical obſervations, to remove the great uncertainty in which this queſtion was involved.

Previouſly, however, to the tranſits of Venus, which happened in 1761 and 1769, a great part of the uncertainty was removed, by a number of very accurate obſervations of the parallax of Mars. It clearly appeared from the beſt obſervations that had been made both by the Engliſh and French aſtronomers, that the ſemi-diameter of the earth, as ſeen from the ſun, could not ſubtend a greater angle than 10″; this was a near approximation to the truth.

It is well known that the determination of the ſun's diſtance, which we now aſſume as the baſis of our aſtronomical calculations, is derived from the obſervations of the tranſits of Venus over the ſun's diſk in 1761 and 1769. To derive the greateſt poſſible advantage from theſe important obſervations, aſtronomers were ſent from Europe to all parts of the globe, and the reſult obtained from their obſervations was, that the ſun's mean parallax was very nearly 8.″6 or 8.″7, which gives the diſtance of the ſun 23600 times the radius of the earth, or about 95 millions of miles.

The diſtance of the ſun from the earth being thus determined and taken as unity, the diſtance of the other planets may be computed from the law of Kepler demonſtrated by Newton, that the ſquares of their periodic times are as the cubes of their diſtances.

In this manner the diſtances of the planets have been computed by different aſtronomers, as in the following table.

	Kepler.	Caſſini.	Halley.	De la Lande.	Log. of theſe Diſtances.
Mercury	38806	38760	38710	38710	9.5878221
Venus	72413	72340	72333	72333	9.8593379
Earth	100000	100000	100000	100000	0.0000000
Mars	152350	152373	152369	152369	0.1828973
Ceres and the new planets				260000	
Jupiter	520000	520290	520098	522279	0.7162364
Saturn	951000	954180	954007	954072	0.9795813
Herſchel				1908180	1.2826193

The above diſtances, neglecting the four decimals, may be nearly expreſſed as follows.

Mercury - -	4
Venus - -	7
Earth - -	10
Mars - -	15
Ceres - -	26
Jupiter - -	52
Saturn - -	95
Georgian - -	191

The diſtances of the ſatellites are determined by meaſuring the angle of their greateſt elongation from the primary planet, with a micrometer, and the diſtance of one being determined, the diſtances of the others may be computed from their periodic times, in the ſame manner as for the planets.

The diſtances of the ſatellites of Jupiter are as follows:

	I.	II.	III	IV.
In ſemidiameters of Jupiter, according to Caſſini, - -	5.67	9.00	14.38	25.30
Newton, -	5.96	9.49	15.14	26.60
Diſtance in minutes, at the mean diſtance of Jupiter,	1′ 51″	2′ 57″	4′ 42″	8′ 16″

Diſtance of the ſatellites of Saturn.

	I.	II.	III	IV.	V.	VI.	VII.
Diſtance in minutes, - -	0.43	0.56	1.18	3.0	8.42	35″.06	27″.36
In ſemidiameters of Saturn, -	4.89	6.27	8.75	20.29	59.18		

	I.	II.
Diſtance of the ſatellites of the Georgian, - - - -	33″.09,	44′.23.

The following table is taken from the Aſtronomy of Biot:

Table of the mean diſtances of the ſatellites, the radius of the planet being taken as unity.

	Diameter.	Sidereal Revolution in Days.
1ſt ſatellite of Jupiter,	5.6973	1.76913
2d,	9.0659	3.55118
3d,	14.4616	7.15455
4th,	25.4360	16.68902
1ſt ſatellite of Saturn,	3.080	0.94271
2d,	3.952	1.37024
3d,	4.893	1.88780
4th,	6.268	2.73948
5th,	8.754	4.51749
6th,	20.295	15.9453
7th,	59.154	79.3296
1ſt ſatellite of Uranus,	13.120	5.8926
2d,	17.022	8.7068
3d,	19.845	10.9611
4th,	22.752	13.4559
5th,	45.507	38.0750
6th.	91.008	107.6944

If the diameter of the earth was found too ſmall a baſe to determine the diſtance of the ſun, no wonder that it ſhould be totally inſufficient to give us any accurate information relative to the diſtance of the fixed ſtars, which is ſo immenſe, that even the diameter of the orbit of the earth ſcarce ſubtends a viſible angle, though it is very little leſs than two hundred million miles. One of the moſt rational arguments againſt the motion of the earth round the ſun, is founded on the want of a correſponding parallax in the fixed ſtars; but the arguments on the other ſide are ſo ſtrong and irreſiſtible, that we are neceſſarily led, as an obvious conſequence, to place the fixed ſtars at a diſtance inconceivably remote. When we come to treat more fully of *parallax*, we ſhall find that there are very reaſonable grounds for ſuppoſing, that the neareſt fixed ſtars are about a million, million of miles diſtant from us. And the ſmall teleſcopic ſtars at the extremity of the milky way 500 times that diſtance; ſo that the light by which they are viſible, would be twenty thouſand years in being tranſmitted from them to us!—But ſome of the nebulæ, ſeen by Dr. Herſchel in his 40 feet teleſcope, are immenſely more remote; their light muſt probably have been ſome millions of years in reaching our ſyſtem, from which we may draw this curious inference, that they at leaſt have exiſted that length of time.

Diſtance of the Moon from the Sun or fixed Star.

It is by means of the angular diſtance of the moon from the ſun or fixed ſtars, previouſly calculated, that the longitude is found at ſea, by what is called the lunar method.

To calculate the diſtance of the moon from the ſtar, the

longitude of the moon muſt be found by the tables for the given time, and alſo the longitude of the ſtar. Their reſpective diſtances from the pole of the ecliptic or latitudes muſt likewiſe be taken, and a ſpherical triangle formed by the moon, the ſtar, and the pole of the ecliptic, which may be reſolved by the following proportion.

As rad. : coſ. of difference of longitude :: tangent of the leaſt of the two diſtances from the north pole of the ecliptic : tangent of ſegment I.

Subtract ſegment I. from the greateſt of the two diſtances from the pole : the remainder is ſegment II.

Then as coſ. ſegment I. : coſ. ſegment II. :: coſ. of leaſt ecliptic polar diſtance : coſ. of the diſtance required.

If the diſtance required is that of the ſun, inſtead of a ſtar, the two proportions are reduced to one, namely,

Rad. : coſ. difference of longitudes :: coſ. latitude of the moon : coſ. of diſtance required.

Dr. Maſkelyne's method, as given in Ph. Tranſ. 1764, conſiſts in finding the approximate diſtance by a ſimilar proportion to that given for finding the diſtance of the ſun, namely, as rad. is to coſ. of the difference of longitude, ſo is the coſ. of their difference of latitude to the coſ. of the required diſtance. The diſtance thus found is to be then corrected in the following manner.

To the log. of the arc equal radius $= 5.3144251$, add the logarithms of — the ſine of the latitude of the moon — the ſine of the latitude of the ſtar — the verſed ſine of the difference of the longitude — and the complement of the logarithms of the approximate diſtance found as above. The ſum will be the logarithm of the number of ſeconds which muſt be taken from the approximate diſtance to have the true.

When the given coſines vary rapidly; and the coſines found, very ſlowly, we may employ a formula, given by Mr. Murdoch in the Phil. Tranſ. 1758. In any ſpherical triangle (*Plate* VI. *Geometry*, *fig.* 86.) A B C; $2 \text{ ſin. } \frac{1}{2} A^2 = \frac{\text{coſ. } (AB - AC) - \text{coſ. } BC}{\text{ſin. } AB}$, or $2 \text{ ſin. } AB \,.\, \text{ſin. } AC \,.\, \text{ſin. } \frac{1}{2} A^2 = \text{coſ. } (AB - AC) - \text{coſ. } BC$; but $\text{coſ. } (AB - AC) = 1 - 2 \text{ ſin. } \frac{1}{2} (AB - AC)^2$, and for the ſame reaſon, $\text{coſ. } BC = 1 - 2 \text{ ſin. } \frac{1}{2} BC^2$; ſubſtituting theſe values $2 \text{ ſin. } AB \,.\, \text{ſin. } AC \,.\, \text{ſin. } \frac{1}{2} A^2 = 1 - 2 \text{ ſin. } \frac{1}{2} (AB - AC)^2 - 1 + 2 \text{ ſin. } \frac{1}{2} BC^2$; $\therefore \text{ſin. } \frac{1}{2} BC^2 = \text{ſin. } AB \,.\, \text{ſin. } AC \,.\, \text{ſin. } \frac{1}{2} A^2 + \text{ſin. } \frac{1}{2} (AB - AC)^2$. Let ∞ expreſs the difference between A B and A C, and changing the form of the expreſſion we have $\text{ſin. } \frac{1}{2} (AB \infty AC) \,.\, \sqrt{\left(1 + \frac{\text{ſin. } AC \text{ ſin. } AB}{\text{ſin. } \frac{1}{2} (AB \infty AC)} \cdot \frac{\text{ſin. } \frac{1}{2} A^2}{AC^2}\right)}$: this value may be computed by logarithms, by dividing it into two equations, and making $\frac{\text{ſin. } \frac{1}{2} A}{\text{ſin. } \frac{1}{2} (AB \infty AC)} \sqrt{\text{ſin. } AC \,.\, \text{ſin. } AB} = \text{tang. } a$, then $\text{ſin. } \frac{1}{2} BC = \frac{\text{ſin. } \frac{1}{2} (AC \infty AB)}{\text{coſ. } a}$. Cagnoli Trigon. p. 609.

Example. Let the diſtances of the moon and ſtar from the pole of the ecliptic be $AB = 80°$, and $AC = 30°$, their difference of longitude $A = 110°$; then $\frac{1}{2} (AB \infty AC) = 25°$, and the reſt of the calculation (which gives $BC = 91° \; 1' \; 59''$), will be as follows:

Sin. A C 30° - - -	9.6989700
Sin. A B - - -	9.9933515
	9.6922215
$\frac{1}{2}$ - - - -	9.8461607
Add. ſin. $\frac{1}{2}$ A 55° - -	9.9133645
	9.7595252
Sin. $\frac{1}{2}$ (A B − A C) - -	9.6259483
Tang. *a* 53° 40′ 32″ - -	0.1335769
Coſ. *a* - - - -	9.7725835
Taken from (A B − A C) Sin. $\frac{1}{2}$ B C - -	9.8533648
= 45° 30′ 59″.4 B C - -	91° 1′ 59″

De Lambre's formula is ſomewhat ſhorter and more convenient, namely, $\text{ſin.}^2 \frac{1}{2} BC = \text{ſin.}^2 \frac{1}{2} (AB + AC) - \text{coſ.}^2 \frac{1}{2} A, \text{ ſin. } AB, \text{ ſin. } AC$.

Demonſtration. $\text{Coſ. } BC = \text{coſ. } A \,.\, \text{ſin. } AB \,.\, \text{ſin. } AC + \text{coſ. } AB \,.\, \text{coſ. } AC$, or $1 - 2$, $\text{ſin}^2 \frac{1}{2} BC = 2 \,.\, \text{coſ.}^2 \frac{1}{2} A \,.\, \text{ſin. } AB \,.\, \text{ſin. } AC \,.\, \text{ſin. } AB - \text{ſin. } AC + \text{coſ. } AB \,.\, \text{coſ. } AC = 2 \text{ coſ.}^2 \frac{1}{2} A \,.\, \text{ſin. } AB \,.\, \text{ſin. } AC + \text{coſ. } (AB + BC) = 2 \text{ coſ.}^2 \frac{1}{2} A \,.\, \text{ſin. } AB \,.\, \text{ſin. } AC + 1 - 2, \text{ ſin.}^2 \frac{1}{2} (AB + BC)$; hence, $\text{ſin.}^2 \frac{1}{2} BC = \text{ſin.}^2 \frac{1}{2} (AB + AC) - \text{coſ.}^2 \frac{1}{2} A \,.\, \text{ſin. } AB \,.\, \text{ſin. } AC$: make $\frac{1}{2} AB + AC = m$, and $\text{coſ.}^2 \frac{1}{2} A \,.\, \text{ſin. } AB \,.\, \text{ſin. } AC = \text{ſin.}^2 n$; and then $\text{ſin.}^2 \frac{1}{2} BC = \text{ſin.}^2 m - \text{ſin. } 2n = \text{ſin. } \overline{m + n}, \text{ ſin } (m - n)$.

Example.

Sin. A C -	9.6989700	Sin. *n* - -		9.6047520
Sin. A B -	9.9933515	*n* = 23° 44′ 1″.5		
		m = 55		
Sum - -	19.6923215			
Its half -	9.8461607	*m* + *n*	78° 44′ 1″.5	9.9915494
Coſ. $\frac{1}{2}$ A -	9.7585913	*m* − *n*	31 15 58.5	9.7151805
	9.6047520			19.7067299
		Sin. $\frac{1}{2}$BC	45 30 59.4	9 8533649

Distance *of the Sun from the Moon's Node*, or *Apogee*, is an arc of the ecliptic intercepted between the ſun's true place, and the moon's node, or apogee. See Node.

Distance, *Curtate*. See Curtate.

Distance *of the Baſtions*, in *Fortification*, is the ſide of the exterior polygon.

Distance, in *Geography*, is the arc of a great circle interſected between two places.

To find the diſtance of two places A and B (*Plate* I. *Geogr. fig.* 1.) far remote from each other. Aſſume two ſtations, C and D, from which both the places A and B may be ſeen; and with a proper inſtrument find the angles A D C, C D B, A C D, and D C B; and meaſure the diſtance C D.

Then, in the triangle A C D, we have two angles given, A C D and A D C, together with a ſide; from which, by an eaſy rule in trigonometry, delivered under the article Triangle, we find A D.

So alſo, in the triangle C D B, the baſe D C, and the angles at the ſame, being given, B D is found.

Laſtly, in the triangle A D B, having the ſides A D and D B, together with the included angle A D B; the diſtance required, A B, is found by the rules given for the reſolution of triangles.

The height of a remote object being known, to find its diſtance, when the eye firſt deſcries it; and, again, the height of the eye being given, to find the diſtance to which the

the eye can reach on the ſurface of the ſea or land. Add the height of the eye A B (*Plate* I. *Geometry*, *fig.* 14.) to the ſemidiameter of the earth B C, by which you have A C; and ſince, in the right-angled triangle A D C, the ſides A C and D C are given, the angle D C A is found by the common rule for reſolution of triangles, the quantity of which angle forms the arc D B; which arc, converted into feet, or the like, gives the diſtance required.

Suppoſe, *e. g.* the height of the eye A B five feet, which is ſomewhat leſs than in a man of ordinary ſtature; ſince B C is 19695539, A C will be 19695544; and the angle D A B will be found 89° 57′ 43″: conſequently, D C B, or the arc D B, is 2′ 17″, or 137″; and, therefore, ſince 1°, or 3600″, make 343752 Paris feet, D B is 13081⅓ feet.

After the ſame manner we find the diſtance D B, to which an object of a given altitude A B may be ſeen, and, conſequently, we know what diſtance we are off from an object of a given altitude, when we firſt diſcover the top thereof. See HORIZON.

DISTANCES, in *Geometry*, are meaſured by the chain, decempeda, and the like. See CHAIN, &c.

DISTANCES, *Inacceſſible*, are found by taking bearings thereto from the two extremes of a line, whoſe length is given. See PLAIN-TABLE, THEODOLITE, &c.

DISTANCE, in *Navigation*, is the number of miles, or leagues, that a ſhip has ſailed from any point. See SAILING.

DISTANCE, *Apparent*, in *Optics*, that diſtance which we judge an object to be from us when ſeen afar off, being commonly very different from the true diſtance; becauſe we are apt to think all very remote objects, whoſe parts cannot well be diſtinguiſhed, and which have no other object in view near them, to be at the ſame diſtance from us, though perhaps the one is thouſands of miles nearer than the other, as is the caſe with regard to the ſun and moon.

M. De la Hire enumerates five circumſtances, which aſſiſt us in judging of the diſtance of objects; *viz.* their apparent magnitude, the ſtrength of the colouring, the direction of the two eyes, the parallax of the objects, and the diſtinctneſs of their ſmall parts. Dr. Smith maintains, that we judge of diſtance principally or ſolely, by the apparent magnitude of objects; and concludes univerſally, that the apparent diſtance of an object ſeen in a glaſs, is to its apparent diſtance ſeen by the naked eye, as the apparent magnitude to the naked eye is to its apparent magnitude in the glaſs: but Alhazen long ſince obſerved, that we do not judge of diſtance merely by the angle under which objects are ſeen; and Mr. Robins clearly ſhews the hypotheſis of Dr. Smith to be contrary to fact, in the moſt common and ſimple caſes. Thus, if a double convex glaſs be held upright before ſome luminous object, as a candle, there will be ſeen two images, one erect, and the other inverted: the firſt is made ſimply by reflection from the neareſt ſurface: the ſecond, by reflection from the farther ſurface, the rays undergoing a refraction from the firſt ſurface both before and after the reflexion. If this glaſs has not too ſhort a focal diſtance, when it is held near the object, the inverted image will appear larger than the other, and alſo nearer; but if the glaſs be carried off from the object, though the eye remain as near to it as before, the inverted image will be diminiſhed ſo much faſter than the other, that it will, at length, appear very much leſs than it, but ſtill nearer. Here, ſays Mr. Robins, two images of the ſame object are ſeen under one view, and their apparent diſtances immediately compared; and it is evident that thoſe diſtances have no neceſſary connection with the apparent magnitude. This experiment may be made ſtill more convincing, by ſticking a piece of paper on the middle of the lens, and viewing it through a ſhort tube. He obſerves farther, that the apparent magnitude of very diſtant objects, is neither determined by the magnitude of the angle only under which they are ſeen, nor is the exact proportion of that angle compared to their true diſtance, but is compounded alſo with a deception concerning the diſtance; ſo that, if we had no idea of difference in the diſtance of objects, each would appear in magnitude proportional to the angle under which it was ſeen; and if our apprehenſion of the diſtance was always juſt, our idea of their magnitude would be, in all diſtances, unvaried; but in proportion as we err in our conception of their diſtance, the greater angle ſuggeſts a greater magnitude. By not attending to this compound effect, Mr. Robins apprehends that Dr. Smith was led into his miſtake.

Montucla alſo, without being appriſed of what Mr. Robins had written, made ſimilar objections to the hypotheſis of Dr. Smith. Dr. Porterfield has made ſeveral remarks on the five methods of judging concerning the diſtance of objects above recited from M. De la Hire; and he has added to them, the conformation of each eye. (See *Circle of* DISSIPATION.) This, he ſays, can be of no uſe to us, with reſpect to objects that are placed without the limits of diſtinct viſion. But the greater or leſs confuſion with which the object appears, as it is more or leſs removed from thoſe limits, will aſſiſt the mind in judging of its diſtance: the more confuſed it appears, the farther will it be deemed. However, this confuſion hath its limits; for when an object is placed at a certain diſtance from the eye, to which the breadth of the pupil bears no ſenſible proportion, the rays proceeding from a point in the object may be conſidered as parallel; in which caſe, the picture on the retina will not be ſenſibly more confuſed, though the object be removed to a much greater diſtance. The moſt univerſal, and often the moſt ſure means of judging of the diſtance of objects, he ſays, is the angle made by the optic axes: our two eyes are like two different ſtations, by the aſſiſtance of which diſtances are taken; and this is the reaſon why thoſe perſons who have loſt the ſight of one eye ſo frequently miſs their mark in pouring liquor into a glaſs, ſnuffing a candle, and ſuch other actions as require that diſtance be exactly diſtinguiſhed. With reſpect to the method of judging by the apparent magnitude of objects, he obſerves, that this can only ſerve, when we are otherwiſe acquainted with their real magnitude. Thus he accounts for the deception to which we are liable in eſtimating diſtances, by any extraordinary magnitudes that terminate them; as in traveling towards a large city, caſtle, or cathedral, we fancy them to be nearer than they really are. Hence alſo animals and ſmall objects ſeen in a valley, contiguous to large mountains, or on the top of a high mountain or building, appear exceeding ſmall. Dr. Jurin accounts for the laſt recited phenomenon, by obſerving that we have no diſtinct idea of diſtances in that oblique direction, and therefore judge of them merely by their pictures on the eye. Dr. Porterfield obſerves, with reſpect to the ſtrength of colouring of different objects, that if we are aſſured they are of a ſimilar colour, and one appears more bright and lively than the other, we judge the brighter object to be the nearer. When the ſmall parts of objects appear confuſed, or do not appear at all, we judge that they are at a greater diſtance, and *vice verſâ*; becauſe the image of any object, or part of an object, diminiſhes as the diſtance of it increaſes. Finally, we judge of the diſtance of objects by the number of intervening bodies whereby it is divided into ſeparate and diſtinct parts; and, the more this is the caſe, the greater will the diſtance appear.

pear. Thus, diſtances upon uneven ſurfaces appear leſs than upon a plane, becauſe the inequalities do not appear, and the whole apparent diſtance is diminiſhed by the parts that do not appear in it: and thus the banks of a river appear contiguous to a diſtant eye, when the river is low and not ſeen. Accidens de la Vue, p. 358. Smith's Optics, vol. i. p. 52. and Rem. p. 51. Robins's Tracts, vol. ii. p. 230, 247, 251. Porterfield on the Eye, vol. i. p. 105, vol. ii. p. 387, &c. See Prieſtley's Hiſt. of Viſion, p. 205. and p. 689, &c. See VISIBLE.

DISTANCE *of the Picture*, in *Perſpective*. If, from the point of ſight, a ſtraight line be drawn perpendicular to the picture, the point in which that line cuts the picture, is called the centre of the picture; and the diſtance between that centre and the point of ſight is called the diſtance of the picture. The choice of a proper diſtance from the eye to the picture is of great importance to the pleaſing repreſentation of an object, which cannot be ſeen to advantage, if the angle which it ſubtends exceed 40°.

In the examples that are given by writers of perſpective to illuſtrate the art, we frequently find the repreſentation of objects very diſtorted and unnatural. This inconvenience it is very difficult, and, in many caſes, impoſſible to avoid; for, as all the auxiliary lines are in proportion to the diſtance of the eye from the picture, this diſtance is unavoidably aſſumed too ſmall, otherwiſe the vaniſhing lines and points, and other lines connected with the demonſtration, would exceed the limits of the paper. Therefore, learners ſhould be aware of this circumſtance, and not miſtake an example for imitation, a defect which it would have been deſirable to have avoided.

DISTANCE *of a Vaniſhing Line*. If a ſtraight line be drawn from the point of ſight, perpendicular to a vaniſhing line, the point where it interſects it is called the centre of the vaniſhing line; and the diſtance of this centre from the point of ſight, is the diſtance of the vaniſhing line.

The diſtance of a vaniſhing line is always the hypothenuſe of a right-angled triangle, of which the two ſides are the diſtance of the picture, and the diſtance of the centre of the picture from the centre of the vaniſhing line. *Example* (*Plate* I. *Perſpective*, *fig.* 1.) Let C be the centre of the picture, V *v* any vaniſhing line; through C draw C E parallel to V *v*, making C E equal to the diſtance of the picture; draw C *c* perpendicular to V *v*, and join E *c*: *c* will be the centre of the vaniſhing line, V *v* and E *c* its diſtance, being the hypothenuſe of the right-angled triangle E C *c*, in which E C is the diſtance of the picture, and C *c* the diſtance of the centre of the picture from the centre of the vaniſhing line.

DISTANCE, *Points of*. It is by means of the points of diſtance, that we are enabled, in perſpective, to aſſign to the repreſentation of lines, their proportion with reſpect to the original.

The points of diſtance are always laid off on the vaniſhing-line of the original plane, on which the original line to be repreſented is ſuppoſed to be ſituated. They are ſo called, becauſe they are placed at the ſame diſtance from the vaniſhing point, as the diſtance of the vaniſhing point from the point of ſight. It moſt frequently occurs in practice, that the points of diſtance are laid off on the horizontal line, and the proportions derived from them on the ground-line, or interſecting line. Thus in *Plate* I. *Perſpective*, *fig.* 2. which is the perſpective repreſentation of a cube, whoſe ſide is *a b*; V *v* is the horizontal line, or vaniſhing line, of the baſe of the cube; V the vaniſhing point of the line, or edges of the cube *a m*, *b n*; E the point of ſight. Then with the centre V, and diſtance V E, deſcribe the arc E D, the point D, where it interſects the horizontal line, is the point of diſtance of the vaniſhing point V.

If now *a β* on the ground-line be taken equal to the original line or ſide of the cube, and D *β* be drawn from the point of diſtance, the point *m*, where it interſects *α* V, will determine the length *a m*, which is to be given to the repreſentation of the ſide of the cube.

In the ſame manner we find the point of diſtance *d* correſponding to the vaniſhing point *v*; and the mitre or diagonal point of diſtance D *m*, correſponding to the diagonal vaniſhing point *m v*, and it will be ſeen by inſpection of the figure, how all theſe points of diſtance may be uſed to determine the proportion of lines which tend to their correſponding vaniſhing points. Thus if *a μ* be taken equal to the diagonal of the ſquare *a b*, and a line drawn from D *m* to *μ*, the point *x*, where it interſects *a m*, will determine *a x*, which is the perſpective repreſentation of the diagonal.

But it is by no means neceſſary that the points of diſtance ſhould be taken on the horizontal line V *v*; for the line *a m* belongs equally to the plane *a b m n*, whoſe vaniſhing line is V D *ι*, and interſecting line *γ a β*. Now, if V D *ι* be taken equal to V E, another point of diſtance D *ι* will be obtained, which will equally ſerve to proportion the line *a m*; for if we take *a γ* = *a β*, and join D *ι* and *γ*, the ſame interſection *m* will be obtained as before, and ſince *a m* belongs not only to the planes *a m n b*, *a m x z*, but to an infinity of others, it is evident that there muſt be an infinity of lines, upon which the points of diſtance may be equally taken. Hence any line drawn through *a* may be conſidered as the interſecting line of a plane, in which the ſtraight line *a* V is ſituated; a line drawn through V parallel to it, will be the vaniſhing line, upon which if V D be taken equal to V E, D will be the point of diſtance, by which the line *a* V may be divided into any proportional parts of the interſecting or original line. It cannot be too often recommended to the ſtudent in commencing the ſcience of perſpective, to conſider every caſe in this general manner, and to endeavour to diveſt himſelf of all partiality for the horizontal and ground-lines, which are nothing more than the vaniſhing and interſecting lines of an original plane parallel to the horizon, as will be more fully illuſtrated under perſpective and other ſubjects connected with it.

DISTASTE, or DISGUST, a loſs of appetite, or an averſion, or repugnance, to foods which are commonly eaten.

Diſtaſte is held, by phyſicians, one of the principal diſorders of the ſtomach. It ariſes from a want of ſenſation in the upper orifice of the ventricle, which may be occaſioned various ways: as by a too great abundance of food; thick, heavy humours in the ſtomach: fat viſcid aliment; obſtructions of the lacteals: ſuppreſſions of the uſual evacuations; intermiſſions of the ordinary exerciſes, a defect of the nerves, in having their natural faculty aboliſhed, or ſuſpended, as in a lethargy, and apoplexy; and according to Sylvius, by a groſs viſcid ſaliva, or a thick bile, aſcending out of the ſmall guts into the ſtomach.

DISTEMPER, in *Medicine*. See DISEASE.

DISTEMPER is uſed in *Painting*, for the working up of colours with ſomething elſe beſides mere water, or oil.

If the colours be prepared with the former of theſe, that kind of painting is called limning; and if with oil, it is called painting in oil, or ſimply painting.

If the colours be mixed with ſize, whites of eggs, or any ſuch proper glutinous, or unctuous ſubſtance, and not with oil, they then ſay, it is done in diſtemper; as thoſe of the admirable cartoons, formerly at Hampton court: and as all ancient pictures are ſaid to have been painted before the year 1410.

The beſt method of compounding the colours with the vehicles, is to mix the ſize in water; then to levigate the colours

colours in part of it, and afterwards to put each kind into a proper pot, adding as much more of the melted size as will bring it to a due consistence, and mixing the whole well together in the pot, with a proper brush or wooden spatula. Warm water may be afterwards added, if necessary, for grinding the colours, or for working. The pots must be tied with bladders. This method of painting is chiefly confined to scenes, and grosser works, where the effect depends more upon the perspective art, and opposition of the colours, than on their brightness.

DISTENSION, the act of stretching a thing; also a state of a thing violently stretched, and distended. See TENSION.

DISTENSION, *Distensio*, Διατασις, in the *Ancient Music*, was used for the differences of sounds with relation to acute and grave. Wallis's Append. ad Ptolem. Harm. p. 154.

Nature, in this respect, strictly speaking, assigns no limits. But, with regard to our use, the ancient musicians held, that the nature of what sounded, and also of what was to judge, that is, the human ear, was to be considered: for, neither the human voice, nor even any instrument, can give intervals of distensions immensely great or small, nor could the ear judge of such. Aristoxenus fixes the least interval of distension in practice, to the diesis enharmonica. As to the greatest, he thinks it does not exceed two octaves, and a fourth, or a fifth, if we consider any human voice, or three octaves, if we consider one and the same instrument. He does not deny that the extent of the voice, considered in different subjects, as in men and children, may go even beyond four octaves. Aristoxen. p. 21. edit. Meibom.

DISTHENE, in *Mineralogy*. See SAPPANE.

DISTICH, Διστιχον, a couplet of verses; or a piece of poetry, the sense whereof is comprehended in two lines. There are excellent morals in Cato's distichs. See Vigneul de Marville on the Distichs of Cato, tom. i. p. 54, 55.

Hexameter and pentameter verses, otherwise called elegiacs, are disposed in distichs.

DISTICHIASIS, formed of δις, *twice*, and στιχος, or στοιχος, *order*, *rank*, in *Medicine*, a disorder of the eye-lids; wherein, instead of one, they have two rows of cilia, or hairs.

In the distichiasis, over the common, and natural hairs, there grows another extraordinary row, which frequently eradicates, and tears up the former; and, pricking the membrane immediately investing the eye, occasions pain, and draws defluxions upon it.

It is cured by plucking up the second rows of hairs with nippers, and cauterising the pores out of which they issued.

DISTICHUS, in *Botany*, (from δις, *double*, and στιχος, a *row*,) two-ranked, applied to a stem, expresses that the branches spread in two opposite directions, as in the Silver Fir, *Pinus picea*. *Distichа folia*, two ranked leaves, are such as spread likewise in two rows, and yet are not regularly opposite at their insertion, like the Yew, *Taxus baccata*, and the *Pinus canadensis*. Sm. Introd. to Botany 121, 147.

DISTILLATION, is one of the great operations in *Chemistry*, and is performed in a great variety of ways, according to the object to be attained. It may be defined a process of evaporation, or volatilization, performed in vessels adapted to condense or collect the substance volatilized. Distillation would naturally divide itself into three classes, according as the substance obtained is solid, fluid, or gaseous; but it not unfrequently happens, that the products of the same operation are collected in all three of these states, so that the subject may be more usefully considered in a practical view, as being performed with simple or with compound apparatus.

Distillation, where the sole or principal product is solid, is equally termed *sublimation*, and in general is performed with a very simple apparatus. In a vast number of operations, both in the small and large way, a single vessel is sufficient for sublimation. Thus, in subliming camphor from the rough material, a large glass globe is the only vessel employed. The rough camphor and other materials are dropped in, leaving the greater part of the vessel empty, and the bottom alone is heated, by which the vapour of the camphor rises to the upper part, which is comparatively cool, and there concretes into a hard tough cake, which moulds itself into the form of the vessel. Formerly, the vessels called aludels were much employed in dry distillation, which was the case when the sublimate vaporized was not readily condensed, and when it was required to continue the process for a considerable time, without deranging the lowest vessel where the materials were heated. The aludels were a series of pots, with an upper and lower opening, and fitted to each other, so that the vapour could pass up from the first to the second, the second to the third, and so on to the uppermost. They are described more particularly under the article ALUDEL, and are represented in *Plate* III. *Chemistry*, *fig.* 14. The use of aludels in manufacture, however, has been very generally superseded by long lateral chambers into which the vapour is conducted, these being found much more convenient, particularly (among other things) on this account, that in the perpendicular range of aludels, any slight concussion is apt to cause the sublimed substance to fall down again into the lowest vessel and defeat the end of the operation.

In chemical experiments, a Florence flask is often quite sufficient for sublimations, the bottom alone being heated by a lamp, or on a sand-bath, and the neck loosely stopped. Thus, small quantities of reguline arsenic, corrosive mercurial sublimate, calomel, and many other important preparations may be made. Where a very great heat is required, an earthen retort is the best vessel for sublimation, and the sublimed substance may be collected, either in the cooler extremity of the neck of the retort, or in any receiver beyond it which may be adapted to it. Thus zinc may be distilled from calamine and charcoal, or phosphorus from phosphoric acid and charcoal, simply by dipping the end of the neck of the retort in water, and the sublimed substance, in either case, concretes partly within the neck and partly in the water. Where the vaporized substance, which is solid when cold, is passed through water, it concretes into a remarkably fine powder, instead of a hard cake, as is usually the case when the receiver is dry. Advantage has ingeniously been taken of late of this circumstance in the preparation of calomel, in the laboratory of Messrs. Howard and Company, to save the labour employed in levigating this important mercurial preparation, for by driving the vaporized calomel through water, it concretes into a powder which scarcely any mechanical operation could bring to equal in fineness.

Sublimation is also occasionally performed either in a retort and receiver, or in an alembic and capital, as will be presently described. This is commonly done where a part of the vaporized substance condenses also into a fluid, which is to be preserved.

The apparatus used in the obtaining of gasses, by the distillation of solids or liquids, is in general very simple. A retort, either of glass or earth, to the neck of which is luted a narrow tube for the conveyance of the gas to the pneumatic trough, is in general sufficient. It may be observed, that the best shape for retorts for the distillation of gasses is that in which the neck is small, long, and narrow; whereas in the distillation of liquids, a much more roomy neck is required.

The

The apparatus for the diſtillation of liquids is that which has engaged the greateſt attention from chemiſts and manufacturers; and from the conſtant uſe made of this proceſs, both in experiments, and in manufacture, it is of extreme importance. Every apparatus for this purpoſe muſt conſiſt at leaſt of two parts, *viz.* the boiler or veſſel in which the materials are heated, and the veſſel communicating with the former, in which the ſteam or vapour is condenſed into a liquid. A circumſtance occurs here alſo, which does not take place in the diſtillation of ſolids and gaſſes, which is the large quantity of latent heat that the liquid acquires when reduced to vapour, and conſequently which muſt be again expelled before the vapour can be condenſed into a liquid. Hence in diſtilling of liquids, either the condenſing veſſel muſt be made extremely large, to allow of a vaſt ſurface to be expoſed to the cooler air, or (what is always the caſe in proceſſes of this kind in the large way,) ſome particular contrivance muſt be added for cooling the vapour, which is generally effected by ſurrounding the outſide of the condenſing veſſel with a large body of cold water. It was this circumſtance indeed, that is, the prodigious quantity of heat imparted to a large body of water, by a comparatively ſmall portion of ſteam in the act of condenſation, which firſt ſuggeſted to the late Dr. Black his beautiful theory of latent heat, and furniſhed him with the moſt ſtriking illuſtration of his opinions.

Diſtillation of liquids in the large way is uſually carried on in this country in the ſtill and refrigeratory; but in many parts of the continent the alembic is preferred. The conſtruction of the alembic has been already deſcribed under that article. It eſſentially conſiſts of two parts, *viz.* the boiler, which is either cylindrical or approaching to globular, and the capital, which cloſely fits on the top of the boiler, and is ſurrounded on the outſide with, and incloſed in, a veſſel containing cold water. The advantages and defects of the alembic have been deſcribed under that article. The great defect of the old conſtruction is the ſituation of the veſſel of cold water intended to condenſe the vapour; for being directly over the boiler, if it is kept ſufficiently cold to prevent the eſcape of any of the vapour, a portion of the latter, when condenſed, falls back again into the boiler, and thus the proceſs is needleſsly prolonged. It was with the particular view of removing this defect that ſeveral chemiſts (and eſpecially Beaumé) have added to the capital of the alembic a ſerpentine or worm tub, placed beſide the boiler, into which the conducting pipe of the capital is continued in a ſpiral form, ſo as to detain the vapour for its compleat condenſation, none of which can again fall into the boiler. This led to a farther ſimplification of the whole apparatus, by entirely removing the refrigeratory over the boiler, and thus forcing the whole of the vapour uncooled into the worm pipe, where the water which ſurrounds it condenſes it into a liquid. This apparatus forms the common ſtill and cooler, or worm, now univerſally employed in the diſtillation of all kinds of ſpirits, and the preparation of diſtilled waters, and a number of other uſeful purpoſes.

The common ſtill conſiſts of a boiler, (*a*, *fig.* 1. *Plate* VII.) which may, for ſmall quantities, be made to ſit looſely into any kind of furnace or ſtove, as here repreſented; but in the large way is fixed in maſonry with a fire-place beneath it, of a head or capital *b*, which conſiſts of a hollow globe fitting upon the boiler, and with its upper part drawn out into a curved pipe of decreaſing diameter, which deſcribes a compleat arch, and terminates at the upper part of the ſerpentine or worm into which it fits. The latter, *c*, is a long pipe, with a regularly decreaſing diameter, which is arranged in a ſpiral form in the middle of a large tub of cold water, *d*, by means of which the vapour is condenſed, and trickles down in a ſmall regular ſtream from the lower end of the worm *e*, where it emerges from the ſide of the tub. The boiler of the ſtill is generally made of tinned copper, as well as the lower part of the capital; but the arched termination of the latter, as well as the whole of the worm, are generally of pewter. The joining between the boiler and capital requires a ſlight luting, for which ſlips of paſted paper, or wet bladder, are moſtly ſufficient. The line of tube, from the arch of the capital to the bottom of the worm, ſhould be an uniformly deſcending ſpiral to prevent any lodgement of the diſtilled liquor, and ſome nicety is required in large ſtills, to give the worm an exact degree of ſlope, which is found by experience to be the moſt favourable to ſpeedy condenſation. The chief diſadvantage attending this apparatus is the difficulty of cleaning the ſerpentine, when any ſtrong ſmelling ſubſtance, ſuch as an eſſential oil, has been procured; and, in this reſpect, the common alembic, with the refrigeratory round the capital, has the advantage.

The management of the fire is of great importance in all diſtillations, to avoid on the one hand boiling over, or burning the ingredients by too great heat; and on the other, to keep up the fire ſtrong enough to afford an even regular evaporation into the condenſing part of the apparatus. When too much heat is uſed, there is alſo danger of the capital being blown off by the great expanſive force of the vapour which is too ſuddenly generated, and cannot be condenſed with ſufficient rapidity; or elſe the liquor in the boiler riſes up into the capital, and flows over into the ſerpentine. This latter accident is perceived by the liquor coming out from the bottom of the ſerpentine not in a clear uniform ſtream, but by guſhes, and ſtarts with a guggling noiſe, and coloured or fouled. When the ſtream of diſtilled water flows evenly, and the boiling liquor is heard to ſimmer moderately within the ſtill, the proceſs will be known to go on properly.

We may mention in this place the project of diſtilling in vacuo, which ſeems firſt to have ſuggeſted itſelf to the late Dr. Black, and which, at firſt ſight, appears a very ingenious and happy idea. The evaporation of liquids is regulated not only by the heat to which they are expoſed, but by the degree of preſſure to which they are ſubjected, the evaporation being inverſely as the preſſure. Thus, as it is well known, ether will evaporate ſo violently as to boil in vacuo, and alcohol will boil at a very moderate warmth under the ſame circumſtances. Hence it was ſuppoſed, that by diſtilling in vacuo, a vaſt ſaving of fuel would be obtained, as the temperature required would be ſo much leſs than in ordinary circumſtances. The experiment was made by Mr. Watt, and is thus related in Dr. Black's Lectures. A very ſmall ſtill was half filled with water, and then cloſely united with the receiver, ſo that every joining of the apparatus was air-tight. A ſmall hole was made in the bottom of the receiver, and a plug was fitted to it. The water being made to boil violently ſent the ſteam through the whole apparatus (there being no water in the refrigeratory to condenſe it) forcing the air out by the hole. While the whole was boiling hot, and the ſteam blowing through the hole, this was ſuddenly ſtopped by the plug, and the bottom of the ſtill was ſet in ice. This ſoon cooled its contents, and the ſteam which occupied the reſt of the apparatus collapſed into a few drops of water, leaving the ſpace which it had occupied nearly in vacuo. A lamp was now ſet under the ſtill, and in a few minutes the whole apparatus grew warm. Cold water was put into the refrigeratory, and the diſtillation went on ſlowly and evenly, though the head of the ſtill was ſcarcely

ſcarcely warm to the hand. The temperature of the ſteam was only 100°, but on comparing the quantity of water diſtilled, with the increaſe of temperature which had been imparted to the water of the refrigeratory, by the condenſation, it was found that the latent heat of the ſteam, when produced in vacuo, was ſurpriſingly increaſed, and therefore it is obvious that a proportional increaſe of fuel is conſtantly required to cauſe the water to evaporate at all. By repeating the experiment carefully, Mr. Watt found that water would diſtil very well in vacuo at the temperature of 70°, but that in this ſtate the latent heat of the ſteam amounts to as much as nearly 1300; and therefore as the latent heat is at leaſt as much increaſed as the diſtilling temperature is diminiſhed, the additional quantity of fuel required for the former purpoſe more than counterbalances the ſaving of fuel in the latter.

The apparatus generally uſed for the diſtillation of moderate quantities, and in laboratory experiments, is the retort and receiver. The retort is made either plain or tubulated, and fitted with a ground ſtopper. It ſhould be roomy at the head, as it is there where the vapours firſt begin to condenſe. When the plain retort is uſed, the materials to be diſtilled, if liquid ſhould be poured in by a funnel with a very long neck, that none may lodge in the neck of the retort. The bottom of the retort, where the heat is applied, is blown pretty thin, and being of uniform thickneſs, it will readily bear the heat of an Argand lamp; or even it may be ſlung upon a chain, and placed a little way above an open coal or charcoal fire, if burning clearly without much riſk of breaking. The neck of the retort *a*, *fig.* 2, *Plate* VII. may either paſs at once into that of the receiver, or ſometimes an *Adopter*, *b*, as it is called, is interpoſed to increaſe the diſtance between the retort and receiver, and all the joinings are cloſely luted. The receiver *c* ſhould be of conſiderable capacity to afford a large cool ſurface for the condenſation of the vapour, and this may be further aſſiſted by covering it with a cloth kept conſtantly wetted with cold water: the receiver is ſometimes a ſimple globe, but it is preferable even in the ſimpleſt diſtillations, to have a long tube drawn out from it at the bottom, as here repreſented, which may conveniently enter a bottle *d*, placed underneath, and thus the liquor is drawn off from the receiver, and the products of the operation may be examined at any period of the proceſs without unluting any of the veſſels; beſides which all danger of burſting the veſſels by too copious a guſh of vapour is avoided.

All the apparatus for diſtilling, however, which we have hitherto deſcribed, is only uſeful in the ſimpler proceſſes, that is, where the product of the operation is only a ſolid or fluid, and eaſily condenſible without addition. Thus the alembic or ſtill, with the refrigeratory, is devoted almoſt excluſively to the diſtillation of aromatic and other waters or ſpirits, which readily condenſe by cooling; and the ſimple retort and receiver is uſually reſerved either to experimental purpoſes, or in the large way, to the preparation of the ſtronger acids, or of phoſphorus and other ſubſtances, that require a very ſtrong heat. But the older chemiſts often felt a moſt material inconvenience in the uſe of the retort and receiver; for many diſtillations are attended with the production of a vaſt quantity of gas or vapour, either entirely uncondenſible, or which can ſcarcely be made to aſſume a liquid form without being paſſed through water or other fluids. Hence it was neceſſary either to uſe one or more enormouſly large receivers, or elſe to drill a ſmall hole in the receiver employed, or to leave the veſſels only ſlightly luted, and to avoid the riſk of burſting them by the expanſion of the confined vapour, by letting it eſcape into the open air. This often cauſed the loſs of the moſt material and intereſting product of the diſtillation, eſpecially in experiments of reſearch, when the nature of gaſeous bodies began to form ſo conſpicuous a part of the philoſophy of chemiſtry. All theſe inconveniences have been effectually remedied by the apparatus of the late Mr. Woulfe, and the various improvements upon it, which have ſince been adopted, and the utility of this apparatus, is ſo great, that the invention forms almoſt an era in chemical diſcovery. Even as early as the time of Glauber the inconvenience of the old apparatus was felt, and this ingenious chemiſt, about the year 1655, gave a method of adding to the firſt receiver a lateral ſeries of ſtone or earthen jars, connected with it and with each other by ſyphon-ſhaped tubes, whereby all the vapour which eſcaped condenſation in the receiver was obliged to paſs through theſe jars before it could eſcape into the air. Theſe jars, however, were not half filled with water, as in Mr. Woulfe's plan, but empty, and let in a large pan of cold water to aſſiſt the condenſation.

The great improvement made in this apparatus by the late Mr. Woulfe, and deſcribed in the Phil. Tranſ. for 1767, was to fill theſe veſſels with water into which the conducting pipes dip, and thus to compel every portion of vapour or gas to paſs through as many veſſels of water as is required before it is allowed to eſcape; and even at laſt the gas may be detained by connecting the tube from the laſt bottle with a pneumatic trough or a gas-holder.

Another contrivance, however, is eſſential to the perfection of this apparatus. When the diſtillation is nearly over, or when, from any accidental cooling, the production of gas or vapour begins to ſlacken, a degree of vacuum is always made in the retort owing to the contraction by cooling in the bulk of the vapour which it contains. This circumſtance forms a ſimilar vacuum in the receiver, to fill which a ſtrong abſorption or ſuction of the liquid takes place from the firſt bottle back into the receiver through the connecting tube. This again would cauſe an equal vacuum in the firſt bottle, were it not that an equal portion of liquid of the ſecond bottle is ſucked up into the firſt: and this again produces the ſame abſorption from the third to the ſecond, and ſo on through the whole ſeries of connected bottles, through every part of which a retrograde motion takes place; and the different products of the operation, which were collected ſeparately in the different veſſels, are thus mixed and confounded together. To remedy this defect, ſeveral contrivances have been adopted. The inventor, Mr. Woulfe, employed an intermediate empty veſſel between the receiver and the firſt water-bottle, into which the bent tube from the receiver was immerſed only to a very ſhort depth, in conſequence of which, when the abſorption took place, the liquor was poured into this intermediate veſſel, and went no further. Another mode of obviating abſorption is by letting in the external air to that part of the apparatus where the vacuum begins. This, however, cannot be done by a conſtant and free communication with the air, for in this caſe, the veſſels not being air-tight, the whole object of the apparatus, in compelling the products of diſtillation to paſs through water for condenſation, would be defeated. There muſt, therefore, be ſome contrivance by which the veſſels may be kept air-tight ſo long as the diſtillation continues, but muſt admit the atmoſphere as ſoon as ever the flow of vapour or gas ceaſes, and a vacuum is beginning to be formed. This object may be attained in ſeveral ways. The ſimpleſt is to inſert into the veſſel a long tube of narrow bore, which ſhall juſt dip into the contained liquid, and thus ſhut out the air during diſtillation, but will eaſily admit the air when a partial vacuum is formed, and the level of the liquid is a little lowered

lowered by the ſuction of a portion into the conducting tube from the adjoining veſſel. Theſe tubes, for preventing abſorption, generally occupy the middleſmoſt of the three openings with which the Woulfe-apparatus bottles are uſually made, and which is ſhewn as a ſeparate figure in *Plate* VI. with the upright tube perforating the cork. The great advantage of theſe tubes is, that they are ſimple, eaſily obtained, and put together without any difficulty, nothing more being neceſſary than to bore a round hole in the cork, and lute the joinings with ſealing-wax or ſome other cement. This contrivance has the diſadvantages, however, that when any great influx of gas cauſes a preſſure within the bottle, a part of the liquor muſt be forced out of the upright tube, unleſs it be made ſo inconveniently long as to counteract any moderate preſſure: and alſo that when the bulk of the contained liquor is much increaſed during the diſtillation, the lower end of the tube dips too low to anſwer the deſired purpoſe of preventing abſorption of the liquid into the contiguous bottle.

Another contrivance, to prevent abſorption, and which has no other imperfection than its extreme fragility and liability to accident, is the tube with one or two bulbs, invented by a French artiſt, of the name of Wetter, and bearing his name. It is ſhewn with two bulbs forming the upper portion of, and cemented to the connecting tube *f*, *Plate* VI. and with a ſingle bulb and ſeparate in *Plate* VII. *fig.* 3; *e* forming the ſtopper of the receiver *a*. The Wetter's tube (which is of glaſs, like all the reſt of the Woulfe's apparatus) is bent twice to a compleat return or ſemicircle, ſo that one extremity is oppoſite to the other. The upper end is expanded into a kind of cup or bulb, and another complete bulb is blown in the ſpace between the two bends. A little mercury is then poured into the tube, enough to fill the lower bend, and thus compleatly to ſhut up all communication with the external air. If in this ſtate, there is a greater preſſure within the veſſel; to which the Wetter's tube is adapted, than that of the external air, the mercury is forced on towards the upper orifice of the tube, by its weight increaſing the preſſure within the veſſel, and it is not till this preſſure is ſo great as to force all the mercury into the upper bulb, that any gas can eſcape from the veſſel into the air. On the other hand, if abſorption takes place within the veſſel, and, in conſequence, a partial vacuum begins to form, the preſſure of the external air then drives all the mercury into the other bulb (or that which is between the two bends); and as this fluid does not fill the cavity, the air from without paſſes by its ſide, and ruſhes into the veſſel to reſtore the equilibrium. This ſimple and ingenious contrivance, therefore, unites almoſt every requiſite, but unfortunately its length and the ſtreſs on particular parts render it extremely liable to be broken, more eſpecially where it is hermetically ſealed to, and forms a part of a bent conducting tube as in F, *Plate* VI. The danger of breaking is alſo much increaſed whilſt it is made to fit into any glaſs veſſel by grinding. The ſeries of veſſels which forms the compound Woulfe's diſtilling apparatus in the above plate may be here briefly deſcribed, as it is well arranged and fitted for the moſt important experiments. A is a ſand-trough fixed over a furnace, and containing the tubulated retort B, in the neck of which is fitted the acid-holder C. This is a glaſs phial furniſhed with a glaſs ſtop-cock, accurately ground to fit both the phial and the neck of the retort. Its uſe is to allow the operator to drop any acid or other liquid down from the phial into the retort, for the purpoſe of diſengaging gas or other vapour from the contents of the retort, without admitting any particle of external air, which in delicate experiments of reſearch is of importance. D is a tubulated receiver, ſupported by the wooden ſtand E: F is the conducting and the Wetter's tube in one piece, as already deſcribed. When therefore any vacuum occurs, either in the retort or the receiver, the external air ruſhes in through the Wetter's tube, and prevents any regurgitation of liquor from the bottle G, into the receiver: G, I, L, are bottles with three tubulures, connected with each other by the bent tubes H, K; M is a tube proceeding from the laſt bottle, and which is bent of the proper form to be introduced under a jar inverted over water or mercury, into which may paſs any gas which has not been condenſed either in the receiver, or by paſſing through the liquid of any of the bottles. N is a convenient box, which ſerves both as a ſtand for the Woulfe bottles, and as a ſecure place to keep them in when not uſed. It may be added that if any abſorption be apprehended of the liquor from any one of the bottles into the other, (which however can hardly happen independently of a vacuum beginning in the retort and receiver) this may be provided againſt by fitting the middle opening with a tube, (as here repreſented ſeparately) which muſt juſt dip below the ſurface of the liquor of the bottles.

Several ingenious compound diſtilling apparatuſes have been contrived, which ſhould anſwer the end of conveying vapour through any ſeries of liquids for the purpoſe of condenſation, without having the fragility of the Woulfe's apparatus of contiguous bottles on the ſame level and connected with bent tubes, for it ſhould be added, that it is extremely difficult where the two extremities of the tubes are cloſely ground to fit the bottles, to give that preciſe degree of bend to the middle of the tubes which ſhall keep the ſtoppered ends in their places, without leaving a dangerous ſtreſs on any part of ſuch fragile ſubſtances.

Fig. 28, *Plate* V. is a ſtrong and uſeful kind of Woulfe's apparatus, invented by the late Dr. Hamilton. Its conſtruction is obvious by mere inſpection. The retort A is to be ſupported and heated either on a ſand bath, or on a ſtand over a lamp, and the diſtilled matters paſs into the ſucceſſive receivers C. C, C, C, into the laſt three of which water is to be put, whilſt that which is neareſt to the retort is to be left empty. If this receiver is tubulated, and a Wetter's tube fixed to the opening, or if the retort is tubulated and provided with the Wetter's tube, all abſorption will be prevented.

Fig. 3, *Plate* VII. is a uſeful and ſafe Woulfe's apparatus, invented by Mr. Knight of Foſter-lane, London. A, B, C, D, repreſents four veſſels, each ground into the mouth of that below it. E, E, E, are glaſs tubes, the middles of which are ground into the neck of each veſſel, and of ſufficient length to allow the upper end to riſe above the liquor, while the lower deſcends nearly to the bottom of the veſſel below: one of theſe tubes is repreſented ſeparately in *fig.* 4. The veſſel A is kept empty, and ſerves as a receiver to contain any liquid diſtilled from the retort which enters at the orifice F, and it is alſo furniſhed with a Wetter's tube G, to prevent the abſorption of any liquid up from the lower veſſels, when a vacuum is formed by the cooling of the retort or receiver. The veſſels B, C, and D, are filled with the liquor intended to be impregnated with the vapour or gas, that diſtils over and which paſſes by the tubes ſucceſſively through the whole range of veſſels. The lower one, D, has the bent tube H to carry off any unabſorbable gas, and it is made broad and firm at the bottom, beſides being fitted into a heavy wooden ſtand (not here repreſented,) to leſſen the danger of being overſet. This apparatus unites every requiſite, and it has the great advantage of not being eaſily deranged, and if any part is broken, it may be replaced without much difficulty.

Some other modes of faturating liquids with gaffes in compound diftillations, will be mentioned under the article Nooth's Apparatus.

Distillation, *Brewing for*. See Brewing.

Distillation *of falt water*, in order to obtain frefh. See *Salt*-Water.

Distillation *of wood*. See Pyroligneous *acid*.

DISTILLED Spirits. See Spirits.

Distilled *Waters*, in *Pharmacy*. When any vegetable matter is boiled with water in any veffel fitted to collect and condenfe the vapour, a diftilled water is obtained, which is, in almoft every inftance, fomewhat impregnated with odorous or fapid particles which it has extracted from the vegetable and carried up with it in the procefs. But the difference in degree of impregnation, according to the fubftance employed, is extreme. Sometimes only a faint and naufeous tafte is given, which foon goes off; but in other inftances the water is highly fcented and tafteful.

The firft occurs where the plant is of the herbaceous and nearly infipid kind, or only bitter without being aromatic; but where the plant is rich in effential oil, or ftrongly aromatic, the water partakes largely of thefe properties.

A vaft variety of diftilled waters have been ufed in pharmacy, moft of them obtained from the vegetable, but fome from the animal kingdom.

Of the vegetable waters, many were obtained from the inodorous herbaceous plants, all of which are now difufed in this country as being entirely unfit and ufelefs, but appear to be ftill common in many parts of the continent, and efpecially in France, and therefore they require fome little notice in this place.

The method of preparing them is thus given by Beaumé, taking plantain water as an example. Any quantity of the frefh plantain is taken and put into an alembic or ftill, fo as to fill about half its capacity. The plant is then covered with water, the capital is luted on with pafted paper, the worm-tub is filled with cold water, and the alembic is rapidly heated to the boiling point, and is kept at the fame degree the whole time. The diftilled water of plantain then begins to come over, and the procefs is continued till about a quarter as much liquor is obtained as there was put of water in the alembic.

In the like manner, all the diftilled waters of the fucculent plants are obtained.

Some have recommended the expreffed juice of the plant to be ufed inftead of the plant itfelf, but this is not neceffary, though in one refpect it might be ufeful, as it would prevent all rifk of empyreuma which fometimes takes place in the common way, by the adherence of part of the entire plant to the bottom of the ftill.

When the entire plant is ufed, the ftill fhould not be more than two-thirds full, as the plants fwell extremely on the firft boiling, which might caufe the liquor to boil over, or by ftopping the canal of the ftill-head, might endanger the veffel's blowing up.

All the waters diftilled from the infipid fucculent plants, have a kind of herbaceous fmell, which is fo fimilar in all, as to make it difficult to diftinguifh which plant has been ufed. The diftilled water has befides, when firft prepared, a fmell and tafte which have been called empyreumatic, though it does not depend on any fcorching of the materials, fince it is equally perceived, when a water-bath is ufed, and confequently when the plant has not been expofed to a greater heat than that of boiling water. This peculiar empyreuma goes off, on expofing the water to a gentle heat for two or three days in bottles loofely corked. It alfo difappears, as Beaumé has obferved, on freezing the water.

All thefe waters, when kept for fome months, begin to grow turbid, and undergo fome kind of fermentation, or fpontaneous action, after which they depofit a number of flocculi apparently mucilaginous, but which have not been examined with accuracy, and after a while, they fhew fenfible figns of containing fometimes an acid, at others ammonia, and in about a year's time they begin to become offenfive and mouldy. If, therefore, they are ufed in medicine, they fhould not be kept for many months.

The diftilled waters from the fucculent inodorous plants are, however, totally difcarded from the prefent pharmacopœias, at leaft in this country, and it does not appear that we have fuftained any lofs by their removal. It ftill remains, however, as a matter worthy of inveftigation, whether the infipid plants, that poffefs very decided medicinal properties, fuch as the digitalis, and the numerous tribe of narcotics, may not yield a powerful diftilled water from which benefit may be obtained. But for all ufeful purpofes (as far as we yet know) the infufion and extract, or tincture of thefe plants, or the dried plantain fubftance, anfwer every end that can be expected, and are prepared with much lefs trouble, and are probably much more durable.

A confiderable number of infipid diftilled waters (or nearly fo) were formerly obtained by fubmitting feveral of the gelatinous animal fubftances to diftillation, fuch as frog's fpawn, fnails, &c., in which cafe the intermede of the water-bath was effential. Thefe waters are infipid, but have a flight animal fmell, and change in courfe of time. They were fuppofed to be ufeful in nephritic and internal hæmorrhagic complaints, and were employed pretty abundantly externally, as cofmetics. They are all now very properly expunged from the pharmacopœias of this country.

The diftilled waters that are actually kept in our fhops are thofe which are prepared from the aromatic vegetables, from moft of which an effential oil in fufpenfion may alfo be obtained at the fame time; and as the water tafles and fmells ftrongly of the oil peculiar to the plant, and alfo as a water very fimilar to the diftilled water, may generally be made by diffolving fome of the oil in plain water, there can be no doubt but that the diftilled waters of all the aromatic vegetables owe their ftrong fmell and tafte to the effential oil which they hold in folution. Some rules are to be obferved in the diftillation of thefe waters; the fubject of diftillation fhould be firft thoroughly macerated water, to open its texture and make it yield its effential oil more abundantly. When the herbaceous plants are ufed, fuch as peppermint for example, they become fufficiently macerated in the time that it requires to bring the water to a boiling heat, fo that no previous preparation is neceffary, it being fufficient to put them into the ftill without the requifite quantity of cold water. But the woods and other hard parts of plants fhould be macerated for fome time before diftillation, being previoufly well bruifed and their texture broken down. It was formerly the cuftom to ferment them before diftillation, and pearl-afhes were added to affift in breaking down the texture of the fubftance. In moft cafes, however, this previous ftep is needlefs, and fometimes hurtful, and it is now nearly abandoned. The quantity of water required, of courfe, muft vary according to the nature of the fubftance ufed. Herbaceous plants, recently gathered, require only two or three times their weight. When previoufly dried, the ftill may be filled to three-fourths of its capacity, with the plants moderately preffed, and fo much water added as will fully cover them. The fire fhould be raifed expeditiouffy at firft, as a long continued heat is apt to impair the aromatic flavour. The water which firft comes over is almoft always milky and turbid, owing

owing to an excess of essential oil above the quantity which it can hold in clear solution, that it carries up with it; and this excess of oil, when the distilled water cools gradually, collects at top in the form of a thin film, or subsides to the bottom when its specific gravity is the greatest. As the water distils over it becomes clearer and proportionably less aromatic to the taste, till at last, when perfectly limpid, it becomes nearly insipid, and the fire should then be withdrawn.

The same process is employed in the extraction of the *essential oils* from plants, as will be mentioned under that article; only in this case, as much of the materials and as little water as possible are employed; and the water of the refrigeratory is kept somewhat warm, otherwise much of the oil would condense too soon, and fall back into the boiler.

The distilled aromatic waters, as well as those from the insipid plants, have at first an unpleasant flavour, which is the same in all, and may be easily distinguished through the strong aromatic taste proper to the individual plant. This unpleasant taste goes off in a few days if the water is kept in a loosely corked bottle. That the waters may keep better, it is usual to add about a twentieth of their weight of spirit of wine.

After all the aromatic water has come over, if the process be still continued, an acidulous liquor sometimes rises, which is strong enough to corrode slightly the still head, to which circumstance Quincy, with great probability, ascribes the anthelmintic virtues which some of these waters appear to possess.

Beaumé has also remarked, that in continuing the distillation with a hot fire, after the water has run limpid and nearly tasteless, there sometimes rises a second portion of oil, which is strongly empyreumatic, and has but little of the odour of the plant, and is less fluid than the first oil. It should therefore never be mixed with the aromatic water. This oil appears to be similar in nature to that which is collected in abundance in the distillation of some kinds of brandy, as mentioned under that article; but its nature has not been properly examined, so that it is doubtful whether it be a fixed oil driven over by the continuance of the heat, or a portion of the proper essential oil altered in the process. Beaumé has obtained this oil from thyme, rosemary, and lavender.

Some plants that abound in fragrance, and yield a very aromatic water, afford very little, if any, essential oil in common distillation. The rose is a striking instance.

The only distilled waters retained by the London and Edinburgh colleges are those prepared from orange peel, sweet fennel, rose leaves, peppermint, pennyroyal, spearmint, lemon peel, cinnamon, cassia cinnamon, dill seeds, and pimento.

DISTILLER, a person who distils spirits for sale. By 43 G. III. c. 69, every distiller or maker of low wines or spirits for sale, or exportation, within England, shall take out a licence, which shall be charged with the yearly sum of 10*l.*; and every rectifier of spirits within England shall pay for such licence a duty of 5*l.*; and such licence shall be renewed annually before the end of the year, on pain of forfeiting, if a common distiller, 200*l.*; if a molass distiller or rectifier, 30*l.*; 24 G. III. c. 41. No person shall be deemed a rectifier or compounder who shall not have an entered still capable of containing, exclusive of the head, 120 gallons; which shall have suitable tubs and worms, and be used for rectifying British spirits for sale, 26 G. III. c. 73. By 19 G. III. c. 50. every such distiller shall cause to be put up in large characters, over the outward door of every place used for making or keeping of British-made spirits, the words *Distiller*, *Rectifier*, or *Compounder* of *Spirituous Liquors*, on pain of 100*l.*; and if any person shall buy any such spirits of any person not having such words over his door, he shall forfeit 50*l.* By 21 G. III. c. 55, if any distiller or dealer shall buy any British made spirits (except, as in the former case, at the public sales of condemned spirits by the commissioners of excise) he shall forfeit 500*l.* By 19 G. III. c. 50, no person shall be permitted to make entry of any workhouse or place, or of any still or utensil for making, distilling, or keeping of low wines or spirits, unless he shall occupy a tenement of 10*l.* a year, assessed in his own name, and paying the parish rates: and by 21 G. III. c. 55, in order to prevent private distillations, every person who shall make or distil any low wines or spirits, whether for sale or not for sale, shall be deemed a common distiller for sale, and shall enter his still and vessels at the next office of excise; and every person making or keeping any wash fit for distillation, and having in his custody any still, shall be deemed a common distiller for sale, and be liable to the several duties, and subject to the survey of the officers. No common distiller or maker of low wines, spirits, or strong waters for sale, shall set up any tun, cask, wash-back, copper, still or other vessel, for making or keeping any worts, wash, low wines, spirits, or strong waters; nor alter nor enlarge the same, nor have any of them private or concealed, or any private warehouse, cellar, &c. for making or keeping any the said liquors, without first giving notice at the next office of excise, on pain of 20*l.*; and he in whose occupation any of the same shall be, shall forfeit 50*l.*; 8 and 9 W. c. 19. And by 24 G. II. c. 40. every distiller shall, 10 days before he distils or makes any spirituous liquors, enter every vessel, &c. at the next office of excise; on pain of 50*l.* for every still or vessel used and not entered. And every distiller shall, four days before he begins to brew any grain, &c. make entry at the next excise office, of all coppers, vessels, &c. inserting in such entry the day on which he intends to begin, and the use to which such vessel is to be applied; which shall not be altered on pain of forfeiting 100*l.* with the liquor, which may be seized by any officer of excise, 26 G. III. c. 73. And by 21 G. III. c. 55, no person shall make use of any vessel, room, &c. for making wash for the distillation of low wines and spirits, without giving notice at the next office of excise, on pain of 50*l.* for every vessel, room, &c. used without notice. Nor shall any person withdraw his entry whilst any duty is depending, or any vessels are standing, except by changing it on the day of its being withdrawn, 23 G. III. c. 70., 26 G. III. c. 73. No person is allowed to have any still or number of stills, which singly or together contain less than 100 gallons, under the penalty of 100*l.* for every still; and the wash-still shall contain at least 400 gallons, exclusive of the head, under the same penalty, 2 Geo. III. c. 5. and 14 Geo. III. c. 73.

Distillers are to shew to the officer every still or other vessel entered; and the vessels are to be marked by the gauger; and defacing the mark, or rubbing out, incurs a penalty of 20*l.* 26 Geo. II. c. 40.

Distillers who use private pipes, &c. for conveyance of distilled liquor, forfeit 100*l.* 10 and 11 W. c. 4. They shall also make holes in the breast of the still for taking gauges and samples, and provide locks on the still-heads, the holes, discharge-cocks, and furnace-door, under a penalty of 50*l.* and of 200*l.* for breaking or wilfully damaging such lock or fastening, after it has been secured by the officer, 12 Geo. III. c. 46. 14 Geo. III. c. 73.

The distiller shall provide proper ladders for the officer to examine each still, and assist in setting them up, on pain of 200*l.* 23 G. III. c. 70.

Distillers.

Distillers are required to give notice to the officer of excise, before they receive any wine, cider, &c. or any kind of fermented wash, on pain of 50*l.* and also before they charge or open the still, expressing and describing the number and marks of the wash-batches used; and they are prohibited from charging the still with any other, under a penalty of 100*l.* 24 G. II. c. 40; 12 G. III. c. 46; 14 G. III. c. 73.

Distillers, in preparing grist for wash, that use more than in the proportion of one quarter of wheat to two quarters of any other grain, forfeit 50*l.* 33 G. II. c. 9.

If any corn distiller, or maker of low wines or spirits from corn or grain, shall make use of any molasses, coarse sugar, honey, or any composition or extract of sugar, in brewing or preparing his wash for distillation, or receive such materials into his custody, exceeding 10lbs. in weight, he shall forfeit 100*l.*; and officers may take samples of the wash in any vessel, paying for the same at the rate of 1*s.* 6*d.* a gallon; and if the distiller shall obstruct him, he shall forfeit 100*l.* 23 G. III. c. 70.

Officers are to attend at the still-house, after due notice, to see that the wash-stills are properly filled, and when they are fully charged to lock and secure them. And if any person shall open any still-head, &c. after they have been so locked, and before they are opened by the officer of excise, or shall wilful y damage any lock or fastening, he shall forfeit 200*l.* 12 G. III. c. 46.

Removing or concealing wash, &c. in the possession of any distiller, incurs a forfeiture of the same; and such distiller, and the person employed to remove, or who shall receive the same, shall severally forfeit 10*s.* for every gallon of it; and no wort, wash, &c. shall be put into the still, or removed from the back or vessel in which it was fermented, till the same has been gauged; in the penalty of 200*l.* and double duty.

The officer shall every three months, if required, take an account of the stock of all distillers and rectifiers, and if any unfair increase shall be found, the same shall be forfeited, and may be seized; and the person in whose stock such excess shall be found shall forfeit 50*l.* Rectifiers are to mark the strength and quality of mixed spirits on the outside of the cask, and in default thereof, or if untruly marked, the same shall be forfeited, and also the casks, and may be seized; and the rectifier shall forfeit 50*l.* 26 G. III. c. 73.

By 27 G. III. c. 31, made perpetual by 41 G. III. c. 97, it was enacted, that all spirits should be deemed and taken to be of the strength indicated by Clarke's hydrometer, but by 43 G. III. c. 97. the lords of the treasury may discontinue the use of this hydrometer, and direct any other to be used in lieu of it. All British spirits of the third extraction, or which have been twice distilled from low wines, and had flavour communicated to them, shall be deemed "British brandy;" if no flavour has been communicated to them, the same shall be deemed "rectified British spirits." If of the second extraction, or once distilled from low wines, the same shall be deemed "raw British spirits." And all British spirits distilled with juniper berries, carraway seeds, anise seeds, or other seeds, or ingredients used in the compounding of spirits, shall be deemed "British compounds." And all British spirits of a greater strength than one to two over hydrometer proof, shall be deemed "spirits of wine." Officers shall take an account of the stock of rectifiers and compounders every three months at least, and if any increase of quantity, under certain limitations, be found, the quantity in excess shall be forfeited, and may be seized; and such person shall forfeit 50*l.* And if any British spirits or compounds are sent out of a greater strength than one in five under hydrometer proof, the same shall be forfeited, and treble value, or 50*l.* in the whole; and the same may be seized, with the casks and vessels containing it. 30 G. III. c. 37. The distiller shall weekly make entry of all wash by him used for the making of low wines and spirits within each week, on pain of 10*l.*; and within a week after shall pay off the duties, on pain of double duty. 19 G. III. c. 50. All permits for removing British spirits shall correspond with the request notes, and delivered with such spirits to the buyer, on the forfeiture of the same to such buyer, and double the price including the duties: and such buyer may be admitted to prove, that such spirits were delivered without a lawful permit: but no buyer shall be allowed to avail himself of such forfeiture, unless complaint is made within fourteen days after the delivery of the spirits. 26 G. III. c. 73.

Retailers of distilled liquors, or such as sell the same in less quantity than two gallons, must take out a licence, for which they are to pay annually a sum corresponding to the rent of the premises which they occupy; if the rent of such retailer be 15*l.* or upwards, 5*l.* 2*s.*; at 20*l.* and upwards, 5*l.* 10*s.*; at 25*l.* and upwards, 5*l.* 18*s.*; at 30*l.* or upwards, 6*l.* 6*s.*; at 40*l.* or upwards, 6*l.* 14*s.*; and at 50*l.* or upwards, 7*l.* 2*s.* This licence, which is to be renewed annually, on the penalty of 50*l.*, is to be granted only to those who keep taverns, victualling-houses, inns, coffee-houses, or ale-houses; who, within the limits of the head office of excise in London, pay 10*l.* a year rent and parish rates, and in places where the occupiers are not rated 12*l.* a year; and who, in other parts of the kingdom, pay to church and poor. They must first be licensed to sell ale in the places where they dwell.

By 16 G. II. c. 8. retailers of spirituous liquors, without licence, were subject to a penalty of 10*l.*; and by 24 G. II. c. 40. all liquors found in the custody of such persons, or within six calendar months after conviction, were to be seized. And by 13 G. III. c. 50. and 30 G. III. c. 38. such retailers are to forfeit 50*l.*, subject to mitigation so as not to be reduced below 5*l.* Every person, who shall retail less than two gallons, shall enter his warehouses, shops, &c. and his spirituous liquors, on pain of 20*l.* for every place, and 40*s.* for every gallon not entered: and also the liquors and casks. 9 G. II. c. 23. 30 G. III. c. 38. By 19 G. III. c. 69. every importer or dealer in spirituous liquors, shall cause to be painted, on a conspicuous part of the house, shop, or cellar, &c. used by him, the words *Importer of*, or *Dealer in, Spirituous Liquors*, on pain of 50*l.* Any importer or dealer buying of a person, who has not these words over the door of his shop, &c. shall forfeit 100*l.* Any person, who hath not made entry of his liquors, and who hath these words over his door, shall forfeit 50*l.* No spirituous liquors shall be brought into a place of sale, without previous notice to the officer of excise, and leaving with him a certificate, expressing that all the duties are paid, the quantity and quality, the name of the seller, &c. on pain of forfeiting 20*l.*, and also the liquor and casks. 9 G. II. c. 23. Retailers shall not increase the quantity of their liquors, on pain of 40*s.* a gallon; and the liquors so mixed with water, or any other liquors, shall be seized and forfeited. 9 G. II. c. 23. By 21 G. III. c. 55. the stock increased shall be forfeited, a quantity equal to the increased quantity shall be seized by the officer, and the person offending shall forfeit 20*l.* The officer may, at all times, by day or night, enter into warehouses, shops, or other places, to take an account of the quantity and quality; and if any retailer hinder the officer, he shall forfeit 50*l.* 9 G. II. c. 23. No licensed retailer shall have any share in a distillery or rectifying house, or be concerned in such trade, on pain of 200*l.* 26 G. III. c. 73.

Hawkers of spirituous liquors in the streets, &c. are liable

liable to a forfeiture of 10*l.* 9 Geo. II. c. 23. 11 Geo. II. c. 26. Persons giving away spirituous liquors, or paying wages in them, shall be deemed retailers. 9 Geo. II. c. 23. Keepers of gaols, workhouses, &c. selling spirituous liquors, or knowingly suffering them to be sold, except such as are prescribed by a physician, surgeon, or apothecary, forfeit for the first offence 100*l.* and for the second their office. Persons bringing any such liquors into any place of that kind may be apprehended, and on conviction committed to the house of correction or prison for any time, not exceeding three months, unless they immediately pay a fine, not exceeding 20*l.* nor less than 10*l.* Debts for spirituous liquors cannot be recovered, unless they have been contracted, or the liquors delivered at one time to the value of 20*s.* or upwards: and distillers knowingly selling or delivering distilled liquors to unlicensed retailers, forfeit 10*l.* and treble their value; and the retailer, convicting the distiller, is entitled to a share of the penalty, and is himself indemnified. Persons riotously rescuing offenders, or assaulting informers, and their aiders or abettors, are guilty of felony, and liable to seven years' transportation. 24 Geo. II. c. 40. If any person shall obstruct any officer in the execution of his duty, in relation to this act, he shall forfeit 200*l.* 23 Geo. III. c. 81. No liquor exceeding one gallon shall be removed without a permit. 6 Geo. I. c. 21. British spirits made from corn are allowed on exportation as merchandize, a bounty or drawback of 3*l.* 12*s.* *per* ton. 5 Geo. III. c. 5. 27 Geo. III. c. 13. And by 6 Geo. II. c. 17. for spirits drawn from British corn, a drawback was to be allowed at the port of shipping, of 4*l.* 18*s.* *per* ton, in full of all drawbacks: and by 23 Geo. II. c. 9, there was to be an additional drawback of 24*l.* 10*s.* a ton, on all British made spirits exported; provided that they are not exported in casks containing less than a hundred gallons, and in vessels of less burden than a hundred tons, except to Africa and Newfoundland, whither they may be exported in any vessels not less than seventy tons. 6 Geo. III. c. 46. The 43 Geo. III. c. 69, which consolidates the duties, &c. of excise, continues all advances, bounties, and drawbacks, which are particularly directed to be made by any act or acts of parliament in force, on or immediately before 5th of July, 1803, except so far as such allowances may be varied or repealed by the said act. By 39 and 40 Geo. III. c. 73, spirits distilled in England for exportation to Scotland, are exempted from the excise duties in England. And by 43 Geo. III. c. 69, for every gallon, English wine measure, of spirits, not exceeding in strength that of one to ten over hydrometer proof, and so in proportion for any higher degree of strength, made in England and thence imported into Scotland, payment is to be made by the importer before landing, of 4*s.*; and by c. 81. an additional duty of 2*s.*: for every such gallon manufactured in Scotland and brought from thence into England, 5*s.* 0½*d.*; and by c. 81. an additional duty of 2*s.* 5*d.* For every gallon of such spirits of greater strength than one to ten over hydrometer proof, and not exceeding 3*l* *per cent.* over and above one to ten over hydrometer proof, 7*s.* 5½*d.* and a surcharge. And all duties and drawbacks under these acts shall be proportionate to the actual quantity. No spirits shall be sent from Scotland to England, or from England to Scotland by land, or in vessels of less than 70 tons burden, or in casks containing less than 100 gallons, on forfeiture of the same, together with casks or package; and also the vessels, boats, horses, cattle, and carriages employed, which may be seized. 28 Geo. III. c. 46. And if any distiller, rectifier, compounder, or dealer in spirits, or servant belonging to any such person, shall obstruct any officer in the execution of this act, he shall forfeit 200*l.*

DISTILLERY, the art of distilling brandy and other spirits. This art was first brought into Europe by the Moors of Spain about the year 1550: they learned it of the African Moors, who had it from the Egyptians; and the Egyptians are said to have practised it in the reign of the emperor Diocleſian, though it was unknown to the ancient Greeks and Romans. Anderson's Hist. of Commerce, vol. i. p. 83. See Fermentation, and Malt *Distillery*.

DISTINCT Notion, or *idea*, according to M. Leibnitz, is, when we can enumerate marks and characters enough whereby to recollect a thing.

Such, *e. gr.*, is this; that a circle is a figure bounded with a curve line that returns into itself; all the points whereof are equally distant from one middle point. Or, it is that wherein the mind perceives a difference from all other ideas.

Distinct *Base*, in *Optics*, is that distance from the pole of a convex glass, in which objects, beheld through it, appear distinct, and well defined: so that the distinct base coincides with what we otherwise call the focus.

The distinct base is caused by the collection of the rays proceeding from a single point in the object, into a single point in the representation; and therefore concave glasses which do not unite, but scatter and dissipate the rays, can have no real distinct base.

Distinct *Vision*. See Vision.

DISTINCTION, a diversity in things, or conceptions. Logicians define distinction, an assemblage of two, or more words, whereby disparate things, or their conceptions, are denoted.

There are three kinds of distinctions, taken from the three different modes of existence; the first real; the second modal; and the last rational.

Distinction, *Real*, is that between things which may exist or be conceived to exist, apart from each other: such is that between two substances, or the modes of two substances.

Distinction, *Modal*, is that between several things, one whereof may exist without the other; but not, *vice versâ*, the other without that: such is that between the mind, and an act of will; between wax, and its hardness; water, and its freezing, &c.

Distinctio *Rationis*, or *Rational* Distinction, is that between several things, which are really one and the same, and whereof one cannot exist without the other, nor, *vice versâ*, the other without this: such is that between a thing and its essence; between the essence, and properties, &c.

Of this distinction some authors admit two kinds; the one barbarously called rationis ratiocinatæ, having some foundation in things; as when we distinguish the justice of God from his mercy: the other called rationis ratiocinantis, which has no foundation at all; and therefore is, by many, quite rejected.

Though others contend that there is no distinctio rationis, but is, at the same time, a real distinction: thus, say they, God, and just God, are, to each other, as milk, and white milk; and a just God, and merciful God, as white milk, and sweet milk. But when I say, milk is distinguished from white milk, or white milk from sweet milk, the distinction falls between whiteness and sweetness, which is a real distinction. See Realists.

Distinction, *Metaphysical*, called also by the schoolmen alietas, alteritas, and diversitas, is a non-agreement of

being,

being, whereby this entity is not that, or one thing is not another.

DISTINCTIO, or DISTINGUO, in the *Schools*, an expedient to evade an argument, or to clear up and unfold an ambiguous propofition, which may be true in one fenfe, and falfe in another. The refpondent was hard preffed, but he difengaged himfelf by a diftinguo. Moliere makes T. D. fay to his miftrefs, who had told him, he muft fubmit to the will of a perfon he loved; "Diftinguo, Mademoifelle, pour l'intereft de fon amour, Concedo; contre fa paffion, Nego."

DISTORTION, in *Surgery*, a twifting or partial diflocation of any member, &c. This fpecies of deformity may be occafioned by a fpafmodic contraction in one or more mufcles, drawing the affected part to either fide; or it may be produced by a paralyfis of the fame mufcles, in which cafe the affected part will be relaxed, fo as to feem contracted on the oppofite fide. The palfied mufcles having loft their action, will be counterbalanced and furmounted by the natural action of their antagonift mufcles; and, if this kind of diftortion be in the mouth, a perfon will laugh, talk, or move the lips, &c. chiefly or entirely on the found fide.

Diftortions may be produced in the bones of growing perfons, and efpecially in their fpine, from mere carelefnefs; *i. e.* by often leaning fideways, or ufing the limbs very unequally. A wanton habit of fquinting has been fometimes known to occafion a fixed contortion of the eye; but the fame malady may be alfo caufed by a partial palfy in one of the mufcles attached to the globe of the eye, as now and then occurs after a fevere fever.

The difeafe, called a wry-neck, is frequently produced by the rigid and permanent contraction of a mufcle named fterno-cleido-maftoideus, which admits of relief by a furgical operation. See WRY-NECK, PARALYSIS, SPRAIN, LUXATION, VARI, VALGI, and SPINAL-STAYS.

A twifting of the limbs may arife, as it often does in children, from a preternatural laxity of the membranes inveffing a joint, and allowing a fub-luxation of the bones; or the fame effect may take place from a violent and fudden over-ftretching of the ligaments. The term fprain applies, when, in confequence of any exertion, or turning of a limb towards one fide, a very fevere pain is felt at the moment of the diftortion. This accident may alfo occur in confequence of a perfon fuddenly reaching at any object which is too far diftant, fo that the limbs muft be too much extended, or when he fuddenly turns his head in any particular direction, &c. The limb is immediately afterwards affected with violent pain, which continues for a longer or fhorter period, whereby the motion of the limb is more or lefs interrupted. Frequently a fwelling is produced at the joint, which proves very obftinate, and in the worft cafes goes on to fuppuration, during which the fkin generally retains its natural colour. In fuch cafes there is probably an effufion of a fluid into the burfæ, or into the fheaths of the tendons, which has not been re-abforbed.

The moft abfurd and pernicious practice which can be employed in thefe cafes, is to attempt to extend the limb, as is done by many, who thereby always aggravate the complaint. The beft method is to keep the limb quiet, and frequently to rub it with fome difcutient application, fuch as a folution of fal ammoniac, the linim. faponis, or fpir. vin. camphorat. &c.; and to cover it with compreffes dipped in thefe fubftances. We may alfo apply leeches, if the inflammation and pain run high.

Mr. Theden has particularly called the attention of practitioners to the diftention of tendons, and difplacement of mufcular fibres. His practice in thefe cafes is to lay the patient upon his healthy fide, and to rub with his finger (previoufly wetted with fome proper application) the affected mufcle at the part where the pain is felt, fometimes longitudinally, and fometimes croffwife; and at times he directs an affiftant to move the painful limb backwards and forwards, the frictions being continued all the while. As foon as by this treatment he hits the proper fpot, an immediate cure is effected. He recommends at the fame time to ufe his vulnerary wafh, or a folution of balf. vitæ externally with fal ammoniac.

Mr. Ponteau terms this accident *an actual diflocation of the mufcles*, and fpecifies three cafes in which it may take place. In the firft cafe, when one of the flexor mufcles of the foot contracts either alone, or more violently than the neighbouring and affiftant mufcles, it may be forced out of its place; or, when a relaxed mufcle is fituated between two others that contract, it may be forced by thefe out of its fituation; finally, fuch a diflocation may be produced, when at a time when the body or any limb is in a very uncommon and forced pofition, the mufcle naturally alfo contracts in a very preternatural direction. Long and flender mufcles are moft fubject to this accident. As a means of cure, he directs us to relax the diflocated mufcle, and then to reduce it into its proper pofition by frictions applied to the whole of the painful part in the manner recommended by Mr. Theden. The relaxation of the diflocated mufcle is always effected by placing the patient in that pofition in which he is fenfible of leaft pain. The weaknefs of the limb which remains behind, after the difcuffion of the inflammation, is to be removed by the ufe of the fhower-bath; the fwathing of the limb is alfo of great ufe. In no cafe is it allowed to ufe emollient fomentations, and ftill lefs greafy ointments, as thereby the complaint will be rendered worfe, and even fatal confequences fometimes may enfue.

Diftortions of various kinds may take place in the lower extremity, either at the knee-joint, or at the ankle, or the joint of the foot. Of the latter fpecies of diftortions two kinds are diftinguifhed, namely, that in which the foot is turned preternaturally inwards (VARI) or outwards (VALGI). When the feet are turned preternaturally inwards, the patient is alfo faid to be club-footed.

All thefe kinds of diftortions are either congenital, or they gradually arife in weak rickety children, efpecially when they are too early compelled to walk or ftand. Thefe deformities may often be avoided, by avoiding a pofture in which the weight of the body refts upon the deformed part. When the knee-joint or the ankle is diftorted, it is in many cafes impoffible to force the bones into their natural form by means of machines; and it will fometimes be far better to leave the cure to nature, whilft the rachitic affection is counteracted by proper remedies, and all the *lædentia* avoided.

The machine invented by Mr. Gavin Wilfon, is faid to be of ufe in remedying diftortions of the leg. This confifts of a fheath of ftrong leather, open in front, into which the diftorted leg is placed. The ftrength of the fheath is increafed by means of iron hoops. When the leg has been placed in this machine, the foot is fecured to the fole of it, by a ftrap, and is alfo drawn either to one fide or the other, according to the nature of its diftortions by two other ftraps, in a gradual manner.

As a means of remedying diftortions of the foot, Mr. Benjamin Bell has recommended the ufe of a pair of fhoes, of foft leather, hooped round with iron, and attached to an iron frame. For fupporting weak legs and remedying deformities,

formities, Mr. Gooch recommends a machine compofed of three femi-circular elaftic fteel hoops, which are to be applied to the fmall of the leg, go half round the foot, and are fecured by means of leathern ftraps held by round buttons. A machine, fimilar to that of Mr. Gooch, has been invented by Mr. Meinfhaufen; but of this no delineation has hitherto been given. Mr. Lentin has alfo effected a perfect cure in a cafe of a child, whofe heel was drawn upwards by the tendo achillis in fuch a manner, that he could not make it touch the ground when he ftood, by means of a machine fimilar to a prefs, combined with the ufe of the warm bath and oily frictions.

To the cure of club-feet, as they are termed, Mr. Sheldrake has been very attentive, and has publifhed a great deal in the Med. and Phyf. Journal.

Mr. Venel, of Germany, has alfo been particularly active, and his method has been followed by Meffrs. Ehrmann and Brückner, with the beft fuccefs. As in thefe cafes it is principally requifite that the extenfion of the contracted and ftiff mufcles and ligaments fhould not be performed too fuddenly, but in a flow and gradual manner, the continued ufe of emollient remedies fhould be combined with a moderate and gradually augmented extenfion of the parts. All the contracted mufcles and ligaments muft be rubbed, throughout their whole length, for the fpace of half an hour, thrice a day, with fome emollient application. During the application of the frictions, the limb muft be extended gradually, but fteadily, and in proportion as the patient can bear it. Mr. Brückner recommends particularly for frictions, animal fubftances, fuch as the fat of geefe, ducks, and other fowls; alfo the oil which is obtained by boiling ox's and fheep's feet in water. Before rubbing in the ointment, he ordered the patient to be placed, morning and evening, in a lukewarm bath, for the fpace of twenty minutes, immediately after which he rubbed the ointment into the calf of the leg, and on the infide of the ankle.

The extenfion of the contracted foft parts is performed by the hands alone, after each time of the frictions, and afterwards fupported and promoted by the application of bandages or machines. The extenfion of the feet is performed after each friction, and in the following manner, after the patient has drawn on his ftockings: If the operator has the right foot before him, he lays hold of the heel in fuch a manner, that his thumb refts upon the fore-part of the joint, and the points of his fingers internally on the heel, and on the inner fide of the ankle. With the right hand he lays hold of the fore-part of the foot, applying his thumb to the fole under the ball, and the hollow of his hand acrofs upon the back of the foot, outwards and backwards. The points of the fingers he preffes upon the root of the foot. In operating upon the left foot the hands are reverfed. In performing the extenfion, the operator keeps the hand, with which he holds the heel, fteady, and preffes the bone of the heel outwards with the points of his fingers, and with the other hand he endeavours to prefs the inner margin of the foot downwards, and to turn the fole downwards; and at the fame time the anterior part of the foot is preffed, as much as poffible, outwards and upwards, and the root of the foot downward, fo as to extend the whole foot. The extenfion muft be performed in a gradual manner, and as foon as the patient exhibits fymptoms of pain, it muft be intermitted; but the extending operations muft be performed feveral times in fucceffion, after fhort intervals.

When thefe operations have been continued for feveral weeks, there is obferved, as the firft favourable fymptom, a flight tumefcence of the whole foot, together with a greater flexibility, and this is the period when a bandage or machine may be beneficially employed, in order to extend the foot permanently and uniformly. But with new-born infants, it is not neceffary to ufe all thefe preparations. The pediluvia, frictions, and extenfion muft be repeated daily, even during the ufe of the machine. Children who have already begun to walk, muft relinquifh the ufe of their legs during the progrefs of the cure, and either fit or be carried.

The bandages muft be adapted, 1ft, to check the voluntary motion of the foot, to turn it outwards, lengthen it, draw down the heel, or elevate the fore part of the foot towards the leg, and, in general, counteract all the contracted mufcles; 2dly, the preffure, by means of which this is to be effected, muft be fuch that it can gradually be increafed, in proportion as, in confequence of the emollient applications and diftention, the preternatural tenfion abates; but it muft be permanent and operate without occafioning pain. The bandaging is to be performed by means of the following apparatus: take a fquare piece of linen, about a foot and a half long, fold it into a triangle, and roll the two angles, that lie over each other, together in fuch a manner, as to form a bandage fomething more than an inch in breadth, and pointed at both ends. In rolling up the right foot, this bandage is to be applied over the tendo achillis, about half a foot from its extremity, its corners being held by an affiftant. The bandage muft then be carried round the ankle, and the ends brought forward again on the inner fide of the ankle, after which it is to be carried obliquely over the back of the foot and the middle of the inner margin of the foot to the fole, which being done, it is to be drawn tight on the outer fide, fo as to extend the foot and turn it outwards. When now the tight bandage is drawn upwards over the outer edge of the foot, this edge may be raifed a little, and thus the fole, which is directed inwards, be preffed down. After this, another turn is made, exactly in the fame manner, round the fore part of the foot, by which means we are ftill better enabled to give the foot the above-mentioned direction. When this has been done, the one corner of the bandage is drawn obliquely upwards, and the other obliquely downwards; and both are tied together with a ftrong knot upon the back of the foot. The two ends of the bandage are then carried once more round the region of the ankles, and tied together. Both the breadth and length of this bandage muft be adapted to the fize of the foot, and altered in proportion as the child grows larger. Over the bandage another ftrong piece of cloth muft be tied, and this muft be changed for a dry one, as often as it is wet through, in order that the bandage may be kept clean.

Venel's apparatus was not applied by Mr. Brückner till he had produced a perceptible flexibility of the foot by the means above-mentioned. During the ufe of the apparatus, the pediluvia muft be continued to be employed twice a day. In warm weather, the patient fhould wear thread, and in cold weather cotton ftockings; which fhould be frequently changed and kept free from holes, as otherwife the bandages would be injured.

When the feet have been reftored to their natural form by the ufe of the machines, but have not yet acquired their proper ftrength, we muft employ remedies adapted to increafe the tone of the fibres, and invigorate the nerves. With this view, the luke-warm baths muft gradually be changed for cold ones, in which the patient muft keep his feet, after being previoufly well cooled, for the fpace of five minutes every day. After the ufe of the bath, the feet

feet ſhould be wiped dry, and rubbed with a piece of fine flannel till they become warm; after which they may be washed with brandy or ſome other ſpirituous application.

But in order that the feet may retain the form which has been reſtored to them, till the relaxed parts are completely ſtrengthened, and the antagoniſm of the muſcles of the leg brought to a perfect equilibrium, the *retaining machine (Hafitung's machine)* muſt now be applied. In this the patient muſt confine his feet till the proper poſition has become perfectly habitual to them, and till they have acquired their proper ſtrength. The feet muſt become able to turn themſelves outwards with greater eaſe than inwards; when this has been effected, we may proceed with ſafety to teach the child to walk. During the firſt months he ſhould never be ſuffered to walk without ſome perſon to watch him; and every evening he ought to keep his feet for ſome time in the retaining machine.

During the whole firſt year the patient ought to wear half boots, laced together over the whole back of the leg towards the middle of the foſe-parts, ſo as to fit every where cloſe to the leg. The ſhoe ſhould have no heel, and the outer edge of the ſole ought to be twice as high as the inner, throughout its whole length. The quarters, as they are termed, ought to be made of ſtiff leather. On that part of the external margin of the ſole which lies under the heel, and on the quarters above it, a plate of iron is fixed, and attached below to the ſole-leather. In the middle of the place is a hole with a ſcrew, which receives the inferior extremity of the iron rod. This rod is three lines in diameter, flat on the inner ſide, and ſo long as to reach over the head of the fibula. At the upper extremity a plate of iron, an inch and a half in breadth, and three quarters of an inch in height, is fixed. This plate is hollowed out at its inner ſide, in order that it may fit the better to the upper and outer ſide of the leg, at the ſide of the knee. At one extremity there are ſeveral holes, for the purpoſe of ſewing a leathern ſtrap to it, and at the other there is a peg with a button to which the ſtrap, after having been carried down under the knee, is attached. The rod riſes upwards immediately behind the outer point of the ankle. Over the peg, which is inſerted into the ſcrew-ſocket, the rod is bent outwards, ſo that its upper extremity ſtands at the diſtance of at leaſt an inch from the knee. When therefore this extremity is preſſed towards the leg, by drawing the ſtrap tight, the foot is compelled to turn itſelf outwards.

After the uſe of theſe boots has been diſcontinued, it will be proper that the child ſhould wear ſhoes with high quarters, not faſtened with buckles, but with ſtrings, and with ſoles higher at the outer than the inner ſide. This inequality of the ſhoes may be gradually diminiſhed with every new pair, till the ſole is perfectly even.

Mr. Brünninghauſen has deſcribed another very ſimple and convenient machine, which, combined with the remedies that have already been mentioned, may undoubtedly produce the moſt beneficial effects. It is made of ſtrong tinned iron or copper; and conſiſts of a ſole formed according to the ſhape of the foot, with a margin half an inch high. From this a long flat piece of the ſame iron plate proceeds upwards, along the inner ſide of the leg, as far as the knee. At the lower extremity of this plate a ſtrap is attached, which paſſes over the heel and the oppoſite edge of the foot, where it is drawn through an oblong ſlit, from whence it is carried over the back of the foot, at the ſide of the firſt turn, through a third fiſſure, under the ſole; and then through a fourth fiſſure, and at laſt over the roots of the toes again to the outer edge of the foot, where it is drawn through a fifth ſlit, and ſecured by means of a ſmall hook.

It is to be underſtood, that the tarſus muſt be drawn downwards and outwards, which this machine does by means of the firſt turn of the ſtrap over the heel. The metatarſus muſt be drawn iawards and backwards, which is performed by the ſecond turn of the ſtrap. Theſe two turns of the ſtrap muſt be drawn the tighteſt, and never looſened, for which purpoſe the ſtrap is ſecured by means of two ſmall hooks on the margin of the ſole-plate. The fourth turn paſſes under the ſole, in order that the fifth may draw the point of the foot a little outwards.

We ſhall finally mention another mode of treatment, recommended by Dr. Sommer, of Riga, of which a more ample account is given in Loder's "*Journal fuer die Chirurgie*." Having bathed the foot, and rubbed it with goſe-greaſe, he takes a piece of linen of the proper ſize, with which he bandages the whole leg, from within to without, and from the toes to the knee; after which he ties a piece of ſtiff ſole-leather to the foot, in ſuch a manner that a ſtrap, attached to that part of the leather which lies on the inner ſide of the foot, having been doubled round, paſſes over the back of the foot, and is drawn through a hole on the outer ſide of the ſole; whilſt another ſtrap, which is faſtened cloſe to the firſt, after having alſo been doubled round, paſſes round the heel, proceeds over the flat part of the foot, and is drawn through a hole on the inner margin of the ſole; and both ſtraps are tied together below, in ſuch a manner however as not to compreſs the foot too much. This being done, he applies, on the inner ſide of the leg, a wooden rod, with its two pegs at the bottom inſerted into two holes in the ſole, after which he applies a ſtrap under the knee, ſomewhat looſely, in order that the rod may remain moveable, which he ties together on the outer ſide of the rod. The ſtrap attached to the outer ſide of the ſole is then drawn through the ſtrap on the rod juſt mentioned, and tied to another which is likewiſe attached to the outer ſide of the ſole. When theſe ſtraps are drawn tight, the wooden rod is puſhed downwards, and preſſes upon the ſole, by which means the foot is at once extended, turned outwards, and retained in this poſition.

DISTORTION *of the Eye*, is called ſquinting, or ſtrabiſmus. See DIPLOPIA and STRABISMUS.

DISTORTOR ORIS, in *Anatomy*, one of the muſcles of the mouth, called alſo zygomaticus. It is deſcribed in the article DEGLUTITION.

DISTRACTION, in *Medicine*, ſometimes denotes the act of pulling a fibre, membrane, or the like, beyond its natural extent: and what is capable of this enlargement, is ſaid to be diſtractile.

DISTRAIN, in *Law*. *To* DISTRAIN, or *Diſtrein*, is to attach, or ſeize on one's goods, for the ſatisfaction of a debt. See the next article.

DISTRESS, DISTRICTIO, is the taking of a perſonal chattel out of the poſſeſſion of the wrong-doer, into the cuſtody of the party injured, to procure a ſatisfaction for the wrong committed. The term *diſtreſs* is alſo, in our law-books, applied to the thing taken by this proceſs, as well as to the proceſs itſelf. The moſt uſual injury for which a diſtreſs may be taken is that of non-payment of rents. (See RENT.) This was held as an univerſal principle, that a diſtreſs may be taken for any kind of rent in arrear; the detaining of which beyond the day of payment is an injury to him that is entitled to receive it. Likewiſe, for neglecting to do ſuit to the lord's court, (Bro. Abr. title Diſtreſs, 15.) or other certain perſonal ſervice (Co. Litt. 46.), the lord may diſtrain, of common right. Alſo, for amercements in a court-leet a diſtreſs may be had of common

common right; but not for amercements in a court-baron, without a ſpecial preſcription to warrant it. (Brownl. 36.) Another injury for which diſtreſſes may be taken, is where a man finds beaſts of a ſtranger wandering in his grounds, *damage-feaſant;* that is, doing him hurt or damage, by treading down his graſs, or the like; in which caſe the owner of the ſoil may diſtrain them till ſatisfaction be made him for the injury ſuſtained. Laſtly, for ſeveral duties and penalties inflicted by ſpecial acts of parliament, (as for aſſeſſments made by commiſſioners of ſewers, ſtat. 7 Ann. c. 10. or for the relief of the poor, ſtat. 43 Eliz. c. 2.) remedy by diſtreſs and ſale is given: with regard to which it may be obſerved, that ſuch diſtreſſes are partly analogous to the ancient diſtreſs at common law, as being repleviable and the like. (4 Burr. 589); but more reſembling the common law proceſs of execution, by ſeiſing and ſelling the goods of the debtor under a writ of *fieri facias*, which ſee.

As to the things which may be diſtrained, or taken in diſtreſs, it may be laid down as a general rule, that all chattels perſonal are liable to be diſtrained, unleſs particularly protected or exempted. Inſtead, therefore, of mentioning the things that are diſtrainable, it will be more eaſy to recount the things which are not ſo, with the reaſon of their particular exemptions. (Co. Litt. 47.) As every thing which is diſtrained is preſumed to be the property of the wrong-doer, it will follow that ſuch things, in which no man can have an abſolute and valuable property (as dogs, cats, rabbits, and all animals *feræ naturæ*) cannot be diſtrained. But if deer (which are *feræ naturæ*) are kept in a private incloſure for the purpoſe of ſale or profit, this circumſtance reduces them to a kind of ſtock or merchandize, that they may be diſtrained for rent. Moreover, whatever is in the perſonal uſe or occupation of any man is, for the time, privileged and protected from any diſtreſs; as an axe with which a man is cutting wood, or a horſe while a man is riding him. But horſes drawing a cart, and alſo the cart, may be diſtrained for rent-arrere, if a man be not upon the cart (1 Vent. 36.); and it hath been ſaid, that if a horſe, though a man be riding him, be taken *damage-feaſant*, or treſpaſſing in another's ground, the horſe may be diſtrained and led away to the pound. (1 Sid. 440.) However, all the authorities upon this point are collected together in Hargr. Co. Litt. 47; and the clear reſult of them is, that ſuch a diſtreſs is illegal. Again, valuable things in the way of trade ſhall not be liable to diſtreſs: as a horſe ſtanding in a ſmith's ſhop to be ſhod, or in a common inn; or cloth at a taylor's houſe; or corn ſent to a mill or market. All theſe are protected or privileged for the benefit of trade; and are ſuppoſed in common preſumption not to belong to the owner of the houſe, but to his cuſtomers. But, generally ſpeaking, whatever goods and chattels the landlord finds upon the premiſes, whether they, in fact, belong to the tenant or a ſtranger, are diſtrainable by him for rent; for otherwiſe a door would be open to infinite frauds upon the landlord; and the ſtranger has his remedy by action on the caſe againſt the tenant, if by the tenant's default the chattels are diſtrained, ſo that he cannot render them when called upon. With regard to a ſtranger's beaſts which are found on the tenant's land, the following diſtinctions are, however, taken. If they are put in by conſent of the owner of the beaſts, they are diſtrainable immediately afterwards for rent-arrere by the landlord. (Cro. Eliz. 549.) So alſo if the ſtranger's cattle break the fences, and commit a treſpaſs by coming on the land, they are diſtrainable immediately by the leſſor for his tenant's rent, as a puniſhment to the owner of the beaſts for the wrong committed through his negligence. (Co. Litt. 47.) But if the lands were not ſufficiently fenced ſo as to keep out cattle, the landlord cannot diſtrain them, till they have been *levant* and *couchant* on the land; that is, have been long enough there to have lain down and roſe up to feed; which, in general, is held to be one night at leaſt; and then the law preſumes, that the owner may have notice whither his cattle have ſtrayed, and it is his own negligence not to have taken them away. Yet, if the leſſor or his tenant were bound to repair the fences and did not, and thereby the cattle eſcaped into their grounds, without the negligence or default of the owner; in this caſe, though the cattle may have been *levant* and *couchant*, they are not diſtrainable for rent, till actual notice is given to the owner, that they are there, and he neglects to recover them (Lutw. 1580); for the law will not ſuffer the landlord to take advantage of his own or his tenant's wrong. There are alſo other things privileged by the ancient common law; as a man's tools and utenſils of his trade, the axe of a carpenter, the books of a ſcholar, and the like; which are ſaid to be privileged for the ſake of the public, becauſe the taking of them away would diſable the owner from ſerving the commonwealth in his ſtation. So, beaſts of the plough, *averia carucæ*, and ſheep, are privileged from diſtreſſes at common law (ſtat. 51 Hen. III. c. 4.); while dead goods, or other ſort of beaſts, which Bracton calls *catalla otioſa*, may be diſtrained. But, as beaſts of the plough may be taken in execution for debt, ſo they may be for diſtreſſes by ſtatute, which partake of the nature of executions. (4 Burr. 589.) And, perhaps, the true reaſon, why theſe and the tools of a man's trade were privileged at the common law, was, becauſe the diſtreſs was then merely intended to compel the payment of the rent, and not as a ſatisfaction, for the non-payment; and, therefore, to deprive the party of the inſtruments and means of paying it, would counteract the very end of the diſtreſs (4 Burr. 588.) Moreover, nothing ſhall be diſtrained for rent, which may not be rendered again in as good a plight as when it was diſtrained; for which reaſon milk, fruit, and the like, cannot be diſtrained; a diſtreſs at common law being only in the nature of a pledge or ſecurity, to be reſtored in the ſame plight when the debt is paid. So, anciently, ſheaves or ſtacks of corn could not be diſtrained; becauſe ſome damage muſt needs accrue in their removal; but a cart loaded with corn might; as that could be ſafely reſtored.

But now by ſtatute 2 W. and M. c. 5. corn in ſheaves or cocks, or looſe in the ſtraw, or hay in barns or ricks, or otherwiſe, may be diſtrained, as well as other chattels. Laſtly, things fixed to the freehold may not be diſtrained, as caldrons, windows, doors, and chimney pieces; for they ſavour of the realty. For this reaſon alſo corn growing could not be diſtrained; till the ſtatute 11 Geo. II. c. 19. impowered landlords to diſtrain corn, hops, graſs, or other products of the earth, and to cut and gather them when ripe. The goods of a carrier are privileged, and cannot be diſtrained for rent, though the waggon containing them is put into the barn of a houſe, or on the road. 1 Salk. 249.

The next inquiry pertaining to this ſubject is, how diſtreſſes may be taken, diſpoſed of, or avoided? The law of diſtreſſes, ſays judge Blackſtone, is greatly altered in late years. Formerly they were regarded as a mere pledge or ſecurity for payment of rent or other duties, or ſatisfaction for damage done. And ſo the law continues with regard to diſtreſſes of beaſts taken *damage feaſant*, and for other cauſes, not altered by act of parliament; over which the diſtrainor has no other power than to retain them till ſatisfaction is made. But diſtreſſes for rent-arrere being found by the legiſlature to be the ſhorteſt and moſt effectual method of compelling the payment of ſuch rent, many beneficial laws for this purpoſe

have been made in the laſt century; which have much altered the common law, as laid down by our ancient writers. In diſcuſſing this part of the ſubject, it will be ſuppoſed that the diſtreſs is made for rent; and the differences between ſuch diſtreſs, and that taken for other cauſes, will be ſpecified. All diſtreſſes muſt be made by *day*, unleſs in the caſe of *damage-feaſant*; an exception being made in this caſe, leſt the beaſts ſhould eſcape before they are taken. (Co. Litt. 142.) When a perſon intends to make a diſtreſs, he muſt, by himſelf or his bailiff, enter on the demiſed premiſes; formerly during the continuance of the leaſe, but now, (ſtat. 8 Ann. c. 14.) if the tenant holds over, the landlord may diſtrain within ſix months after the determination of the leaſe; provided his own title or intereſt, as well as the tenant's poſſeſſion, continue at the time of the diſtreſs. If the leſſor does not find ſufficient diſtreſs on the premiſes, formerly he could not reſort any where elſe; and therefore, knaviſh tenants made a practice to convey away their goods and ſtock, fraudulently, from the houſe or lands demiſed, in order to cheat their landlords. But now (ſtat. 8 Ann. c. 14. 11 Geo. II. c. 19.) the landlord may diſtrain any goods of his tenant, carried clandeſtinely off the premiſes, wherever he finds them within thirty days after, unleſs they have been *bona fide* ſold for a valuable conſideration: and all perſons privy to, or aſſiſting in ſuch fraudulent conveyance, forfeit double the value to the landlord. The landlord may alſo diſtrain the beaſts of his tenant, feeding upon any commons or waſtes, appendant or appurtenant to the demiſed premiſes. The landlord might not formerly break open a houſe, to make a diſtreſs, for that is a breach of the peace. But when he was in the houſe, it was held, that he might break open an inner door (Co. Litt. 16. Comberb. 17.); and now (ſtat. 11 Geo. II. c. 19.) he may, by the aſſiſtance of the peace officers of the pariſh, break open, in the day-time, any place, whither the goods have been fraudulently removed, and locked up to prevent a diſtreſs; oath being firſt made, in caſe it be a dwelling-houſe, of a reaſonable ground to ſuſpect that ſuch goods are concealed in it. Where a man is entitled to diſtrain for an entire duty, he ought to diſtrain for the whole at once; and not for part at one time, and part at another. (2 Lutw. 1532.) But if he diſtrains for the whole, and there is not ſufficient on the premiſes, or he happens to miſtake in the value of the thing diſtrained, and ſo takes an inſufficient diſtreſs, he may take a ſecond diſtreſs to complete his remedy. (Cro. Eliz. 13. ſtat. 17 Car. II. c. 7. 4 Burr. 590.) Diſtreſſes muſt be proportioned to the thing diſtrained for. By the ſtatute of Marlbridge, 52 Hen. III. c. 4. if any man takes a great or unreaſonable diſtreſs, for rent-arrere, he ſhall be heavily amerced for the ſame. Or if (2 Inſt. 107.) the landlord diſtrains two oxen for twelve-pence rent; the taking of *both* is an unreaſonable diſtreſs; but if there were no other diſtreſs nearer the value to be found, he might reaſonably have diſtrained *one* of them; but for homage, fealty, or ſuit and ſervice, as alſo for parliamentary wages, it is ſaid that no diſtreſs can be exceſſive. (Bro Abr. tit. Aſſiſe. 291. Prerogative. 98.) For as theſe diſtreſſes cannot be ſold, the owner, upon making ſatisfaction, may have his chattels again. The remedy for exceſſive diſtreſſes is by a ſpecial action on the ſtatute of Marlbridge; for an action of treſpaſs is not maintainable upon this account, it being no injury at the common law. (1 Ventr. 104. Fitzgib. 85. 4 Burr. 590.)

When the diſtreſs is thus taken, the next object of conſideration is the diſpoſal of it. For which purpoſe the things diſtrained muſt in the firſt place be carried to ſome pound, and there impounded by the taker. But, in their way thither, they may be *reſcued* by the owner, in caſe the diſtreſs was taken without cauſe, or contrary to law: as if no rent be due; if they were taken upon the high way, or the like; in theſe caſes the tenant may lawfully make reſcue. (Co. Litt. 160, 161.) But if they be once impounded, even though taken without any cauſe, the owner may not break the pound and take them out; for they are then in the cuſtody of the law. (Co. Litt. 47.) See POUND.

When impounded, the goods were formerly only in the nature of a pledge or ſecurity to compel the performance of ſatisfaction; and upon this account it has been held (Cro. Jac. 148.) that the diſtrainor is not at liberty to work or uſe a diſtrained beaſt. And thus the law ſtill continues with regard to beaſts taken damage-feaſant, and diſtreſſes for ſuit or ſervices; which muſt remain impounded, 'till the owner makes ſatisfaction; or contests the right of diſtraining by replevying the chattels. (See REPLEVY.) This kind of diſtreſs, though it puts the owner to inconvenience, and is therefore a puniſhment to *him*, yet, if he continues obſtinate and will make no ſatisfaction or payment, it is no remedy at all to the diſtrainor. But for a debt due to the crown, unleſs paid within forty days, the diſtreſs was always ſaleable at common law. (Bro. Abr. tit. Diſtreſs. 71.) And for an amercement at a court-leet, the lord may alſo ſell the diſtreſs, (8 Rep. 41.); partly becauſe, being the king's court of record, its proceſs partakes of the royal prerogative, (Bro. *ubi ſupra*. 12 Mod. 330.): but principally, becauſe it is in the nature of an execution to levy a legal debt. And, ſo in the ſeveral ſtatute-diſtreſſes, already mentioned, which are alſo in the nature of executions; the power of ſale is likewiſe uſually given, to effectuate and complete the remedy. And in like manner, by ſeveral acts of parliament, (2 W. & M. c. 5. 8 Ann. c. 14. 4 Geo. II. c. 28. 11 Geo. II. c. 19.), in all caſes of diſtreſs for rent, if the tenant or owner do not, within five days after the diſtreſs is taken, and notice of the cauſe thereof given to him, replevy the ſame with ſufficient ſecurity, the diſtrainor, with the ſheriff or conſtable, ſhall cauſe the ſame to be appraiſed by two ſworn appraiſers, and ſell the ſame towards ſatisfaction of the rent and charges; rendering the overplus, if any, to the owner himſelf. And, by theſe means, a full and entire ſatisfaction may now be had for rent in arrere, by the mere act of the party himſelf, *viz.* by diſtreſs, the remedy given at common law, and ſale conſequent thereon, which is added by act of parliament. If any diſtreſs and ſale ſhall be made, for rent in arrear and due, when none is really due, the owner ſhall recover double value, with full coſts. 2 W. Seſſ. 1. c. 5.

The taking of a diſtreſs was formerly reckoned a hazardous kind of proceeding, on account of the many particulars that attended it: for if any irregularity was committed, it vitiated the whole, and made the diſtrainors treſpaſſers *ab initio*. (1 Ventr. 37.) But now by the ſtatute 11 Geo. II. c. 19. it is provided, that for any unlawful act done, the whole ſhall not be unlawful, or the parties treſpaſſors *ab initio*; but that the party grieved ſhall only have an action for the real damage ſuſtained; and not even that, if tender of amends is made before any action is brought. Blackſt. Comm. Book iii.

DISTRESS, *perſonal*, is made by diſtraining a man's moveable goods, and ſeizing all the profits of his lands and tenements, from the teſte, or date of the writ, for the defendant's contempt in not appearing to an action brought againſt him when he was ſummoned, or attached; and the iſſues ſo returned by the ſheriffs, are forfeited to the king, and eſtreated into the exchequer.

DISTRESS, *real*, is made on immoveable goods. It differs from an attachment in this, that it cannot be taken by any common

common perſon, without the compaſs of his own fee; except it be preſently after the cattle, or other things are driven, or borne off the ground, on purpoſe to avoid diſtreſs.

Diſtreſs is alſo divided into *finite* and *infinite*.

Distress, *finite*, is that limited by law, how often it ſhall be made to bring the party to trial of the action; *viz.* once, twice, &c.

Distress, *infinite*, is without limitation, till the party appears; as againſt a jury, which refuſes to appear upon certificate of aſſiſe, the proceſs is *venire facias*, *habeas corpus*, and *diſtreſs infinite*. See Distringas.

Laſtly, diſtreſs is again divided into *grand diſtreſs*, by Fitzherbert called *magna diſtrictio*; and *ordinary diſtreſs*.

Distress, *grand*, is that made of all the goods and chattels th. party has within the county.

DISTRIBUTION, the act of dividing a thing into ſeveral parts, in order to the diſpenſing each in its proper place. See Division.

Distribution in *Architecture*. Distribution *of the plan*, denotes the dividing, and diſpenſing the ſeveral parts and members, which compoſe the plan of a building.

Distribution *of ornaments*, is an equal, orderly placing of the ornaments in any member, or compoſition of architecture. See Ornament.

Distribution, in *Law*, the ſurplus of an eſtate, or *pur autre vie*, is diſtributable by adminiſtrators. See Adminiſtrator.

For the diſtribution of the eſtates of inteſtates, ſee Inteſtate.

Distribution, in *Logic*, is a kind of diviſion which diſtinguiſhes an univerſal whole into its ſeveral kinds or ſpecies. The rules of good diſtribution are much the ſame as thoſe of diviſion.

Distribution, *manual*, and *quotidian*, in *Eccleſiaſtical Matters*, denotes certain ſmall ſums of money, appointed by the donors or founders thereof, to be diſtributed to ſuch of the canons of a chapter as are actually preſent, and aſſiſtant at certain offices.

Distribution, in *Painting*, denotes the diſpoſition of the objects and lights in a picture. See Clair-Obscure.

Distribution, in *Printing*, the taking of the form aſunder, ſeparating the letters, and diſpoſing them in the caſes again, each in its proper cell.

Distribution, in *Rhetoric*, is a kind of description; or a figure whereby an orderly diviſion and enumeration is made of the principal qualities of a ſubject.

For example, He has underſtanding to ſee our faults, juſtice to reſtrain them, and authority to puniſh them. Their throat is an open ſepulchre; they flatter with their tongues; the poiſon of aſps is under their lips; their mouth is full of curſing and lies; and their feet are ſwift to ſhed blood.

DISTRIBUTIVE, that *diſtributes*, from *dis*, *aſunder*, and *tribuere*, *to give*.

Distributive *juſtice*, is that whereby we give every perſon what belongs to him. See Justice.

Distributives, in *Grammar*. See Numerals.

DISTRICT, in *Law*, the territory, or extent of juriſdiction, of a judge. A judge or officer cannot act out of his own diſtrict. See Judge. Diſtrict alſo denotes the place wherein a man has the power of diſtraining; or, the circuit, or territory, wherein one may be compelled to appear.—Where we ſay, *hors de ſon fee*; others ſay, *extra diſtrictum ſuum*. Brit. c. 20.

DISTRINGAS, a writ directed to the ſheriff, or other officer, commanding him to diſtrain one for a debt to the king; or for his appearance at a certain day. There is a *diſtringas* againſt peers, and perſons entitled to privilege of parliament, under ſtat. 10 Geo. III. c. 50; by which the effects (in law called the *iſſues*) levied may be ſold to pay the plaintiff's coſts, and it has been held that this ſtatute extends to all writs of *diſtringas*.

In detinue after judgment, the plaintiff may have a *diſtringas* to compel the defendant to deliver the goods by repeated diſtreſſes of his chattels. (1 Ro. Abr. 737. Raſt. Entr. 215.) See Distress, Execution, Parliament, and Process.

Distringas *juratores*, a writ directed to a ſheriff, whereby he is commanded to diſtrain upon a jury to appear and to return iſſues on their lands, &c. for non-appearance. Where an iſſue in fact is joined to be tried by a jury, which is retained by the ſheriff in a panel upon a *venire facias* for that purpoſe; there goes forth a writ of *diſtringas juratores* for the ſheriff to have their bodies in court, &c. at the return of the writ. (1 Lil. Abr. 483.) This writ ought to be delivered to the ſheriff in ſuch time, that he may warn the jury to appear four days before the writ is returnable, if the jurors live within 40 miles of the place of trial; and eight days if they live farther off. (Id. 484.) There may be an *alias*, or *pluries diſtringas jur'*, where the jury doth not appear. See Jury, and Trial.

DISTURBANCE, a ſpecies of real injury, which is uſually a wrong done to ſome incorporeal hereditament, by hindering or diſquieting the owners in their regular and lawful enjoyment of it. (Finch. L. 187.) Of this injury there are five ſorts, *viz.* diſturbance of *franchiſes*, diſturbance of *common*, diſturbance of *ways*, diſturbance of *tenure*, and diſturbance of *patronage*.

Disturbance *of franchiſes* happens, when a man has the franchiſe of holding a court-leet, of keeping a fair or market, of free-warren, of taking toll, of ſeizing waifs or eſtrays, or (in ſhort) any other ſpecies of franchiſe whatſoever; and he is diſturbed, or incommoded in the exerciſe of it. As if another by diſtreſs, menaces, or perſuaſions, prevails upon the ſuitors not to appear at any court; or obſtructs the paſſage to any fair or market; or hunts in my free-warren; or refuſes to pay me the accuſtomed toll; or hinders me from ſeiſing the waif or eſtray, whereby it eſcapes, or is carried out of my liberty:—in every caſe of this kind, there is an injury done to the legal owner: his property is damniſied: and the profits ariſing from his franchiſe are diminiſhed. To remedy which, as the law has given no other writ, he is therefore entitled to ſue for damages by a ſpecial action *on the caſe*, or, in caſe of toll, may take a diſtreſs, if he pleaſes. (Cro. Eliz. 558.)

Disturbance *of Common* is any act, by which the right of another to his common is incommoded, or diminiſhed. This may happen, where one, who hath no right of common, puts his cattle into the land; and thus robs the cattle of the commoners of their reſpective ſhares of the paſture. Or, if one who hath a right of common, puts in cattle which are not commonable, as hogs and goats; which amounts to the ſame inconvenience. But the lord of the ſoil may (by cuſtom, or preſcription, but not without) put a ſtranger's cattle into the common. (1 Roll. Abr. 396.); and alſo, by a like preſcription for common appurtenant, cattle that are not commonable may be put into the common. (Co. Lit. 122.) The lord of the ſoil may alſo juſtify making hurrows in it, and putting in rabbits, ſo as that they do not increaſe to ſo large a number as totally to deſtroy the common. (Cro. Eliz. 876. Cro. Jac. 195. Lutw. 108.) But, in general, in caſe the beaſts of a ſtranger, or the uncommonable cattle of a commoner, be found upon the land, the lord, or any of the commoners, may diſtrain them damage-feaſant (9 Rep. 112); or the commoner may bring an action *on the caſe* to recover damages,

mages, provided that the injury done be considerable; so that he may lay his action with a *per quod*, or allege, that *thereby* he was deprived of his common. But for a trivial trespass the commoner has no action; but the lord of the soil only, for the entry and trespass committed. 9 Rep. 112.

Another disturbance of common is by *surcharging* it; or putting more cattle in it than the pasture and herbage will sustain, or the party hath a right to do. This injury by surcharging can, properly speaking, only happen where the common is appendant, or appurtenant (see COMMON), and, of course, limitable by law; or where, when *in gross*, it is expressly limited and certain; for where a man hath common *in gross*, *sans nombre*, or *without stint*, he cannot be a surcharger. However, in this latter case, there must be left sufficient for the lord's own beasts (1 Roll. Abr. 399.); for the law will not suppose that, at the original grant of the common, the lord meant to exclude himself.

The usual remedies for surcharging the common are, either by distraining so many of the beasts as are above the number allowed, or else by an action of trespass; both which may be had by the lord; or, lastly, by a special action on the case for damages, in which any commoner may be plaintiff. (Freem. 273.) But the ancient and most effectual method of proceeding is by writ of *admeasurement* of *pasture*. See ADMEASUREMENT, COMMON, and SURCHARGE.

There is another disturbance of common, when the owner of the land, or other person, so incloses, or otherwise obstructs it, that the commoner is precluded from enjoying the benefit, to which he is by law entitled. This may be done, either by erecting fences, or by driving the cattle off the land, or by ploughing up the soil of the common. (Cro. Eliz. 198.) Or it may be done, by erecting a warren in it, and stocking it with rabbits, in such numbers, that they devour the whole herbage, and thus destroy the common. In this case, though the commoner may not destroy the rabbits, yet the law looks upon this as an injurious disturbance of his right, and has given him his remedy by action against the owner. (Cro. Jac. 195.) This kind of disturbance amounts to a disseisin, and if the commoner chuses so to consider it, the law has given him an *assise* of *novel disseisin*, against the lord, to recover the possession of his common. (F. N. B. 179.) Or it has given a writ of *quod permittat*, against any stranger, as well as the owner of the land, in case of such a disturbance to the plaintiff as amounts to a total deprivation of his common; whereby the defendant shall be compelled to permit the plaintiff to enjoy his common as he ought. (Finch. L. 275. F. N. B. 123.) But if the commoner does not chuse to bring a *real* action to recover seisin, or to try the right, he may, (which is the easier and more usual way,) bring an action on the case for his damages, instead of an *assise*, or a *quod permittat*. (Cro. Jac. 195.) There are cases, indeed, in which the lord may inclose and abridge the common; for which, as they are no injury to any one, so no one is intitled to any remedy. See COMMON *par Cause de Vicinage*.

DISTURBANCE *of Ways* is very similar, in its nature, to the last, and principally happens, when a person, who hath a right to a way over another's ground, by grant, or prescription, is obstructed by inclosures, or other obstacles, or by ploughing across it; by which means he cannot enjoy his right of way, or, at least, not in so commodious a manner as he might have done. If this be a way annexed to his estate, and the obstruction is made by the tenant of the land, this brings it to the species of injury, called *Nusance*, which see. But if the right of way, thus obstructed by the tenant, be only *in gross*, (that is, annexed to a man's person, and unconnected with any lands or tenements,) or, if the obstruction of a way belonging to an house or land is made by a stranger, it is then, in either case, merely a disturbance; for the obstruction of a way *in gross* is no detriment to any lands, or tenements, and, therefore, does not fall under the legal notion of a nusance, which must be laid *ad nocumentum liberi tenementi*, (F. N. B. 182.); and the obstruction of it by a stranger can never tend to put the *right* of way in dispute;—the remedy, therefore, for these disturbances is not by assise, or any real action, but by the universal remedy of action on the case, to recover damages. Hale on F. N. B. 183. Lutw. 111. 119.

DISTURBANCE *of Tenure*, is the breaking of that connection which subsists between the lord and his tenant, and to which the law pays so high a regard, that it will not suffer it to be wantonly dissolved by the act of a third person. To have an estate well tenanted, is an advantage that every landlord must be very sensible of; and, therefore, the driving away of a tenant from off his estate is an injury of no small consequence. So that if there be a tenant at will of any lands or tenements, and a stranger, either by menaces and threats, or by unlawful distresses, or by fraud and circumvention, or other means, contrives to drive him away, or inveigle him to leave his tenancy, this the law very justly construes to be a wrong and injury to the lord, (Hal. Anal. c. 40. 1 Roll. Abr. 108.), and gives him a reparation in damages against the offender by a special action on the case.

DISTURBANCE *of patronage* is an hindrance or obstruction of a patron to present his clerk to a benefice. This injury was distinguished at common law from another species of injury, called *usurpation*, which see. Disturbers of a right of advowson may be these three persons; the pseudo-patron, his clerk, and the ordinary: the pretended patron, by presenting to a church to which he has no right, and thereby making it litigious or disputable; the clerk, by demanding or obtaining institution, which leads to and promotes the same inconvenience; and the ordinary, by refusing to admit the real patron's clerk, or admitting the clerk of the pretender. These disturbances are vexatious and injurious to him who hath the right; and therefore, if he be not wanting to himself, the law (besides the writ of right of advowson, which is a final and conclusive remedy) hath given him two inferior possessory actions for his relief; an ASSISE of *darrein presentment*, and a writ of QUARE *impedit* (which see respectively), in which the patron is always the plaintiff, and not the clerk. For the law supposes the injury to be offered to him only, by obstructing or refusing the admission of his nominee; and not to the clerk, who hath no right in him till institution, and of course can suffer no injury. Besides these possessory actions, there may be also had a writ of right of advowson, which resembles other writs of right: the only distinguishing advantage of which now is, that it is more conclusive than a *quare impedit*; since to an action of *quare impedit* a recovery had in a writ of right may be pleaded in bar. There is no limitation with regard to the time within which any actions respecting advowsons are to be brought; at least none later than the times of Richard I. and Henry III.; for by statute 1 Mar. st. 2. c. 5, the statute of limitations, 32 Hen. VIII. c. 2, is declared not to extend to any writ of right of advowson, *quare impedit*, or assise of *darrein presentment*, or *jus patronatus*. And this upon very good reason; because it may very easily happen, that the title to an advowson may not come in question, nor the right have an opportunity to be tried, within two years; which is the longest period of limitation assigned by the statute of

of Henry VIII. In a writ of *quare impedit*, which is almost the only real action that remains in common use, and also in the assise of *darrein presentment*, and writ of right, the patron only, and not the clerk, is allowed to sue the disturber. But, by virtue of several acts of parliament (stat. 3 Jac. I. c. 5. 1 W. & M. c. 16. 12 Ann. st. 2. c. 14. 11 Geo. II. c. 17.), there is one species of presentations, in which a remedy, to be sued in the temporal courts, is put into the hands of the clerks presented, as well as of the owners of the advowson: *i. e.* the presentation to such benefices, as belong to Roman catholic patrons; which, according to their several counties, are vested in and secured to the two universities of this kingdom. And particularly by the statute of 12 Ann. st. 2. c. 14. § 4. a new method of proceeding is provided, *viz.* that, besides the writs of *quare impedit*, which the universities as patrons are entitled to bring, they, or their clerks, may be at liberty to file a bill in equity, against any person presenting to such livings, and disturbing their right of patronage, or his *cestui que trust*, or any other person whom they have cause to suspect: in order to compel a discovery of any secret trusts, for the benefit of papists, in evasion of those laws whereby this right of advowson is vested in those learned bodies: and also (by the stat. 11 Geo. II. c. 17.) to compel a discovery whether any grant or conveyance, said to be made of such advowson, were made *bonâ fide* to a protestant purchaser, for the benefit of protestants, and for a full consideration; without which requisites every such grant and conveyance of any advowson or avoidance is absolutely null and void. This is a particular law, and calculated for a particular purpose: but in no other instance does the common law permit the clerk himself to interfere in recovering a presentation, of which he is afterwards to have the advantage. When the clerk is in full possession of the benefice, the law gives him the same possessory remedies to recover his glebe, his rents, his tithes, and other ecclesiastical dues, by writ of entry, assise, ejectment, debt, or trespass (as the case may happen) which it furnishes to the owners of lay property. Yet he shall not have a writ of right, nor such other similar writs as are grounded upon the mere right; because he hath not in him the entire fee and right (F. N. B. 49.); but he is entitled to a special remedy called a writ of Juris *utrum*, which see. Blackst. Comm. book iii.

DISTURBER, an appellation given by the law to a bishop who refuses or neglects to examine and admit the patron's clerk without good reason assigned, or notice given; and he shall not have any title to present by lapse; for no man shall take advantage of his own wrong. (2 Roll. Abr. 369.) Also if the right of presentation be litigious or contested, and an action be brought against the bishop to try the title, no lapse shall incur till the question of right be decided. (Co. Litt. 344.) See Lapse.

DISVELOPED, in *Heraldry*, is used much in the same sense with displayed. Thus colours, said in an army to be flying, are, in heraldry, said to be disveloped.

DISUNITE, in the *Manège*, is used for a horse that drags his haunches, that gallops false, or upon an ill foot. See Gallop.

DITCH, in *Agriculture*, signifies a trench or opening cut in the ground, mostly round the fences of fields, in order to keep the hedge-plants free from stagnant moisture, and at the same time prevent their being injured by cattle, &c. They are however sometimes made large and wide, so as to form division fences, and act as drains to the adjoining lands. See Fence.

Ditches are formed very differently in different situations, but the chief things to be considered in making of them, are the nature of the soil, and their being constructed so as to convey off the water as expeditiously as possible.

In cases where the under-stratum or sub-soil is of the springy kind, and the land of the hilly sort, it has been advised, in order to prevent the danger of the springs working through under the banks, and thereby letting down the faces of them, together with the layer of plants into the ditches, to make them in the direction of the hills, by which this inconvenience is in a great measure prevented.

In all low vale districts, where the lands lie flat, the ditches should be deep, wide, and kept constantly well cleaned out, as from such situations being apt to be naturally too cold and moist, every possible endeavour should be had recourse to to free them from surface water, which Mr. Marshall has well remarked, "if it stand only an hour upon the soil, or in immediate contact with it, adds more or less to its natural coldness."

The forming of these sorts of ditches is too much neglected in many low parts of the kingdom, as the coarse, rank, rushy herbage of the lands sufficiently shews.

The earthy material which is collected in cleaning out many ditches of this nature, from its containing the putrid recrements of different animal and vegetable matters, is found to constitute, when mixed, by frequent turning over, with mild lime, and after this has been well blended, incorporating a little dung with the whole mass, an excellent manure for all sorts of light soils, either as a top-dressing or for being turned into them.

Ditch, or *Fossé*, in the *Military Art*, is a very large excavation made for the purpose of preventing an enemy from approaching the walls of a fortified place; and especially to obviate any attempts which might otherwise be made, to surprise by an escalade.

In many instances, the ditch surrounding the body of the place may be compared to a small river; being from 25 to 50 yards in width, and usually not less than eight or ten feet in depth. Where fortresses are built on the borders of large running waters, the ditch is usually filled by their influx, through channels of masonry, in which proper flood-gates, &c. are fixed, so as to let in the water at pleasure.

Ditches may be either wet or dry: the former are best calculated for the prevention of a surprise, and of desertion; but when the water is stagnant, the health of the garrison may be considerably affected: add to this, that the revetement, or facing, of the scarp, and counterscarp, are in general sapped and weakened by too long a continuance of moisture. Dry ditches should be well turfed at the bottom, so as to afford a good pasture, and to prevent the soil from cracking, or being sun-scorched. These afford a more ready communication with the outworks than wet ditches; the latter requiring numerous bridge's, which may be destroyed by the shot from the besiegers' batteries; occasioning very serious inconvenience, and eventually subjecting the outworks to capture.

There is frequently a small ditch made in the middle of the great *fossé* which surrounds the body of the place: this is called the *cunette*, or *cuvette*; and for the most part may be taken at 15 feet in breadth, by six or eight in depth. This serves as the main channel, whereby the water let in at the sluices is made to flow uniformly at every face or front; and being lined with masonry built perpendicularly, forms a considerable check on all attempts to pass the ditch by fording when the besiegers have been able to draw off the main body of water therefrom. The *cunettes*, or minor ditches, rarely pass in front of the curtains, being principally formed opposite the faces of the bastions: they often contain large supplies of excellent fish; and in Asia are sometimes rendered,

dered, in a manner, impaſſable, owing to the number of alligators they contain, and which are maintained for the purpoſe of deterring the garriſon from deſertion, and from the clandeſtine acquirement of ſpirituous liquors. For further particulars regarding the dimenſions, uſes, defences, &c. of the ditch, we refer the reader to the head of FORTIFICATION; in which it will be found a prominent feature.

DITCH-*water*. See WATER.

DITCHING, in *Agriculture*, a term ſignifying the practice of forming hedge and ditch fences. It likewiſe implies the operation of making up or cleaning out theſe ſorts of fences.

DITFORT, in *Geography*, a town of Germany, in the circle of Upper Saxony, belonging to the abbey of Quedlingburg; 4 miles N. E. of it.

DITHMAR, or DIETHUMAR, in *Biography*, a German prelate and hiſtorian, was the ſon of Sigefrid, count of Saye, and born in the year 976. Having embraced the monaſtic life, he was made biſhop of Merſburg, by the emperor Henry II. in 1018; and he died in 1028, in high reputation for ſanctity. His Latin chronicle, containing, in ſeven books, the hiſtory of the emperors Henry I. Otho I. II. III. and Henry II. has been ſeveral times reprinted, and is accounted a faithful narrative. Moreri.

DITHMAR, JUSTUS-CHRISTOPHER, an eminent juriſt and antiquary, was born, in 1677, at Rottenburg in Heſſe, and after having diſtinguiſhed himſelf by his ſtudies under his father, who was ſchool-maſter and miniſter in his native town, he removed to the univerſity of Marpurg, where he applied to theology and the oriental languages, and thence to Leyden. He afterwards travelled in Germany and Holland, as preceptor to one of the ſons of the preſident Van Danckelmann, and by the intereſt of that family he became profeſſor, firſt of hiſtory, and then of the law of nature, at Frankfort on the Oder, where he alſo delivered lectures on the management of the domains and public finances. He died at Frankfort in 1737. Some of the moſt important of his learned works, which are numerous, are "Gregorii VII. Pontif. Vita," 8vo.; "Hiſtoria Belli inter Imperium et Sacerdotium," 8vo.; "Delineatio Hiſtoriæ Brandenburgenſis," 4to.; "Chytræi Marchia Brandenb. ad noſtra tempora continuata," 8vo.; "C. Corn. Taciti Germania, cum perpetuo et pragmatico Commentario;" "Diſſert. de abdicatione regnorum, aliorumque dignitatum illuſtrium," 4to. "A Collection of Diſſertations on various ſubjects of public and natural law and hiſtory," 8vo.; and "An Introduction to Political Economy, with a catalogue of the beſt books on the ſubject," 8vo. which is a popular work in Germany, and uſed in ſeveral of the univerſities. Moreri.

DITHYRAMBIC, ſomething that relates to the dithyrambus. We ſay, a dithyrambic verſe, dithyrambic poet, dithyrambic heat, &c. A compound dithyrambic word, Mr. Dacier obſerves, has ſometimes its beauty and force. Some moderns call compoſitions which are in the taſte of an ode, only not diſtinguiſhed into ſtrophes, and conſiſting of all kinds of verſe indifferently, dithyrambic odes.

Dithyrambic poetry owes its birth to Greece, and the tranſports of wine. It ſavours ſtrongly of its original; as admitting of no rules, but the ſallies of a fiery imagination. And yet art is not quite excluded; but delicately applied to guide and reſtrain the dithyrambic impetuoſity, and only indulge it in ſlights that are pleaſing. In effect, what our poets ſay of the ode, is more true of the dithyrambic than of the ode, that its diſorder is an effect of art.

Dithyrambic poetry muſt have required dithyrambic melodies; and we are told that this Greek ſong, in honour of Bacchus, was ſung in the Phrygian mode, and partook of all the fire and joviality, which the god to whom it is addreſſed inſpires. Rouſſeau, with a Sardonic ſmile, ſays, "We muſt not talk with the modern literati on this ſubject, who are always ſo wiſe and guarded, who cry out againſt the riot and diſorder of dithyrambics. It is certainly very indecorous to get drunk, particularly in honour of a divinity; but I had rather be drunk myſelf than have no other proof of my wiſdom and ſobriety, than that which meaſures with cold and inſipid reaſon, the actions of a man inflamed with wine.

"Take love, and wine, from ſocial and convivial ſongs, and what remains but ſatire and politics? no great ſtimulants to good humour or good fellowſhip."

Dithyrambics and nomes were equally hymns ſung in honour of the gods. The nomes were for Apollo, as the dithyrambics were for Bacchus.

The abbé Vatry, in an excellent memoir on the origin and progreſs of tragedy, Mem. de Litt. tome xv. ſays, that all the etymologies of the term dithyrambic are ſo forced, that he is firmly of opinion the word is not Greek, and that both the name and thing were brought from Egypt with the worſhip of Bacchus; for the Greeks are by no means agreed concerning the perſon who firſt made them acquainted with Bacchus; ſome affirming it to have been Cecrops, ſome Melampus, and ſome Orpheus; but all unite in deriving the worſhip of this god from the Egyptians.

The learned Redi's dithyrambic poem, entitled "Bacco in Toſcano," is one of the moſt ſpirited and pleaſing productions in the Italian language; and the notes with which the author has illuſtrated his verſes, abound with learning, ſcience, and hiſtorical information.

DITHYRAMBUS, Διθύραμβος, in the *Ancient Poetry*, a hymn in honour of Bacchus, full of tranſport, and poetical rage.

The meaſure, which is what diſtinguiſhes this kind of poetry, is ſaid to have been invented by Dithyrambus, a Theban; but Pindar attributes it to the Corinthians; and the modern etymologiſts furniſh us with another origin of the word.

In effect the verſe might be called thus from the god it was conſecrated to, who himſelf was named Dithyrambus; either on account of his having been brought twice into the world, according to the fable of Semele and Jupiter, or by reaſon of his having triumphed twice; from δὶς, *twice;* and θρίαμβος, *triumph*. Be this as it will, the ancients, we are told by Ariſtotle and Horace, gave the appellation dithyrambus to thoſe verſes wherein none of the common rules or meaſures were obſerved; much like thoſe called by the French vers libres, by the Italians verſi ſciolti, and by the modern Greeks politici, a name they gave to proſe, which theſe verſes reſemble more than poetry.

We have now no remains of the dithyrambi of the ancient poets, ſo that we cannot ſay preciſely what their meaſure was; all we know is, that it is very bold and irregular. The poets not only took the liberty to forge new words for the purpoſe, but they made double and compound words, which contributed very much to the magnificence of the dithyrambus.

Horace has ſometimes imitated them. Dacier, F. Commire, and ſome other modern writers, have compoſed Latin pieces of all kinds of verſe, indifferently, according as the ſubject and words preſented themſelves, without any order, or diſtribution into ſtrophes, and call them dithyrambi. See PINDARIC.

DITHONES, in *Ancient Geography*, a people of Illyria, in Dalmatia. Pliny.

DITKIRCHEN, in *Geography*, a town of Germany, in the circle of the Lower Rhine, in the electorate of Treves, on the Lahn; 17 miles W. of Wetzlar.

DITMANING, a ſmall town of Bavaria, with an old caſtle on the river Saltze.

DITMANSDORF, a town of Germany, in the archduchy of Auſtria; 2 miles S. of Schrattenſaal.

DITMARSH, or Ditmarsch, one of the ſubdiviſions of the duchy of Holſtein, belonging to Denmark, between the rivers Elbe and Eyder. Together with Holſtein Proper and Stormar, it was formerly called *Nordalbingia*, or Saxony beyond the Elbe. It is about 35 Engliſh miles long, and ſcarcely 20 broad.

This country was anciently under the government of the earls of Stade, who held it as a fief of the empire. Rudolphus, the laſt of theſe earls, having been murdered by the inhabitants of Ditmarſh, in 1144, the county of Stade devolved to Henry the Lion, duke of Saxony, who, in 1148, marched againſt the inſurgents, but having been put under the ban of the empire, it was only in 1180 that Hartwig, archbiſhop of Bremen, who took poſſeſſion of the county of Stade, reduced the rebels to obedience. They ſoon revolted again, and fought the protection of Waldemar, biſhop of Sleſwick; after which they renewed their allegiance to the ſee of Bremen.

The earls of Holſtein frequently attacked Ditmarſh, but were never able to conquer the country. Chriſtian I. king of Denmark, received Ditmarſh from the emperor Frederick III. as a fief, to be incorporated with the duchy of Holſtein; but the inhabitants refuſed their allegiance, and applied to pope Sixtus IV., by whoſe decree they once more ſubmitted to the ſee of Bremen, in 1476.

In the year 1500, John, king of Denmark, waged an unſucceſsful war againſt Ditmarſh: but at length Frederick II. and the dukes John and Adolphus of Holſtein, conquered this country in 1559, and divided it among themſelves. In the year 1773, the whole province of Ditmarſh reverted to Denmark, by the exchange of the Weſtphalian counties of Oldenburg and Delmenhorſt.

Ditmarſh is divided into South and North Ditmarſh. The former conſiſts of Marſhland and Geeſtland. The Marſhland, or the Marches, extends along the banks of the Elbe, and is protected by ſtrong dikes and embankments. The ſoil, which has been gained from the ſea, is uncommonly fertile, and is called koog or kog. The dikes are nineteen feet high, and under the immediate inſpection of government. They are kept at a very great expence. In the year 1634, the water ruſhed through the dikes, and ſwept away whole villages, with their churches, mills, cattle, and ſheep. Fifteen hundred individuals periſhed in this inundation. The Marſhland has ſeven pariſhes; its two principal places are the towns of Meldorf and Brunſbüttel, which has a ferry over the Elbe, not far from Hamburg.

The Geeſtland is the higher part of South Ditmarſh, on the ſhore of the Baltic. It has five pariſhes. Its moſt remarkable place is Hemmingſtedt, where the inhabitants of Ditmarſh gained that ſignal victory over the Danes, in which they took the famous Daniſh banner, called the Dannebrog.

North Ditmarſh counts nine pariſhes. Its principal towns are Lunden and Heyde.

DITOMBIO, a river of Piedmont, which riſes two miles N. E. from Orta, paſſes through the Novareſe, and divides into two rivers, the Albona and the Gogna.

DITONE, Ditonum, in *Muſic*, an interval comprehending two tones, a greater and a leſs. See Interval, and Tone.

The word is formed of δις, *twice*, and τονος, *tone*.

The ratio of the ſounds that form the ditone is of 4 to 5, or $\frac{4}{5} = 197\,\Sigma + 4f + 17\,m$, which is the *major third*: and that of the ſemi-ditone, of 5 to 6. F. Perran makes the ditone the fourth kind of ſimple concords: others make it the firſt diſcord, dividing the ditone into eighteen equal parts, or commas, the nine on the acute ſide go to the greater tone. Salomon de Caux.

Dr. Calleot, in his "Plain Statement of Earl Stanhope's Temperament," has applied this term to the five lower keys of each ſeptave (or octave) of the clavier, or range of finger keys on harpſichords, piano-fortes, organs, &c.; the ditone is  , and the tritone  , which, together, make up the ſeptave, or  . See Septave and Finger-*Key*.

Ditone, *Greateſt*, is an interval whoſe ratio is $\frac{64}{81}$, $= 208\,\Sigma + 4f + 18\,m$, which is the diſſonant major third of Galileo, and alſo the comma-redundant major third, which ſee.

Ditone, *Leaſt*, is an interval whoſe ratio is $\frac{81}{100}$, $= 186\,\Sigma + 4f + 16\,m$, which is the comma-deficient major third, which ſee.

DITONICO, Diatonic, according to Zarſino, is the pure and natural diatonic genus, or the diatonic of Didymus; in which not one of the ſounds is in the leaſt altered; ſuch is the plain chant of the church. But the genus diatonum ditonicum of Ptolemy, which coincides with the diatonic of Pythagoras, and reſults from that diviſion of a monochord bearing the name of Euclid's ſection of the canon, is expreſſed by $\frac{256}{243} \times \frac{9}{8} \times \frac{9}{8} = \frac{4}{3}$. But theſe ancient ſyſtems have been juſtly laid aſide ſince the invention of a temperament, as being unfit for the execution of muſical compoſitions in ſeveral parts. Smith's Harmon. p. 33.

DITONICUM, Diatonum. See Genus.

DITRIGLYPH, in *Architecture*, the ſpace between two triglyphs. Se Triglyph.

DITRIHEDRIA, in *Natural Hiſtory*, the name of a genus of ſpars. The word is derived from the Greek δις, *twice*, τρις, *three*, and ἕδρα, a *ſide* or *plane*. The bodies of this genus are ſpars compoſed of twice three planes, being formed of two trigonal pyramids joined baſe to baſe, without the intervention of any intermediate column. Of this genus there are five known ſpecies: 1. One with long and pointed pyramids, found in the mines of Cornwall, and ſome other parts of England. 2. One with long and broad pyramids, found looſe in the fiſſures of the alabaſter quarries of Blanckenberg, in Germany. 3. One with ſhort and broad pyramids, found in the mines of Rammelſberg. 4. One with extremely broad depreſſed pyramids, found in the alabaſter quarries at Blanckenberg, and ſometimes in the mines of Goſſelaer, in Saxony. 5. One with ſhort, but ſharp-pointed pyramids, found very frequently in the mines of the Harte Foreſt, and ſometimes on Mendip Hills with us. Hill's Foſſils, p. 218.

DITTANDER, in *Botany*. See Lepidium.

DITTANI, in *Ancient Geography*, a people of Spain, in the Tarragoneſe territory, placed by Strabo on mount Oroſpeda. They were a colony of Celts.

DITTANY, in *Botany*. See Origanum.

Dittany, *Baſtard*. See Marrubium.

Dittany, *White*. See Dictamnus.

DITTEAH, in *Geography*, a town of Hindooſtan, in the province of Bundelcund, in length above $1\frac{1}{2}$ mile, and

and nearly as much in breadth; populous and well built; the houſes being of ſtone, and covered with tiles. It is ſurrounded by a ſtone wall, and furniſhed with gates. At the N. W. extremity is a large building, with one large and ſix ſmaller cupolas, formerly the reſidence of the rajah; but the preſent rajah has built a palace for himſelf, ſeated on an eminence without the town, on the S. E. ſide, and commanding a view of the country. Cloſe to this hill is a pretty extenſive lake. The inhabitants are robuſt and handſome, and preſent the appearance of opulence and content; but they bear the character of a warlike people. The diſtrict yields a revenue of nine or ten lacks of rupees annually, ſubject to the payment of a tribute to the Mahrattas, the amount of which varies with their power to exact it. Aſ. Reſearches, vol. vi. p. 22.

DITTERBACH, a town of Bohemia, in the circle of Chrudim; ſeven miles S. E. of Politzka.

DITTERS, Charles, in *Biography*, the favourite, ſays Gerber, of the German nation, was born in 1730. He began his career as a muſician by the violin, as a performer on which inſtrument he was admitted into the imperial chapel at Vienna; and when he followed the emperor Joſeph to Frankfort, on his election of king of the Romans, he eclipſed all his rivals. At that time he bore his family name of Ditters; but in 1770, the emperor, as a reward for his merit and talents, elevated him to the rank of nobility by the title of Ditterſdorf, and at the ſame time appointed him ranger of the foreſts in his Sileſian domains. On his arrival in Sileſia, the prince biſhop of Breſlau nominated him director of his chapel, or choral band, and from that time he reſided alternately in Sileſia and Vienna. In 1792, he lived in a ſplendid manner on his own property in Auſtria, which was very conſiderable.

In 1772, we heard his muſic performed at Vienna among the beſt compoſers of that period; and at Bruſſels his ſymphonies were in the higheſt favour at this time, and performed under the direction of that admirable director of the band, M. Fitzthumb, which we heard with very great pleaſure. Few of Haydn's ſymphonies were then known, and Vanhal and Ditters were at the head of German ſymphoniſts.

Of the works of Ditters, which are uncommonly numerous and excellent, not more than eight or ten have been printed. And theſe were not choſen for their ſuperior merit, but becauſe copies had been more eaſily obtained by the editors. The fifteen ſymphonies, compoſed from his feelings on reading the metamorphoſes of Ovid, are to be excepted; for theſe he not only led with univerſal applauſe at Vienna, but alſo by general intreaty, attended himſelf to their publication. In 1780, a new ſource of applauſe was opened to him by ſetting words to muſic. The oratorio of Eſther, "O ſia la Liberatrice del popolo Giudaico nella Perſia," compoſed by him, was performed for the benefit of the widows and families of muſicians. But his moſt admired German work "Der Doctor und der Apotheker," was performed in the Vienna theatre, in 1786. Two years after this, he ſet and publiſhed, at Vienna, three other operas.

DITTLEMEN, in *Geography*, a town of Pruſſia; 3 miles S. of Inſterburg.

DITTO, in *Books of Accounts*, written contractedly D°. ſignifies *the ſame*, viz. as the preceding article.

The word is corrupted from the Italian *detto*, the ſaid; as in our law phraſe "the ſaid premiſes," meaning the ſame as were aforementioned.

DITTON, Humphrey, in *Biography*, an excellent mathematician, was born at Saliſbury in the year 1675. His father was a zealous non-conformiſt, but ſufficiently candid and liberal to acknowledge merit wherever it might be found, and accordingly placed the ſon under the care of a clergyman of the eſtabliſhment, with whom he continued till he was of an age to enter upon ſome profeſſion. At this period he undertook the charge of a diſſenting congregation at Tunbridge in Kent, which he continued to ſerve ſeveral years, till he found the labour more than equal to his ſtrength. He then reſigned the office of preacher, and, at the advice of Dr. Harris and Mr. Whiſton, devoted himſelf entirely to mathematical purſuits. In this line he ſoon acquired diſtinction, and was enabled to enrol among his friends the firſt men of the age, among whom was ſir Iſaac Newton. By the intereſt and recommendation of this able man, Mr. Ditton was elected maſter of the mathematical ſchool in Chriſt's hoſpital, the duties of which he continued to perform till his death, which happened in the year 1675, before he had ſcarcely attained to the meridian of life. His works are numerous, chiefly on mathematical ſubjects; the moſt important was his treatiſe on "Fluxions," which was publiſhed in 1706, and reprinted twenty years afterwards with additions and alterations by Mr. John Clarke. His work on "The General Laws of Nature and Motion," was highly applauded by men of the firſt eminence in ſcience and literature: it was deemed a capital introduction to the writings of Galileo, Huygens, and ſir Iſaac Newton. As a divine, Mr. Ditton is known by "A Diſcourſe on the Reſurrection of Jeſus Chriſt," which has been ſeveral times printed, and has been tranſlated into foreign languages. In conjunction with Mr. Whiſton, he laid before the commiſſioners of the board of longitude a method for the diſcovery of that difficult problem, which, being rejected, was the cauſe of ſo much uneaſineſs and chagrin, as probably to haſten his end. Dr. Kippis, in ſpeaking of the treatiſe on the reſurrection, calls it a "work of great value. According to the faſhion of the times, it is written in the mathematical form, which, perhaps, gives it too abſtract an appearance, but it would well reward a diligent peruſal: as is the caſe with many other good books, the memory of it is almoſt overwhelmed by the ſucceſſion of new publications. A perſon who ſhould apply himſelf to the ſtudy of the logic of probabilities, would find his account in reading Mr. Ditton's performance." Biog. Brit.

DITTY, a poem, a ſong. This word, probably, is derived from *ditie*, Fr. and the French from *dictum*, Lat. a ſaying, a ſentence, and not from *dicht*, Dutch.

In old French it implied an epiſtle: "Lectio Epiſtolæ beati Pauli Apoſtoli ad Titum; Saint Paus envoie cheſt ditie." Shakeſpear, Milton, and Dryden have repeatedly given reſpect and importance to this word.

> Being young, I framed to the harp
> Many an Engliſh ditty lovely well,
> And gave the tongue a helpful ornament. Hen. IV.

> Mean while the rural ditties were not mute,
> Temper'd to the oaten flute;
> Rough ſatyrs danc'd. Milton.

They will be ſighing and ſinging under thy inexorable windows lamentable ditties, and call thee cruel. Dryden.

DIU, in *Geography*, an iſland in the Indian ſea, near the ſouth coaſt of the country of Guzerat, and not far W. from the entrance of the gulf of Cambaya, about three miles long and one broad, with a town of the ſame name, that has a good harbour, ſubject to the Portugueſe. The town is ſmall, but well built and fortified; and in the period of the proſperity of the Portugueſe, and before Cambaya and Surat attained to reputation, it was a place of

great trade, and the port was always full of ships. N. lat. 20° 45.′ E. long. 70° 5′.

Diu *Point*, a cape of Hindooſtan, on the ſouth coaſt of Guzerat. N. lat. 20° 43′. E. long. 69° 52′ 15.″

DIVAL, in *Heraldry*, the herb *night ſhade*, a plant with poiſonous berries, looking like black cherries, uſed by ſuch as blazon with flowers and herbs inſtead of colours and metals. for ſable, or black. See Sable.

DIVALIA, in *Antiquity*, a feaſt held among the ancient Romans on the twenty-firſt day of December, in honour of the goddeſs Angerona; whence it is alſo called *Angeronalia*.

On the day of this feaſt, the pontifices performed ſacrifice in the temple of Voluptia, or the goddeſs of joy and pleaſure, who, ſome ſay, was the ſame with Angerona; and ſuppoſed to drive away all the ſorrows and chagrins of life.

DIVAN, a council-chamber, or court, wherein juſtice is adminiſtered, in the eaſtern nations, particularly among the Turks.

Divan is an Arabic word, ſignifying the ſame with ſopha in the Turkiſh dialect.

There are two ſorts of divans, that of the grand ſignior, called the council of ſtate, which conſiſts of ſeven of the principal officers of the empire. The grand ſignior never gives audience to ambaſſadors, except on Tueſday, on which day the divan is aſſembled:—this council is held on the ground floor of a ſquare tower, which bears the ſame name. The vizir, the great judges of Europe and Aſia, the grand treaſurer, &c. &c. ſit on benches round the hall; and above the ſeat of the vizir, facing the entrance, is a little window, grated, and raiſed about nine or ten feet, from which the grand ſignior may hear all that paſſes; but where he cannot, as they wiſh to have it believed, either be aſſaſſinated, or aſſaſſinate. The other divan is that of the grand vizir, formerly compoſed of ſix ordinary vizirs, or pachas with three tails, whoſe reputation for wiſdom was not to be equivocal. The vizir aſked their opinion when he thought it neceſſary. To this council were likewiſe admitted the mufti and the two kodileſkers, when the law was to be conſulted. Selim, however, ſoon after his acceſſion to the throne, compoſed this council of twelve perſons, the moſt diſtinguiſhed by their office. The vizir and the mufti are preſidents of it: the one in his quality of lieutenant-general of the empire for temporal affairs: the other as vicar of the ſultan for the interpretation and depoſitary of the laws. The other ten members are the *kiaya-bey*, the *reis-effendi*, the *teſterdar-effendi*, the *tehélébi-effendi*, the *terſana-émini*, the *tchiaoux-bachi*, the two *ex-reis-effendi*, and two *ex-teſterdars-effendi*: which ſee reſpectively. The captain-pacha and the kiaya of the ſultana-validai are called to the extraordinary councils; and although they are not ordinary members of the council, they are conſulted, and both of them have the greateſt influence in the deliberations, on account of the intereſt which the former preſerves with Selim, and from that which the latter has obtained with the ſultana mother.

This council, unfortunately compoſed of members that are mutual enemies, jealous of each other, and more occupied about their own intereſts than the happineſs of the ſtate, has been very far from accompliſhing the intentions of Selim. Since its creation, the ſtate of affairs has daily become worſe; the empire is menaced with a total diſſolution; the finances are exhauſted; and the danger which threatened the government has actually occurred. See Turkey.

The divan at Aleppo is compoſed of the baſhaw or pacha, Mohaſil or Difter-dar (teſterdar), Cady, Mufti, Nakeeb, and Sarda, or aga of the Janizaries, who, by their office, are members of this council; and beſides theſe it conſiſts of the principal effendis and agas, together with the ſhahbinder, or head of the merchants. The divan is aſſembled as often as emergencies require; a ſummons being carried to each member by the baſhaw's chauſes, who are inferior officers, carrying a ſhort ſtick ornamented with ſilver, and employed in attendance at the gate of the ſeraglio for carrying meſſages, &c.: but this council regularly meets every Friday at the ſeraglio. The effendis rendezvous firſt at the Mahkamy or great tribunal, whence they ride in proceſſion with the Cady. Buſineſs relating to the city and all parts of the province is tranſacted in the divan; the baſhaw always affecting to be deſirous of obtaining exact information. After the breaking up of the Friday's divan, the baſhaw uſually goes in ſtate to the moſque, attended by moſt of the members.

The word is alſo uſed for a hall, in the private houſes of the orientals. The cuſtom of China does not allow the receiving of viſits in the inner parts of the houſe, but only at the entry, in a divan contrived on purpoſe for ceremonies. Le Compte.

The divan among the Turks is a common appellation for an apartment in the ſeraglio, which is neatly fitted up, and ſerves for the reception of company, for occaſional lodging and repoſe, or for the conducting of public buſineſs. (See Seraglio.) All the houſes of the Turks of middle rank at Aleppo have a divan, with a little garden or fountain before it.

Divan-Beghi, the appellation of one of the miniſters of ſtate in Perſia.

The divan-beghi is the ſuperintendant of juſtice; his place is the laſt of the ſix miniſters of the ſecond rank, who are all under the athemadaulet, or firſt miniſter.

To the tribunal of the divan-beghi appeals lie from ſentences paſſed by the governors. He has a fixed ſtipend, or appointment, of 50,000 crowns, that he may render juſtice *gratis*. All the ſerjeants, uſhers, &c. of the court, are in the ſervice of the divan-beghi. He takes cognizance of the criminal cauſes of the chams, governors, and other great lords of Perſia, when accuſed of any fault, and receives appeals from the daruga.

There are divan-beghis not only at court, and in the capital, but alſo in the provinces, and other cities of the empire.

This officer is not confined by any other law or rule, in the adminiſtration of juſtice, but the Alcoran, which alſo he interprets at pleaſure. He takes no cognizance in civil cauſes.

DIVANDUROU, in *Geography*, the name of five ſmall iſlands in the Indian ſea, near the Maldives.

DIVE, a river of France, in the department of the Vienne. It has its ſource near La Grimaudiére, paſſes by Moncontour, Baſnueil, and falls into the river Thoué, below Saint Juſt, in the department of Mayenne and Loire. Its inundations deprive agriculture of 50,000 arpens of excellent ſoil. A canal has been commenced to drain this land; it is to extend from the mouth of the Dive to Saumur, a length of nine miles, or 15 kiliometres, and will facilitate the tranſport of proviſions to Nantes.—Alſo, a river of France, in the department of Calvados, which has its ſource in the ſouth in the department of the Orne, flows almoſt due north, and after having received the waters of the Oudon, Faiſon, and La Vie, falls into the Engliſh channel near the town of Dives.

DIVER, in *Ornithology*. Several kinds of water-fowl are known by this name in different parts of England, as for example,

ample, the MERGUS MINUTUS is called the lough diver; and the ALCA ALCE, the small black and white diver. A number of the COLYMBUS genus are also called divers by English writers.

DIVERBIA, *Lat.* a term in the Roman drama, implying the different species of cantilena used by the interlocutors on the stage.

The Greek dramas consisted of soliloquy, dialogue, and chorus; but as the chorus was never adopted in the Latin comedy, it has been imagined, that such cantica, or soliloquies, as were full of sentiment and passion, had a different, more elaborate, and refined melody and accompaniment set to them than the diverbia, or dialogues; and that, like the choruses of the Greek tragedy, they served as interludes, or act tunes. But we have been able to meet with no satisfactory proof of these cantica, or songs being a part of the piece, like the Greek chorus: for though Flaccus is mentioned as composer of the modes or melodies, to which all the six comedies of Terence were sung, no notice is taken of a different music for the cantica, or even interludes, if such there were, used betweeen the acts. Some of the soliloquies in Terence seem too short and trivial to be sung to different music from the diverbia; and others, that are longer and more sentimental, have no distinction of versification, like the odes or choruses of Greek tragedy, to point them out as cantica; but are all in the same free Iambic verse as the diverbia.

Donatus, who flourished three hundred and fifty years after Christ, tells us, indeed, that "though the dialogues were spoken, the cantica were set to music, not by the poet, but by an able composer." "Diverbia histriones pronuntiabat: cantica verò temperabant modis, non à poetâ, sed à perito artis musices factis." Scholia in Terent. We should therefore rather imagine that these cantica of the Latin comedy were real intermezzi, or interludes, wholly detached from the piece, and, perhaps, not only the productions of a different composer, but of a different poet. That the Tibicines exhibited between the acts seems evident from a passage in Plautus, who makes one of his characters say at the conclusion of the first act of the Pseudolus, I must go in: "Tibicen vos interea hic delectaverit."

The melody of ancient declamation being then only a species of recitative, could receive nothing but a poetical rhythm, far less exact than one strictly musical; exact, indeed, as to long and short syllables, but as it approached nearer to common speech than air, so it must have been more lax and incommensurate as to time, than measured melody, such as constitutes air at present. Long and short syllables are rigourously attended to in modern recitative, the words are strongly accentuated, and yet the musical measure, or time, is never attended to, or beaten.

M. de Voltaire, so much attached to the ancient drama, and so little to modern music, says, we can no where find such an exact resemblance of the Greek stage, as in the Italian opera. "The Italian recitative is precisely the melopoeia of the ancients; and though this recitative is tiresome in ill written pieces, yet it is admirable in good ones; and the choruses in some of them, which are interwoven in the subject, resemble the ancient chorus so much the more, as they were set to a different kind of music from the recitative; for the strophe, epode, and antistrophe, were sung by the Greeks quite differently from the melopoeia of the rest of the play."

"I know," continues M. de Voltaire, "that these tragedies, so bewitching by the charms of the music, and magnificence of the decorations, have a defect which the Greeks always avoided; a defect which has transformed the most beautiful, and, in other respects, the most regular tragedies that ever were written, into monsters: for what can be more absurd than to terminate every scene by one of those detached airs, which interrupt the business, and destroy the interest of the drama, in order to afford an opportunity to an effeminate throat to shine in trills and divisions, at the expence of poetry and good sense." Dissert. sur la Tragedie Ancienne et Moderne.

The last period of this quotation proves the impossibility of satisfying all parties in theatrical disputes; for those very airs which are so delightful to lovers of music, and which alone render an opera supportable to them, are regarded by the exclusive lovers of poetry as the only blemishes in this kind of drama, which render it inferior to the Greek. However, notwithstanding the acknowledged merit of particular scenes of recitative in an opera, we are inclined to believe, if the airs were omitted, that the rendering this kind of spectacle more Grecian, would neither increase the number of its admirers, nor enrich the managers of the theatre.

DIVERGENCY. For the point of divergency or divergence in *Optics*, see *Virtual* FOCUS.

DIVERGENCY *of Tune*, in *Music*. M. Huygens and M. Sauveur long ago observed, that no voice or perfect instrument can always proceed or leap from one note to another by perfect intervals, without erring from the pitch at first assumed, and hence it is, that temperaments in the melody are unavoidable, where perfect harmony between the parts of a concert are attained, as Mr. Farey has observed (Philosophical Magazine, vol. xxvii. p. 314). Mr. Maxwell, in his "Essay on Tune," has well considered this kind of disagreement, between the intervals in music, which render them unfit or incompetent, to the performance of perfect melody and perfect harmony at the same time, and has denominated the effect which arises from endeavouring to perform certain melodies without false or tempered intervals, in varying the pitch, as above observed, the divergency of tune. See HARMONY, and TEMPERAMENT.

DIVERGENCY *of Meridians*, in *Geographical Surveying*. In proceeding from either pole of the earth towards the equator, the meridians will be found to diverge from each other, and on proceeding the contrary way, to coverge, the law of which has been considered under the article CONVERGENCY *of Meridians*, which see.

DIVERGENT, or DIVERGING *lines*, in *Geometry*, are such whose distance is continually increasing.

Lines which converge one way, diverge the opposite way.

DIVERGENT, or DIVERGING, in *Optics*, is particularly applied to rays, which, issuing from a radiant point, or having in their passage undergone a refraction, or reflection, do continually recede farther from each other.

In which sense the word is opposed to convergent, which implies the rays to approach each other; or to tend to a centre, where being arrived, they intersect; and, if continued farther, become diverging.

Concave glasses render the rays diverging; and convex ones, converging.

Concave mirrors make the rays converge; and convex ones, diverge. See FOCUS.

It is demonstrated, in *Optics*, that as a diameter of a pretty large pupil does not exceed $\frac{1}{5}$th of a digit; diverging rays, flowing from a radiant point, will enter the pupil parallel, to all intents and purposes, if the distance of the radiant from the eye be 40,000 feet. See LIGHT and VISION.

DIVERGING *hyperbola*, is one whose legs turn their convexities towards one another, and run towards quite contrary ways.

DIVER-

DIVERSIFYING, in *Rhetoric*, is of infinite ſervice to the orator; it is an accompliſhment eſſential to his character, and may fitly be called the ſubject of all his tropes and figures. Voſſius lays down ſix ways of diverſifying a ſubject. 1. By enlarging on what was briefly mentioned before. 2. By a concise enumeration of what had been inſiſted on at length. 3. By adding ſomething new to what is repeated. 4. By repeating only the principal heads of what had been ſaid. 5. By tranſpoſing the words and periods. 6. By imitating them. Voſſ. Rhet. lib. v. p. 281, & ſeq.

DIVERSION, in *Medicine*, the turning of the courſe or flux of humours from one part to another, by proper applications.

Diversion, amongſt *Military Men*, means the drawing off the enemy's attention, or cauſing him to weaken ſome particular point, on account of either a real, or a feigned, attack upon ſome remote part. When an army is unable to cope with another in the field, and retires behind intrenchments, or into fortified places, another army, though comparatively ſmall, attacking ſome weak point in the enemy's rear, thereby cauſing him to forego any advantage he might have gained, or inducing him to detach a portion of his force, will generally be productive of excellent effects. Diverſions are, for the moſt part, held in terrorem over ſuch coaſts as are but weakly guarded, but from which the enemy would willingly ſend reinforcements to ſome other part; or eventually commence operations againſt ſome neighbouring ſtate. Therefore, when an army either collects in ſuch a ſituation as ſhould enable it to ſeize the opportunity afforded by the enemy's withdrawing his troops; or where an army, being embarked, hovers along a coaſt, ſo as to keep him in a conſtant ſuſpence, the greateſt aid is given: it is evident, that in the latter caſe, the enemy muſt confine himſelf entirely to a defenſive ſyſtem, in lieu of quitting the coaſt to reinforce any other point. To illuſtrate this more fully, let us ſuppoſe that an army were marching from Italy to join the French in an attack upon Spain: a few thouſand men kept hovering in tranſports along the coaſt of Italy muſt neceſſarily prevent the intended co-operation; becauſe, whenever an opportunity might offer, the tranſports would diſcharge their troops; and, if circumſtances ſhould admit, would proceed for reinforcements; or probably pretend to attack, or to watch ſome other point: thus would a real and a feigned attack be carried on, in two different places, at nearly the ſame time; diſtracting and haraſſing the enemy ſo effectually as to make an effectual diverſion in favour of ſome diſtant army.

DIVERSITY. This differs from diſtinction in this, that the latter is the work of the mind; but the former is, in things themſelves, antecedent to the operation of the mind. For things that are ſeveral, are different; even though I do not conceive them. See Distinction.

The diverſity, or difference of things, therefore, ariſes from their eſſential attributes. See Identity.

Diversity, in *Painting*, conſiſts in giving every part or figure in a picture its proper air and attitude. The ſkilful painter has the penetration to diſcern the characters of nature, which vary in all men; whence the countenances and geſtures of the perſons he paints continually vary.

Diversity *of perſon, plea of*, in *Law*. See Reprieve.

DIVERTICULUM, in *Anatomy*, a luſus naturæ or preternatural formation occurring in the ſmall inteſtine. It conſiſts of a piece of gut, ſeldom exceeding three inches in length, having the ſame ſtructure and ſize as the reſt of the tube, opening by one end into the inteſtinal canal, which it joins at right angles, and terminating in a cloſed or blind extremity at the oppoſite end, which is looſe in the abdominal cavity. That theſe diverticula are a natural formation, and do not conſiſt of any morbid extenſion of the coats of the inteſtine, is proved by their being formed of the ſame tunics as the reſt of the canal. They cannot cauſe any ill conſequence. When protruded in a hernia, they might mortify and even ſeparate in a piece of an inch or two long, without affecting the paſſage of the fœces per anum. They have been ſeen in the large inteſtine, but are much more rare in that ſituation. Repreſentations may be ſeen in Ruyſch Theſ. Anat. ſeptimus, tab. 4; and Sandifort Muſeum Anat. Acad. Lugdun. Bat. tab. 107.

Diverticulum Nuckii; the opening through which the round ligament of the uterus paſſes. Nuck ſtates that the peritoneum forms a ſmall canal here in the female, bearing an analogy to the tunica vaginalis of the male, and this is the part called diverticulum Nuckii. We do not conſider this to be the common ſtructure; but there is ſometimes a ſmall and ſhort canal of peritoneum over the paſſage of the round ligament, even in the adult ſubject.

DIVERTISSEMENT, Fr. *Entertainment*, Engl. In the former it implies ſinging and dancing. With us the term is generally applied to pantomime, as a pantomime entertainment. But often at benefits, where all the theatrical attractions poſſible are thrown out to excite curioſity, entertainments of ſinging are frequently promiſed in the bills and advertiſements, without ſpecification.

DIVES, in *Geography*, a ſmall town of France, in the department of Calvados, near the mouth of the river Dive; 12 miles N. E. of Caen. It is the chief place of a canton, in the diſtrict of Pont l'Evêque, with only 410 inhabitants: but the canton contains 33 communes, and a population of 9888 individuals, on a territorial extent of 170 kiliometres. Dives muſt not be confounded with another town in the ſame department, called St. Pierre ſur Dive, which ſee.

DIVESTING, properly ſignifies undreſſing, or ſtripping off one's garment, in contradiſtinction from inveſting.

In law, it is uſed for the act of ſurrendering, or relinquiſhing one's effects. By a contract of donation, or ſale, the donor, or ſeller, is ſaid to be diſſeiſed and diveſted of his property in ſuch a commodity, and the donee, or purchaſer, becomes inveſted therewith. See Investiture.

A demiſe is a general diveſtiture, which the fathers and mothers make of all their effects, in favour of their children.

DIVIDEND, in *Arithmetic*, the number given to be divided; or that whereof the diviſion is made.

The dividend muſt always be greater than the diviſor. The dividend contains the diviſor as many times as the quotient contains unit.

Dividend *of a bankrupt's eſtate*, is that part which is diſtributed to every creditor in proportion to his debt. See Bankrupt.

Dividend, in the *Exchequer*, is one part of an indenture. 10 Ed. I. c. 11.

Dividend, in *Law*, is uſed for a dividing of fees in perquiſites between officers of courts, ariſing from writs, &c.

Dividend, in *Commerce*, the diſtribution of the profits of a ſociety or joint-ſtock company, to the members thereof, according to their reſpective ſhares in the concern. The diviſion is moſt commonly made at ſtated periods, yearly or half-yearly, and is occaſionally raiſed or reduced according to the gains or loſſes during the preceding period. The rate, at which it is to be made, is uſually determined by a general meeting of the proprietors or ſhare-holders, the reſolution, or vote of ſuch general meeting, being the authority on which orders of payment, addreſſed to the treaſurer, or ſome other officer of the company, and called dividend warrants, are iſſued to the reſpective proprietors.

In moſt public companies, the general court, or meeting of proprietors, is at liberty to declare whatever dividend they think proper; in ſome, as the Eaſt India company, the dividend cannot be increaſed, except on certain conditions; and in others, as the London and Weſt India Dock companies, the dividend is reſtricted to not exceed a certain rate *per cent. per ann.*

Dividend warrants are uſually payable on demand, and as they contain an acknowledgment of receiving the ſum expreſſed, they are liable to the ſtamp duties on receipts.

DIVIDEND *of the public funds*, the annual intereſt paid by government to the proprietors of the public debts. The funds being properly the revenues on which the intereſt of the public debts is charged, the diviſion of the reſpective ſhares thereof to the public creditors, came to be conſidered in the ſame light, as the diviſion of the profits of public companies to their ſtockholders; both were annual payments for money advanced; and when the intereſt on the public debts was made payable at the bank of England, the mode of payment being exactly ſimilar to the payment of the dividends on bank ſtock, the order of payment was called a dividend warrant, and the intereſt ſpecified therein, became commonly denominated the dividend.

The dividends on the public funds were formerly paid quarterly at the exchequer, but they are now, with the exception of a few life annuities, all paid half yearly at the bank of England, and the South ſea houſe, the money being tranſmitted from the exchequer for this purpoſe, a few days before the dividends become due. Part of the dividends become due on the 5th January and 5th July; the others on 5th April and 10th October, and they are uſually in courſe of payment, in about a week from thoſe days. For ſome time previous to the days of payment, the transfer books are ſhut, in order to make out the dividend warrants, which being filled up in the name the ſtock ſtood in, when the books ſhut, are, of courſe, only payable to that perſon, or his attorney. At the bank of England, the dividends are paid from nine o'clock till eleven, and from one till three; but on the *3 per cent.* conſols, without any intervention, from nine o'clock till three. At the South ſea houſe, they are paid from nine till twelve o'clock.

The great augmentation of all the public funds which has taken place of late years, has been attended with a conſiderable increaſe in the number of the proprietors thereof, commonly called ſtock-holders, and as many of theſe perſons are foreigners, or others reſiding in diſtant parts, or perſons who do not chooſe to make their relatives acquainted with their property in the funds, it frequently happens, from death, abſence, or other cauſes, that dividends which have become due, remain for a conſiderable time unreceived. Theſe unclaimed dividends were at firſt of but ſmall amount, but they have ſince accumulated very conſiderably, as will appear from the following extract, from an account laid before parliament.

	£.	s.	d.
On 5th July 1739	1,090	15	4½
1743	9,711	3	3½
1747	20,476	15	11½
1751	64,421	5	4
1755	62,504	4	1½
1759	102,075	4	11¾
1763	134,688	6	6¾
1767	186,356	3	11½
1769	227,928	6	2¼
1771	257,040	13	2¾
1773	253,855	10	9¼
1775	292,551	7	8¼
On 5th July 1777	284,719	17	6¾
1779	314,885	8	3¾
1781	340,111	12	9¾
1783	361,388	5	5¼
1785	424,301	3	8¼
1787	493,144	15	3½
1789	547,366	16	6¾

In the year 1791, the magnitude of the ſum thus remaining in the hands of the bank, attracted the attention of the miniſter; and as it could not be pretended to be the property of the bank, it was thought that the public might have the uſe of the principal part thereof, ſo long as it remained undemanded. An act was accordingly paſſed, authoriſing the company to advance out of the unclaimed dividends in their hands 500,000*l.* for the public ſervice, with a proviſion, that if the ſum in their hands ſhould be reduced under 600,000*l.*, the difference ſhould be repaid them.

In conſequence of the publication of the names of the proprietors of the dividends then unclaimed, a conſiderable part of them was received, and thus the ſum advanced to government became only 376,739*l.*; and, as from an omiſſion in framing the act, no proviſion had been made for making up deficiencies to the public, as well as to the bank, whenever the whole ſum of the unclaimed dividends might riſe above, as well as whenever it ſhould fall below the ſtipulated amount of 600,000*l.*, the exceſs beyond the 376,739*l.* actually advanced, remained in the hands of the bank, and was continually increaſing.

Total amount of the unclaimed dividends at the following periods immediately preceding the dividends payable in January.

1794,	January 9th	-	£ 713,372
1795,	—— 9th	-	771,388
1796,	—— 9th	-	814,112
1797,	—— 10th	-	778,027
1798,	—— 11th	-	821,728
1799,	—— 12th	-	860,888
1800,	—— 10th	-	934,388
1801,	—— 9th	-	973,451
1802,	—— 9th	-	916,639
1803,	—— 10th	-	960,233
1804,	—— 9th	-	963,731
1805,	—— 9th	-	1,023,294
1806,	—— 7th	-	1,098,631
1807,	—— 8th	-	1,003,966
1808,	—— 5th	-	1,047,891

The average balance in the hands of the bank, on this account, having been in each year ſtill greater than the ſums above ſtated, a propoſition was made in 1808, that the company ſhould advance out of the unclaimed dividends the ſum of 500,000*l.* for the uſe of the public, in addition to the ſum before advanced purſuant to 31 Geo. III. c. 33, and under ſimilar conditions; but with a proviſion that the amount of unclaimed dividends remaining in the bank ſhould not at any time be reduced below 100,000*l.* As no objection could be made to this propoſal by the bank, an act was paſſed, under which it was carried into effect.

The total amount of unclaimed dividends on the annuities payable at the South ſea houſe, on the 31ſt Dec. 1802, was 107,886*l.* 15*s.* 8*d.*

The dividends of the public funds were long conſidered as exempt from any mode of taxation; all the acts of parliament, by which the different loans have been eſtabliſhed, having provided that the reſpective annuities payable on them "ſhall be free from all taxes, charges, and impoſitions whatſoever." They have, however, in common with all other

other defcriptions of income, been made fubject to the property tax, which is deducted even on the unclaimed dividends.

Stealing any dividend-warrants of the Bank, South Sea Company, Eaft India Company, or of any other corporation, is made felony, with or without benefit of clergy in the fame manner as if the offender had ftolen, or taken by robbery, goods to the value of the money due on fuch dividend-warrants. Stat. 2 Geo. II. c. 25.

Dividend, in the *Univerfity*, is that part or fhare, which every one of the fellows equally divide among themfelves, of their annual ftipend.

DIVIDIVI, the name of a drug brought from the Caraccas into Spain in 1769; and which, by experiments that have been made upon it at Madrid, is found to be preferable to galls in dyeing black.

DIVIDUAL, in *Arithmetic*, is ufed for that part of the dividend diftinguifhed by a point in working by the rule of divifion.

DIVINATION, *rerum futurarum fcientia*, the pretended act, or art, of foretelling future events. This art or fcience, in which the pagans thought themfelves fure of fuccefs, if they proceeded according to certain eftablifhed rules, was founded in their fyftem of theology. They had deified all the parts and powers of nature, and more efpecially the heavenly bodies; afcribing to the latter not only life and intelligence, but a fore-perceiving motion, and a fovereign influence on every thing here below. They had alfo other gods befides the objects of nature, *viz.* Dæmons, from whofe fubordinate miniftry and mediation, divination, prophecy, and magic were fuppofed to proceed. Ammian. Marcell. lib. i. c. 1. Herod. lib. ii. c. 83. Plato. in Symp. in Epinomide, in Phædra, Porphyr. ap. Eufeb. Præp. Evan. lib. iv. v. vi. & de Abftinentia, lib. ii. Jamblich. de Myfter. Apul. Apol. ld. de Deo. Socrat. Diogen. Laert. in Vita Pythag. lib. xxxii. p. 514.

Farmer on Miracles, chap. iii. fect. 3. See Prophecy, Enthusiasm, &c.

Divination, which is as ancient as idolatry, and formed a confiderable part of the pagan theology, proceeded originally from the Egyptians to the Jews, Greeks, and Romans; and was divided by the ancients into artificial, and natural.

Divination, *Artificial*, is that which proceeds by reafoning upon certain external figns, confidered as indications of futurity.

Divination, *Natural*, is that which prefages things from a mere internal fenfe, and perfuafion of the mind, under a particular emotion or agitation, without any affiftance of figns.

Plutarch, in his book "De Defectu Oraculorum," allows that dæmons might be appointed by the gods to prefide over divination and oracles, and to be the guardians of the temperature of thofe exhalations, to which they are afcribed; but at the fame time it is afferted, that the foul is naturally endued with the faculty of divining, and that certain exhalations of the earth were the means of exciting the prophetic power or virtue. P. 418. D. and p. 453. F.

Natural divination, again, is of two kinds: the one native, the other by influx.

The firft is founded on this fuppofition, that the foul, which was thought to be a particle of the divine air or fpirit, taken out from God, and to have exiled from eternity, collected within itfelf, and not diffufed, or divided among the organs of the body, has, from its own nature and effence, fome fore-knowledge of future things. Witnefs what is feen in dreams, extafies, the confines of death, &c.

The fecond is founded on this, that the foul receives, after the manner of a mirror, fome fecondary illumination from the prefence of God, and other fpirits: and hence proceeded oracles.

Divination, *Artificial*, is alfo of two kinds: the one arguing from natural caufes: fuch as the predictions of phyficians about the events of difeafes, from the pulfe, urine, &c. fuch are alfo thofe of the politician, "O venalem urbem, et mox perituram, fi emptorem inveneris!"

The fecond proceeds from experiments and obfervations arbitrarily inftituted, and is moftly fuperftitious.

Infinite are the fyftems of divination reducible to this head; by birds, the entrails of beafts, dreams, lines of the hand, points marked at random, numbers, names, the motion of the fieve, the air, fire, the fortes Præneftinæ, Virgilianæ, and Homericæ; with numerous others, the principal fpecies whereof, and their names, are: Pfychomancy, or fciomancy, which confifts in calling up the fouls or fhades of the deceafed, to learn of them fomething required, Dactyliomancy, performed by means of one or more rings. Hydromancy, performed with fea-water. Pegomancy, with fpring-water. Ornithomancy, or divining by the flight of birds, which was the bufinefs of the augurs. Clidomancy, performed with keys. Cofcinomancy, with a riddle, or fieve-Cledonifm, by words, or voice. Extifpifina, by the entrails of victims. Alphitomancy, or aleuromancy, by flour. Keraunofcopia, by the confideration of thunder. Capnomancy, by fmoke. Alectryomancy, by cocks. Pyromancy, by fire. Lithomancy, by ftones. Lychnomancy, by lamps. Necromancy, by the dead, or their bones, &c. Oneirocritica, by dreams. Oofcopy, by eggs. Lecanomancy, by a bafon of water. Gaftromancy, by the belly, or by phials. Palpitation, faliffatio, παλμός, by the pulfation, or motion of fome member. Axinomancy, by a hatchet, or cleaver. Catoptromancy, or cryftallomancy, by a mirror. Chiromancy, by the lines of the hand. Geomancy, by the earth. Ceromancy, by figures of wax. Arithmomancy, by numbers. Belomancy, by arrows. Sycomancy, &c. all defcribed by Cardan, in his fourth book, De Sapientia; and under their proper articles in this dictionary.

All thefe kinds of divination have been condemned by the fathers, and councils, as fuppofing fome compact with the devil: though fome of them, as well as the heathen philofophers, contend for the fupernatural power and efficacy of pagan divination and forcery. Eufeb. Præp. Ev. lib. v. c. 4. Aug. de Civ. Dei, lib. viii. c. 16. Farmer on Miracles, ubi fupra.

Fludd has feveral treatifes on the different fpecies of divination: and Cicero has two books on the divination of the ancients, in which the feveral kinds of it are explained; and which he refolves into many caufes very different from that of an immediate revelation from fome fpiritual being. He has expofed thefe feveral acts of fuperftition to ridicule; though his brother Quintus had endeavoured to fupport them. To prove the univerfality of the practice of divination, he fays, "Are there any people who do not receive either divination by art, *e. g.* that which is drawn from infpecting the entrails of victims; from the interpretation of prodigies and thunders; from the ufe of aufpices; from the practice of lots and aftrological predictions; or natural divination, which is what they obtain by dreams and by prophecy?"

It feems to have been one article in the creed of the ancient Britons, as well as of all the other nations of antiquity, that

that the gods whom they worshipped had the government of the world, and the direction of future events in their hands; and that they were not unwilling, upon proper application, to discover these events to their pious worshippers. (Æl. Var. Hist. l. ii. c. 31.) "The gods," says Ammianus Marcellinus (l. 21.) "either from the benignity of their own natures, and their love to mankind, or because men have merited this favour from them, take a pleasure in discovering impending events by various indications." This belief gave rise to astrology, augury, magic, lots, and an infinite multitude of religious rites and ceremonies, by which deluded mortals hoped to discover the counsels of heaven, with regard to themselves and their undertakings. (Plin. Hist. Nat. l. xxx. c. 1.) We learn from Pliny, that the ancient Britons were greatly addicted to divination, and excelled so much in the practice of all its arts, that they might have given a lesson to the Persians themselves.

Having given a detail of the principal arts of divination, we shall observe, that besides those which the Britons practised, in common with other nations, they had one of a very horrid nature, which is thus described by Diodorus Siculus (l. v. c. 35.); "They have a great veneration for those who discover future events, either from the flight of birds, or the inspection of the entrails of victims, and all the people yield an implicit faith to their oracles. On great occasions they practise a very strange and incredible manner of divination. They take a man who is to be sacrificed, and kill him with one stroke of a sword, above the diaphragm; and by observing the posture in which he falls, his different convulsions, and the direction in which the blood flows from his body, they form their predictions, according to certain rules which have been left them by their ancestors."

In Holy Scripture, we find mention made of nine different kinds of divination: the first performed by the inspection of plants, stars, and clouds: they are supposed to be the practisers of this, whom Moses calls מעונן *meonen*, of אנן *anan, cloud*, Deuter. chap. xviii. ver. 10. 2. Those, whom the prophet calls, in the same place, מנחש *menochesch;* which the Vulgate, and generality of interpreters, render, *augur*. 3. Those who, in the same place, are called מכשף *mecassheph;* which the Septuagint and Vulgate translate, *a man given to ill practices*. 4. Such authors, whom Moses in the same chapter, ver. 11. calls חובר *hhober*. 5. Those, who consult the spirits called *Python;* or, as Moses expresses it in the same book, אוב ואשל, *those who ask questions of Python*. 6. Witches, or magicians, whom Moses calls ידעני *jedeoni*. 7. Those who consult the dead, *necromancers*. 8. The prophet Hosea, chap. iv. ver. 12. mentions such as consult staves, שאל מקלו; which kind of divination may be called *rhabdomancy*. 9. The last kind of divination mentioned in Scripture is *hepatoscopy*, or the consideration of the liver. See RHABDOMANCY, MAGICIANS, &c.

DIVINE, something that comes from or relates to God. The word is also used figuratively, for any thing that is excellent, extraordinary, and that seems to go beyond the power of nature, and the capacity of mankind.

In which sense, the compass, telescope, clocks, &c. are said to be divine inventions: Plato is called the divine author, the divine Plato; and the same appellation is given to Seneca: Hippocrates is called the divine old man, *divinus senex* &c. The Arabs give the appellation divine, אלהיון *elahioun*, to their second sect of philosophers, consisting of such as admit a first mover of all things, a spiritual substance, free from all kind of matter; in a word, a God. By this name they distinguish them from their first sect, whom they call deherioun, or thabaioun, *i. e.* worldings, and naturalists, as admitting of no principles beyond the material world, and nature.

The word אלהיון *elahioun* is derived from אלא *Alla*, God: so that the elhaioun are the divines, or theologues, as Castellus renders it; or, such as own a God.

DIVINE *Law*. See LAW.

DIVINE *Service, Tenure by*. See TENURE.

DIVINERS, in *Mythology*, those who practised divination. See AUSPICES and AUGURS.

DIVING, the art, or act of descending under water, to considerable depths, and abiding there a competent time.

In remote ages divers were kept in ships to assist in raising anchors and goods thrown overboard in times of danger; and by the laws of the Rhodians, they were allowed a share of the wreck, proportioned to the depth to which they had descended in search of it. In war, they were often employed to destroy the works and ships of the enemy. When Alexander was besieging Tyre, divers swam off from the city, under water, to a great distance, and with long hooks tore to pieces the mole, with which the besiegers were endeavouring to block up the harbour. (Curtius, iv. 3. Arrian de Exped. Alex. l. ii.) Thucydides (l. ii.) informs us, that the Syracusans performed the same exploit.

The uses of diving are very considerable, particularly in the fishing for pearls, corals, sponges, &c. See CORAL and PEARL-*fishing*.

There have been divers methods proposed, and engines contrived, to render the business of diving more safe and easy. The great point in all these is to furnish the diver with fresh air, without which he must either make but a short stay, or perish.

Those who dive for sponges in the Mediterranean, help themselves by carrying down sponges dipt in oil in their mouths. But considering the small quantity of air that can be contained in the pores of a sponge, and how much that little will be contracted by the pressure of the incumbent air, such a supply cannot long subsist the diver. For it is found by experiment, that a gallon of air included in a bladder, and by a pipe reciprocally inspired and expired by the lungs, becomes unfit for respiration in little more than one minute of time. For though its elasticity be but little altered passing the lungs, yet it loses its vivifying spirit, and is rendered effete.

In effect, a naked diver, Dr. Halley assures us, without a sponge, cannot remain above two minutes enclosed in water; nor much longer with one, without suffocating; nor without long practice, near so long: ordinarily persons beginning to be suffocated in about half a minute. Besides, if the depth be considerable, the pressure of the water in the vessels makes the eyes blood-shotten, and frequently occasions a spitting of blood.

Hence, where there has been occasion to continue long at the bottom, some have contrived double flexible pipes, to circulate air down into a cavity enclosing the diver, as with armour, both to furnish air, and to bear off the pressure of the water, and give leave to his breast to dilate upon inspiration; the fresh air being forced down one of the pipes with bellows, and returning by the other of them, not unlike to an artery and vein.

But this method is impracticable when the depth surpasses three fathoms; the water embracing the bare limbs so closely, as to obstruct a circulation of the blood in them; and withal pressing so strongly on all the junctures where the armour is made tight with leather; that if there be the least defect in any of them, the water rushes in, and instantly fills the whole engine, to the great danger of the diver's life.

DIVING-*bell*, is a machine contrived to remedy all these incon-

inconveniences. The invention of the diving-bell, or *Campana urinatoria*, is generally assigned to the 16th century. The first information we have respecting the use of the diving bell in Europe is that of Taisnier, quoted by Schottus in his "Technica Curiosa," (l. vi. c. 9.) He relates, that at Toledo, in Spain, in the year 1538, he saw, in the presence of the emperor Charles V. and about 10,000 spectators, two Greeks let themselves down under water, in a large inverted kettle, with a burning light, and rise up again, without being wet. It appears that this art was then new to the emperor and the Spaniards, and that the Greeks were careful to make the experiment in order to prove the possibility of it. After this period the use of the diving-bell seems to have become still better known. It is described more than once in the works of lord Bacon, who explains its effects, and remarks that it was invented to facilitate labour under water.

In the latter part of the 16th century the diving-bell was sometimes employed in great undertakings. When the English, in the year 1588, dispersed the invincible armada of Spain, some of the ships were wrecked near the isle of Mull, on the western coast of Scotland, and they were said to contain great riches. This report occasioned several attempts to procure part of the lost treasure. In the year 1665, a person was so fortunate as to bring up from the bottom some cannon, which, however, were not sufficient to defray the expences. Some years after attempts of the like kind were renewed. In the year 1683, William Phipps, a native of America, having formed a project for searching a rich Spanish ship sunk on the coast of Hispaniola, and having obtained from Charles II. a ship furnished for the undertaking, set sail; but being unsuccessful returned in great poverty, though with a firm conviction of the practicability of his scheme. Applying without effect to James II. he raised a subscription from private persons, and the duke of Albemarle, son of general Monk, advanced a considerable sum to enable him to make the necessary preparations for a new voyage. In 1687 he determined to try his fortune once more in a ship of 200 tons burden, having previously engaged to divide the profit according to the 20 shares of which the subscription consisted. After many unavailing attempts, he at length succeeded in bringing up, from the depth of six or seven fathoms, treasure amounting to 200,000*l.* sterling, with which he returned to England. Of this sum he himself got about 16, others say 20,000*l.*, and the duke of Albemarle 90,000*l.* Phipps received from his majesty the honour of knighthood, was afterwards high sheriff of New England, and died at London, greatly respected, in 1693. In consequence of this successful adventure, the duke of Albemarle obtained the governorship of Jamaica, in order to try his fortune with other ships sunk in that neighbourhood; but nothing further was found worth the labour of searching for it. In England, however, several companies were formed, and obtained exclusive privileges of fishing up goods on certain coasts, by means of divers. The most considerable of these was that which, in 1688, tried its success at the isle of Mull, at the head of which was the earl of Argyle. The divers went down to the depth of 60 feet under water, remained there sometimes a whole hour, and brought up gold chains, money, and other articles; which, however, when collected, were of little importance. (Martin's description of the Western Islands, 8vo. 1716, Campbell's Political Survey of Britain, 4to. 1774.) The following circumstance proves that this machine was little known in the first half of the 16th century. Among the figures that occur, without explanation, in the oldest edition of Vegetius on the art of war, there is represented a method of catching fish with the hands, at the bottom of the sea. The apparatus for this purpose consists of a cap, fitted so closely to the head of the diver, that no water can make its way into the cavity of it, and from the cap arises a long leather pipe, the opening of which floats on the surface of the water. If the person who drew this figure had been acquainted with the diving-bell, he would certainly have delineated it rather than this useless apparatus. Of the old figures of a diving machine, that which approaches nearest to the diving-bell is in a book on Fortification by Lorini (Ven. 1609. fol.); who describes a square box bound round with iron, which is furnished with windows, and has a stool affixed to it for the diver: but the Italian does not appear to be the inventor of it. In 1617, Francis Kessler gave a description of his water-armour, intended also for diving, but which cannot be used for that purpose. In 1671, Witsen taught, in a better manner than any of his predecessors, the construction and use of the diving bell; though he is much mistaken in saying that it was invented at Amsterdam. In 1679, appeared, for the first time, Borelli's well-known work, "De Motu Animalium," in which he not only described the diving-bell, but also proposed another, the impracticability of which was evinced by James Bernouilli, (Acta Erudit. 1683, Decemb. and Bernouilli Oper.) But further and more important improvements have been since made in this machine by Halley, Triewald, &c.; of which we shall give some account in the sequel of this article. In this machine the diver is safely conveyed to any reasonable depth, and may stay more or less time under the water, as the bell is greater or less.

It is most conveniently made in form of a truncated cone, the smallest base being closed, and the larger open. It is to be poised with lead, and so suspended, that it may sink full of air, with its open basis downward, and as near as may be in a situation parallel to the horizon, so as to close with the surface of the water all at once.

Under this coverele the diver sitting, sinks down with the included air to the depth desired; and if the cavity of the vessel can contain a ton of water, a single man may remain a full hour, without much inconvenience, at the depth of five or six fathoms.

But the lower you go, still the more the included air contracts itself, according to the weight of the water that compresses it; so that at the depth of thirty-three feet the bell becomes half full of water: the pressure of the incumbent water being then equal to that of the atmosphere; and at all other depths, the space occupied by the compressed air in the upper part of the bell, will be to the under part of its capacity filled with water, as thirty-three feet to the depth of the surface of the water in the bell below the common surface thereof. And this condensed air, being taken in with the breath, soon insinuates itself into all the cavities of the body, and has no ill effect, provided the bell be permitted to descend so slowly as to allow time for that purpose.

One inconvenience that attends it is found in the ears, within which there are cavities which open only outwards, and that by pores so small, as not to give admission even to the air itself, unless they be dilated and distended by a considerable force. Hence, on the first descent of the bell, a pressure begins to be felt on each ear, which, by degrees, grows painful, till the force overwhelming the obstacle, what constringes these pores, yields to the pressure, and letting some condensed air slip in, presently ease ensues. The bell descending lower, the pain is renewed, and afterwards it is again eased in the same manner.

But the greatest inconvenience of this engine is, that the water entering it, contracts the bulk of air into so small a compass,

compass, that it soon heats, and becomes unfit for respiration: so that there is a necessity for its being drawn up to recruit it; besides the uncomfortable abiding of the diver, who is almost covered with water.

To obviate the difficulties of the diving-bell, Dr. Halley, to whom we owe the preceding account, contrived some farther apparatus, whereby not only to recruit and refresh the air from time to time, but also to keep the water wholly out of it at any depth; which he effected after the following manner.

His diving-bell, (see *Plate.* II. *Hydraulics, fig.* 18.) was of wood, three feet wide at top, five feet at bottom, and eight feet high, containing about sixty-three cubic feet in its concavity, coated externally with lead, so heavy that it would sink empty, a particular weight being distributed about its bottom R, to make it descend perpendicularly, and no otherwise. In the top was fixed a meniscus glass D, concave downwards, like a window, to let in light from above; with a cock, as at B, to let out the hot air; and a circular seat, as at L M, for the divers to sit on: and, below, about a yard under the bell, was a stage suspended from it by three ropes, each charged with a hundred weight, to keep it steady, and for the divers to stand upon to do their business. The machine was suspended from the mast of a ship by a sprit, which was secured by stays to the mast-head, and was directed by braces to carry it overboard clear of the side of the ship, and to bring it in again.

To supply air to this bell when under water, he had a couple of barrels, as C, holding thirty-six gallons each, cased with lead, so as to sink empty, each having a bung-hole at bottom, to let in the water as they descended, and let it out again as they were drawn up again. In the top of the barrels was another hole, to which was fixed a leathern pipe, or hose, well prepared with bees-wax and oil, long enough to hang below the bung-hole; being kept down by a weight appended; so that the air, driven to the upper part of the barrel by the incroachment of the water, in the descent, could not escape up this pipe, unless the lower end were lifted up.

These air-barrels were fitted with tackle, to make them rise and fall alternately, like two buckets; being directed in their descent by lines fastened to the under edge of the bell; so that they came readily to the hand of a man placed on the stage to receive them: and who taking up the ends of the pipe as soon as they came above the surface of the water in the barrels, all the air included in the upper part thereof was blown forcibly into the bell; the water taking its place.

One barrel thus received and emptied; upon a signal given, it was drawn up, and at the same time the other let down; by which alternate succession fresh air was furnished so plentifully, that the learned doctor himself was one of five, who were all together in nine or ten fathoms depth of water for above an hour and a half, without the least inconvenience; the whole cavity of the bell being perfectly dry.

All the precaution he observed was, to be let down gradually about twelve feet at a time, and then to stop, and drive out the water that had entered, by taking in three or four barrels of fresh air, before he descended farther. And, being arrived at the depth intended, he let out as much of the hot air that had been breathed, as each barrel would replace with cold, by means of the cock B, at the top of the bell, through whose aperture, though very small, the air will rush with so much violence, as to make the surface of the sea boil.

Thus, he found any thing could be done that was required to be done underneath. And by taking off the stage, he could, for a space as wide as the circuit of the bell, lay the bottom of the sea so far dry as not to be overshoes therein. Besides, that by the glass-window so much light was transmitted, that, when the sea was clear, and especially when the sun shone, he could see perfectly well to write or read, much more to fasten, or lay hold of any thing under him that was to be taken up. And by the return of the air-barrel he often sent up orders written with an iron pen on a plate of lead, directing how he would be moved from place to place.

At other times, when the water was troubled and thick, it would be as dark as night below; but in such cases he was able to keep a candle burning in the bell.

Dr. Halley observes, that they were subject to one inconvenience in this bell; they felt at first a small pain in their ears, as if the end of a tobacco-pipe were thrust into them; but after a little while there was a small puff of air, with a little noise, and they were easy. This he supposes to be occasioned by the condensed air shutting up a valve leading from some cavity in the ear, full of common air; but when the condensed air pressed harder, it forced the valve to yield, and filled every cavity. One of the divers, in order to prevent this pressure, stopped his ear with a pledgit of paper; which was pushed in so far, that a surgeon could not extract it without great difficulty.

The same author intimates, that by an additional contrivance he has found it practicable for a diver to go out of the bell to a good distance from it; the air being conveyed to him in a continued stream by small flexible pipes, which serve him as a clue to direct him back again to the bell. For this purpose, one end of one of these pipes, kept open against the pressure of the sea, by a small spiral wire, and made tight without, by painted leather and sheep's guts drawn over it, being open, was fastened in the bell, as at P, to receive air, and the other end was fixed to a leaden cap on the man's head, reaching down below his shoulders, open at bottom, to serve him as a little bell, full of air, for him to breathe at his work, which would keep out the water from him when at the level of the great bell, because of the same density as the air in the great bell. But when he stooped down lower than the level of the great bell, he shut the cock F. to cut off the communication between the two bells. Phil. Transf. Abr. vol. iv. part ii. p. 188, &c. vol. vi. p. 550, &c.

The air in this bell would serve him for a minute or two; and he might instantly change it, by raising himself above the great bell, and opening the cock F. The diver was furnished with a girdle of large leaden weights, and clogs of lead for the feet, which, with the weight of the leaden cap, kept him firm on the ground; he was also well clothed with thick flannels, which being first made wet, and then warmed in the bell by the heat of his body, kept off the chill of the cold water for a considerable time, when he was out of the bell.

Mr. Martin Triewald, F.R.S. and military architect to his Swedish majesty, contrived to construct a diving-bell on a smaller scale, and less expence, than that of Dr. Halley, and yet capable of answering the same intents and purposes. This bell, A B (*fig.* 19.) sinks with leaden weights D, D, suspended from the bottom of it. It is made of copper, and tinned all over on the inside; three strong convex lenses G, G, G, only two of which, G, G, are seen, defended by the copper-lids H, H, H, illuminate this bell. The iron plate E serves the diver to stand upon, when he is at work; this is suspended by chains F, F, F, two of which only are visible, at such a distance from the bottom of the bell, that when he

he ſtands upright, his head is juſt above the water in the bell, where he has the advantage of air fitter for reſpiration, than when he is much higher up; but as there is occaſion for the diver to be wholly in the bell, and conſequently his head in the upper part of it, Mr. Triewald has contrived, that, even there, after he has breathed the hot air as long as he well can, by means of a ſpiral copper tube *b c*, placed cloſe to the inſide of the bell, he may draw the cooler and freſher air from the lowermoſt parts; for which purpoſe a flexible leather-pipe, about two feet long, is fixed to the upper end of the tube at *b*; and to the other end of the pipe is faſtened an ivory mouth-piece, for the diver to hold in his mouth, by which to reſpire the air from below. We ſhall only remark, that as air rendered eſſete by reſpiration, is ſomewhat heavier than common air, it muſt naturally ſubſide in the bell; but it may probably be reſtored by the agitation of the ſea-water, and thus become fitter for reſpiration. Phil. Tranſ. Abr. vol. vii. p. 634 or Deſaugliers' Exper. Phil. vol. ii. p. 220, &c.

A great improvement in the diving-bell was made by the late Mr. Spalding of Edinburgh. This conſtruction ſeems deſigned to remedy ſome inconveniences of Dr. Halley's, which are very evident and of a very dangerous tendency; theſe are, 1ſt, by Dr. Halley's conſtruction, the ſinking or riſing of the bell depends on the people who are at the ſurface of the water. As the bell, when in the water, has a very conſiderable weight; the raiſing of it not only requires a great deal of labour, but there is a poſſibility of the rope breaking, by which it is raiſed, and thus every perſon in the bell would inevitably periſh. 2d. There are, in many parts of the ſea, rocks which lie at a conſiderable depth, the figure of which cannot poſſibly be perceived from above. There is danger that ſome of their ragged prominences may catch hold of the edge of the bell in its deſcent, and thus overſet it, before any ſignal can be given to thoſe above, which would infallibly be attended with the deſtruction of the people in the bell: and as it muſt always be unknown, before trial, what kind of a bottom the ſea has in any place, it is plain, that without ſome contrivance to obviate this laſt danger, the deſcent, in Dr. Halley's diving-bell, is not at all eligible. How theſe inconveniences are remedied by Mr. Spalding's new contrivance will be eaſily underſtood from the following deſcriptions. A B C D, (*fig.* 20.) repreſents a ſection of the bell, which is made of wood; *c, c*, are iron hooks, by means of which it is ſuſpended by ropes Q B E *e*, and Q A F *e*, joining at Q, as expreſſed in the figure: *c, c*, are iron hooks, to which are appended leaden weights, that keep the mouth of the bell always parallel to the ſurface of the water, whether the machine, taken altogether, is lighter or heavier than an equal bulk of water. By theſe weights alone, however, the bell would not ſink; another is therefore added, repreſented at L, and which can be raiſed or lowered at pleaſure, by means of a rope paſſing over a pulley *a*, and faſtened to the ſides of the bell. As the bell deſcends, this weight, called by Mr. Spalding the balance weight, hangs down a conſiderable way below the mouth of the bell. In caſe the edge of the bell is caught by any obſtacle, the balance weight is immediately lowered down, ſo that it may reſt upon the bottom; by this means the bell is lightened, ſo that all danger of over-ſetting it is removed. From being lighter without the balance-weight than an equal bulk of water, it is evident, that the bell will riſe as far as the length of the rope affixed. By another ingenious contrivance, Mr. Spalding rendered it poſſible for the divers to raiſe the bell, with all the weights appended to it, even to the ſurface, or to ſtop at any particular depth, as they think proper; and thus they would ſtill be ſafe, even though the rope deſigned for pulling up the bell was broken. For this purpoſe, the bell is divided into two cavities, both of which are made as tight as poſſible. Juſt above the ſecond bottom E F, are ſmall ſlits on the ſides of the bell, through which the water, entering as the bell deſcends, diſplaces the air originally contained in its cavity, which ſlies out at the proper orifice of the cock H. When this is done, the divers turn the handle, which ſtops the cock, ſo that if any more air gets into the cavity A E F B, it could no longer be diſcharged through the orifice H, as before. When this cavity is full of water, the bell ſinks; but when a conſiderable quantity of air is admitted, it riſes. If, therefore, the divers have a mind to raiſe themſelves, they turn the ſmall cock I, by which a communication is made between the upper and under cavities of the bell; the conſequence of this is, that a quantity of air immediately enters the upper cavity, forces out a quantity of water contained in it, and thus renders the bell lighter by the whole weight of the water, which is thus diſplaced. If a certain quantity of air is admitted into the upper cavity, the bell will deſcend very ſlowly; if a greater quantity, it will neither aſcend or deſcend, but remain ſtationary: and if a larger quantity of air be ſtill admitted, it will riſe to the top. It is to be obſerved, however, that the air that is juſt let into the upper cavity muſt be immediately replaced from the air barrel, and the air is to be let out very ſlowly, or the bell will riſe to the top with ſo great a velocity, that the divers will be in danger of being ſhaken out of their ſeats: but by following theſe directions, every poſſible accident may be prevented, and the people may deſcend to very great depths without the leaſt apprehenſion of danger. The bell alſo becomes ſo eaſily manageable in the water, that it may be conducted from one place to another, by a ſmall boat, with the greateſt eaſe, and with perfect ſafety to thoſe who are in it.

Inſtead of wooden ſeats uſed by Dr. Halley, Mr. Spalding made uſe of ropes ſuſpended by hooks *b, b, b*, and on theſe ropes the divers may ſit without any inconvenience. There are two windows made of thick ſtrong glaſs, for admitting light to the divers. N repreſents an air caſk with its tackle, and C P the flexible pipe through which the air is admitted to the bell. In the aſcent and deſcent of this caſk, the pipe is kept down by a ſmall appended weight, as in Dr. Halley's machine: R is a ſmall cock, by which the hot air is diſcharged as often as it becomes troubleſome. Mr. Spalding is of opinion, that one air barrel, capable of containing thirty gallons, is ſufficient for an ordinary machine.

Several other machines have been contrived, to anſwer the purpoſe of the diving bell, one of which, *fig.* 21, was invented in 1753, by —— Rowe, eſq of which an account was publiſhed in the Univerſal Magazine.

The engine is a trunk, or hollow veſſel of copper or braſs of ſufficient ſtrength to reſiſt the preſſures of deep waters, and dimenſions to contain the body of a man, ſuppoſed to enter therein, feet foremoſt, at A A, bent at the bearing of his knees at B, for the more convenient going between rocks and great ſtones. At *a*, and on the other ſides, are holes for his arms to paſs through, and a glaſs for his ſight at *b*: *d* repreſents a ſleeve made of ſoft leather, lined with fine cloth, exactly to fit the diver's arm, and faſtened to the body of the engine at *a*, where the arms come through, which is likewiſe defended by a ſoft quilting, to prevent the arms from being hurt by preſſure, and the ſleeves from being thruſt into the engine; A A repreſents a cover to fit the head of the engine, faſtened down with ſcrews,

and leather between the borders, so as to prevent leaking in any depth of water; D represents a plate of lead, to be fastened before the engine in a straight line, passing between the arms, not only as a proper weight to sink the engine, but as a balance thereto: whereby the diver will always be kept in a proper posture for working, and more so by means of a block or cradle, supposed to be fastened over the lead, by which means the diver has not only the power of handling what is at the bottom, but may at any time rest his arms from work; *g* is the engine rope by which it is let down and hauled up again from the bottom, *h* is called the life-line, with a knot at *i*, so that the handle at *f* may always remain at a due distance for the diver to take hold thereof, in order to give any notice to the persons above, as, by agreement, by giving a certain number of pulls or sudden twitches, which are immediately felt by the person that holds the line. The diver can tarry under water at least half an hour at one time, without the help of pipes or any other air than what the engine contains. At E and F are two brass screws, the caps of which are to be opened as soon as the diver gets from the bottom to the water's surface, in order to give him fresh air by help of a pair of bellows, blowing at the latter, at which, when the engine leaks, the water is pumped out. In deep water, the diver is forced to make use of a saddle on his back, with a ridge touching the upper part of the engine, whereby he can keep his arms at a due distance out of the engine, which otherwise would be thrust in, by the column of water pressing thereon, equal to the weight thereof.

H H is a rope, to which the diver fastens any thing which is to be drawn up.

It is well known, that the pressure of water increases with its depth; and as water is a dense body, a man cannot descend far in it without experiencing a very strong pressure, so that if a diver, whose head is five feet below the surface, attempts to breathe through a pipe, he finds himself incapable of inhaling the air, on account of the pressure he sustains on his breast. A man, therefore, to descend to a great depth, must have his body and breast free from the external pressure of the fluid. In order to secure him from this inconvenience, C. H. Klingert of Breslau invented a sort of harness made of strong tin plate, in the form of a cylinder, which goes over the diver's head, and which consists of two parts, that he may conveniently thrust his arms through it and put it on: also, a jacket with short sleeves, and drawers of strong leather. All these being water tight, and closely jointed round the body of the diver, secure every part of him, but his arms and legs, from the pressure of the water, which, at the depth of 20 feet, will occasion no inconvenience to these parts.

Fig. 22, represents the diver covered with the harness, and drawers.

Figs. 23 and 25, is the cylinder, the diameter of which is equal to the breadth of a man at the top of the hipbone. It is 15 inches in height, has a globular top, and is made of the strongest tin plate.

In the inside of the cylinder, at *a*, is a strong broad iron hoop, to enable it to withstand better the pressure of the water; and in the inside of the top there are two pieces of a strong hoop of the same kind, placed over each other in the form of a cross at *b*; a strong ring of brass wire is soldered upon the outside at *c*, that the jacket may be fastened to it with an elastic bandage, to prevent it from slipping downwards; at *d d* are the upper halves of the apertures for the arms; and *e*, *e*, are holes to afford light, and into which the eye-glasses are screwed: *f* is the opening into which the mouth-piece of the breathing-pipe is screwed, and *g* is an aperture for looking through, as well as for the purpose of breathing when out of the water, and which, by means of the cover *h* suspended from it, can be screwed up before the diver enters the water.

The lower part of the cylinder, which is also 15 inches in height, is at *i*, and *k* strengthened by iron hoops on the inside, in the same manner as the former. To the lower hoop *k* are soldered four small rings, to which are fastened strong leather straps, three inches in breadth, that can be buckled across over the shoulder, and support the whole machine; *l*, *l*, are the under halves of the apertures for the arms; *m* is also a ring of brass wire soldered to the cylinder, which serves to keep fast the jacket when buckled on, and to support the upper cylinder *d d l*, which slips over the under one, and on that account the under one is a little smaller, so as to fit into the upper one: there is also another such ring at *n*, in order to prevent the drawers from falling down.

At *o* (*fig.* 26.) is a strong semicircular piece of iron, the use of which is to prevent the drawers, when pressed by the water, from touching the under part of the body, otherwise the pressure, even at the depth of six feet, would be insupportable. As it is not possible to sew the leather so closely as to prevent water from forcing its way through the seams, a small pump is suspended at *p* for the purpose of pumping out the water, when it has risen to the height of a few inches in the lower cylinder. Four hooks, *q*, *q*, *q*, *q*, soldered to the lower part of the cylinder, are for the purpose of suspending weight from them.

The jacket *r*, (*fig.* 22.) with short sleeves that cover the upper part of the arms, serves to prevent the water from penetrating through the joining of the cylinders where the one is inserted into the other, as also through the holes for the arms, as it is bound fast round both parts of the cylinder, and likewise round the arms. The case is the same with the drawers which are bound close round the knees.

Fig. 24. represents a brass elastic bandage, employed for fastening on the jacket; and which, when hooked together, is screwed fast by means of the screw *s*, three inches in length; a brass bandage is here used, because leather is apt to stretch, and on that account might be dangerous.

Fig. 27. is the mouth-piece to which the pipes *x*. *y*, are fastened, and which is screwed on at *f* (*fig.* 26.); *t* is the screw; *u* the part which goes into the machine, and which is taken into the mouth; *v* the exterior part of it, in which there is a partition *w*, in order to separate the pipes; and *x* is an aperture that the air in the machine may communicate with the pipe *y*.

The internal diameter of these tubes is three-fourths of an inch Rhinlandish. They consist of strong brass wire, $1\frac{1}{2}$ line in thickness, wound into a spiral form, and covered with strong leather. In order to save expence, six yards of the pipe from the mouth-piece may be made in this manner, and the rest of tubes of tin plate, three or four yards in length, joined together with pieces of leather pipe about a foot in length, prepared in the first manner.

The reservoir *a* (*fig.* 22.) applied in such a manner that it can be screwed off, is for the purpose of collecting the small quantity of water that might force itself into the breathing pipe when long used, and which otherwise would be in continual motion, and render breathing disagreeable.

To prevent the leather from becoming hard, and to close up its pores, so that it may be rendered water-tight, the following mixture was rubbed over it, *viz.* six parts of wax, two of Venetian turpentine, two of pitch, and two of melted

ed hog's lard. It is alſo to be obſerved, that the beſt and ſtrongeſt leather muſt be uſed for the tubes, and ſtrips of leather muſt be ſewed very cloſely on the ſeams of the jacket and drawers.

If the machine be intended for diving to a great depth, it muſt be conſtructed in as ſtrong a manner as poſſible, and the drawers muſt be furniſhed with iron ribs in the inſide, faſtened by means of hoops to the machine, as may be ſeen in *figs.* 23, and 25, over which a net of ſmall chain, or ſtrong cords, muſt be hooked or tied to the hoops *k*, *k*, and alſo to the hoops 2, 2, 2, 2, by means of the holes made in them for that purpoſe; but theſe chains or cords in particular which go behind, muſt not be drawn too tight, that the diver may be able to bend his body.

The ribs, 1, 1, (*figs.* 23 and 25.) are ſcrewed on the inſide to the ſtrong iron hoops *k*, *k*, but in ſuch a manner as to be moveable; and as the centres reſt on the hips, the diver can move his legs backwards or forwards. To theſe ribs the two hoops, 2, 2, are made faſt by rivetting, and the two interior ribs 4, 4, are faſtened in the like manner. To the latter muſt be ſoldered, a circular piece, 6, 6, of the like radius as the part *o*, which moves, as the diver walks backwards and forwards on *o*, by means of a groove, at the ſame time that the outer ribs move; and on an account of theſe ribs, hoops, &c. the preſſure of the water upwards will preſent the leſs impediment to the diver, as it can act only according to the diameter of the ſmalleſt hoop 2.3 and 2 3.

The author gives the following inſtruction for uſing a machine of this kind. When the diver, after being made acquainted with all the parts of the machine, has put it on, and ſuſpended from it the proper weights, let him enter the water at any convenient place, and advance till it reaches to his eyes, while the end of the pipe is held by a perſon on the bank. If the diver can then breathe with eaſe, and if no water forces itſelf into the pipe, which muſt be left to float on the water, he may proceed till it covers his head, having firſt taken the precaution to tie a ſtrong rope to one of his arms; after this he may ſtop for ſome time, and then gradually go deeper and deeper, making ſignals that he finds himſelf at eaſe, by pulling the rope, or by ſpeaking through the pipe. If a man exerciſes himſelf in this manner for ſeveral days ſucceſſively, ſtill increaſing his depth, he will ſoon be able to dive boldly, and to move under water with eaſe and freedom: when he wiſhes to aſcend, he need only unhook the weights, which will drop to the bottom, and being then lighter than an equal volume of water, he will riſe to the ſurface.

To preſerve the weight from being loſt, a particular rope muſt be employed, which may be let down to the diver, upon his making a certain ſignal, and which he may faſten to the weight before he unhooks it.

By following theſe directions, a reſolute man may be taught, in the courſe of a few days, to dive to a moderate depth, though, on account of various preparations and unforeſeen difficulties, the author employed five whole weeks in teaching one who was unacquainted with ſwimming. This man, named Frederick William Joachim, a huntſman by profeſſion, dived in the above apparatus into the Oder, near Breſlau, where the water is of conſiderable depth, and the current ſtrong, on the 24th of June, 1797, before a great number of ſpectators, and ſawed through the trunk of a tree which was lying at the bottom.

He ſhewed alſo that he could have faſtened ſunk bodies to a rope, in order to be drawn up: and that, in caſe any impediments ſhould prevent the uſe of the ſaw, ſuch trunks might be hewn to pieces by an axe. It clearly appears, therefore, that two men, furniſhed with ſuch apparatus, would ſaw to pieces large beams of wood lying at the bottom of rivers, which are often a great obſtruction, and, on account of their ſize, cannot be otherwiſe removed.

One part of the conſtruction was attended with an inconvenience which it may be proper to mention: it has been already remarked, that a man, at the depth of five feet under water, cannot breathe without the machine, and, though one, ſuch as above deſcribed, will defend the preſſure of water from his breaſt and body, yet though it be furniſhed with a pipe to breathe through, it will appear from what follows, that this will be impoſſible. The air which ſurrounds the diver in this machine amounts to ſomewhat more than a cubic foot. Now, if he inhales air through the pipe ſcrewed to the machine, his body muſt diſtend a ſpace equal to the volume of air inhaled, conſequently he compreſſes ſo much of the air that ſurrounds him in the machine; but as this is impoſſible on account of its too great reſiſtance, he does not obtain air ſufficient to ſupport life, and is almoſt in the ſame ſtate as if ſurrounded by water.

To be convinced of the truth of this, let any one take a caſk, equal in content to one or two cubic feet, preſs his mouth againſt the aperture of it, and try whether he can, without difficulty, breathe back into it the air he has inhaled. A larger ſpace around the diver in the machine would make breathing eaſier, but would not afford him ſufficient eaſe to labour. The interior air in the machine, therefore, muſt be connected with the pipe deſtined for breathing, in order that it may be at freedom to dilate as his body is extended, and it is only by a conſtruction of this kind, as ſhewn at *z* in deſcribing *fig.* 24, that a man can breathe while encloſed in ſo ſmall a ſpace. The author, at firſt, had furniſhed his mouth-piece with a valve, that the air might be again exhaled through it, but this valve was ſo ill conſtructed, that it conveyed the exhaled air into the pipe deſtined for breathing. As he found that this was attended with inconvenience, on account of the moiſture which adhered to it, he afterwards omitted the valve entirely.

The diver, therefore, muſt ſuffer the air inhaled through the mouth-piece *u* to eſcape through his noſtrils into the machine; and then the air in it will remain equally elaſtic. The next time he draws breath, the air in the machine will be forced out from it at *z* by the diſtenſion of his body. By theſe means he will be able to breathe freely and eaſily for a long time, and thus the chief difficulty is overcome. This account was firſt publiſhed at Breſlau by Mr. Klingert, and was tranſlated and publiſhed in the Philoſophical Magazine, vol. iii. p. 59.

The famous Corn. Drebell had an expedient in ſome reſpects ſuperior even to the diving-bell, if what is related of it be true. He contrived not only a veſſel to be rowed under water, but alſo a liquor to be carried in the veſſel, which ſupplied the place of freſh air.

The veſſel was made for king James I. carrying twelve rowers, beſides the paſſengers. It was tried in the river Thames; and one of the paſſengers in that ſubmarine navigation, then living, told it one, from whom Mr. Boyle had the relation.

As to the liquor, Mr. Boyle aſſures us, he diſcovered by a phyſician, who married Drebell's daughter, that it was uſed from time to time, when the air in that ſubmarine boat was clogged by the breath of the company, and rendered unfit for reſpiration; at which time, by unſtopping the veſſel full of this liquor, he could ſpeedily reſtore to the troubled air ſuch a proportion of vital parts, as would make it ſerve again a good while. The ſecret of this liquor Drebell would never diſcloſe to above one perſon, who himſelf

assured Mr. Boyle what it was. Boyle's Exp. Phys. Mech. of the Spring of the Air.

Mr. Martin, in his "Philosophia Britannica," mentions a complete apparatus contrived by an Englishman, consisting of strong thick leather, which contained half an hogshead of air, so prepared that no air could escape through it, and constructed in such a manner that it exactly fitted the arms and legs, and had glass placed in the fore part of it. When he put on this apparatus, he could not only walk on the ground at the bottom of the sea, but also enter the cabin of a sunk ship, and convey goods out of it at pleasure. The inventor is said to have carried on this business for more than 40 years, and to have acquired by it considerable property.

We have had many projects of diving machines, and diving ships, of various kinds, which have proved abortive.

DIVING-*Bladder*, a term used by Borelli for a machine, which he contrived for diving under the water to great depths, with great facility, and preferred to the common diving-bell. The vesica, or bladder, as it is usually called, is to be of brass or of copper, and about two feet in diameter. This is to contain the diver's head, and is to be fixed to a goat's-skin habit, exactly fitting to the shape of the body of the person. Within this vesica there are pipes, by means of which a circulation of air is contrived; and the person carries an air-pump by his side, by means of which he may make himself heavier or lighter, as the fishes do, by contracting or dilating their air-bladder: by this means, the objections all other diving-machines are liable to are obviated, and particularly that of the air; the moisture by which it is clogged in respiration, and by which it is rendered unfit for the same use again, being here taken from it by its circulation through the pipes, to the sides of which it adheres, and leaves the air as free as before. Borelli Opera Posthuma.

DIVINI, EUSTACHIO, in *Biography*, an Italian optician, who lived at Rome about the middle of the seventeenth century, was distinguished for his great skill in grinding and fitting up telescopic glasses. At one period, the telescopes of Divini were sought after by astronomers in every part of Europe. Huygens, however, soon surpassed him in that art, and by a glass of his construction, discovered the ring of Saturn. This led to a controversy between the two philosophers, which was carried on during the years 1660 and 1661. After this, little more is known of Divini. In 1663, he announced the invention of a new combination of glasses, to which he ascribed very important advantages, but it is not at all known in what they consisted. Moreri.

DIVINING-ROD. See VIRGULA *Divinatoria*.

DIVINITY, the quality, nature, and essence of God.

It is false that the atheists hold the nature of a divinity to be a political invention of the ancient legislators, to secure and enforce the observation of their laws: on the contrary, it is certain, the legislators made use of that opinion, which they found already impressed on the minds of the people.

The first divinities among the heathens seem to have been the heavenly bodies, and especially the sun; which many of their learned men and philosophers supposed to be animated and endowed with intelligence, or inhabited by intelligent beings. To this purpose, Diodorus Siculus says (l. 2.); "Men, in earlier times, struck with the beauty of the universe, with the splendour and regularity which are every where conspicuous, concluded, without doubt, that some divinity presided in them; and they adored the sun and moon under the names of Osiris and Isis." Plato also, if he be the author of the dialogue "Epinomis," observes, "The first inhabitants of Greece, as I conjecture, acknowledged no other gods but those which are at this very day the gods of the barbarians, namely, the sun, the moon, the earth, the stars, and the heavens." Moses likewise intimates that these were objects of primary worship by cautioning the Israelites against being seduced by it. (Deut. iv. 19.) And as this caution was delivered after their departure from Egypt, some have inferred that this kind of worship was either first practised there, or introduced into that country at an early period. Other divinities which the heathens worshipped were the elements of nature, probably from an imagination that they were the habitations of superior intelligences, or at least that they were under their direction, and subject to their dominion and controul. It was at a very early period that men distinguished as objects either of gratitude, esteem and admiration, on account of their talents, virtues and exploits, or of apprehension and terror, were advanced to the rank of gods, and worshipped by their deluded votaries. In process of time divinities were feigned to exist appropriate to the different ages, professions, and actions of human life; virtues and vices were deified; the affections and passions had divinities assigned them; and there were deities who presided over every part of the body, and over every condition and stage of human life. (See DÆMONS and IDOLATRY.)

Some have reduced the heathen divinities into three classes: the first theological, representing the divine nature under divers attributes; thus Jupiter denotes the absolute power of God, Juno his justice, &c.

The second class of divinities are physical: thus Æolus is that power in nature, whereby vapours and exhalations are collected to form winds, &c.

The last are moral divinities. Thus the Furies are only the secret reproaches and stings of conscience.

DIVINITY is also used in the same sense with theology.

DIUIOHU, in *Botany*, a name given by the people of Guinea to a species of plant, with which they use to ripen or break boils, beating the leaves, and laying them on.

DIVIS, in *Geography*, a mountain of the county of Antrim, Ireland, the roots of which extend to the neighbourhood of the town of Belfast. It is about 1580 feet high, and is reckoned the highest land in the county.

DIVISIBILITY, a passive power, or property in quantity, whereby it becomes separable into parts; either actually, or at least mentally.

The schoolmen define divisibility "capacitas coextensionis cum pluribus;" a capacity of being co-extended with several things: thus, a staff four feet long is divisible, because it may be co-extended with four feet, or forty-eight inches, &c.

This the Peripatetics and Cartesians universally maintain to be an affection, or property of all matter or body: the Cartesians, as holding the essence of matter to consist in extension: for every part or corpuscle of the body being extended, has parts including other parts, and consequently is divisible.

The Epicureans, again, hold divisibility to agree to every physical continuum, as, without parts adjacent to parts, there can be no continuity; and wherever there are parts so adjacent, there must be divisibility. But they deny that this affection agrees to all bodies; for the primary corpuscles, or atoms, they hold perfectly inseccable and indivisible.

The principal argument they allege is, that, from the divi-

sibility

ſibility of all body, and of every aſſignable particle of body even after the repeated number of diviſions, it follows, that the ſmalleſt corpuſcle is infinitely diviſible, which with them is an abſurdity. For a body can only be divided into ſuch parts as it actually contains. But to ſuppoſe infinite parts for the ſmalleſt corpuſcle, ſay they, is to ſuppoſe it infinitely extended: for infinite parts placed externally to each other, as the parts of bodies doubtleſs are, muſt make an infinite extenſion.

They add, that there is a great difference between the diviſibility of phyſical and mathematical quantities. For every mathematical quantity, or dimenſion, they grant, may be increaſed and diminiſhed infinitely, but phyſical quantity, neither the one nor the other.

An artiſt, dividing a continued body, arrives at certain minute parts, beyond which he cannot go; theſe we may call minima artis. In like manner, nature which may begin where art ends, will find bounds; which we may call minima naturæ; and God, whoſe power is infinite, beginning where nature ends, may ſubdivide the minima naturæ; but he will at length come at certain parts, to which there being no other parts contiguous, they cannot be taken away. Theſe minute parts are atoms.

All we can ſay on this ſubject is, that on the one hand it is certain, every extended corpuſcle muſt have two ſides, and conſequently is diviſible; for, if it had not two ſides, it would not be extended; and if it had no extenſion, an aſſemblage of divers ſuch corpuſcles would not compoſe a body. And on the other hand, the infinite diviſibility ſuppoſes an infinity of parts in the minuteſt corpuſcle; whence it follows, that there is no body, how ſmall ſoever, but may furniſh as many ſurfaces, or parts, as the whole globe of the earth can; nay, and infinitely more; which, to ſay no worſe, is a ſtrange paradox.

The infinite diviſibility of mathematical quantity is thus proved, and illuſtrated by the mathematicians: ſuppoſe a line A D (*Plate* VI. *Geometry*, *fig.* 81.) perpendicular to B F; another at G H, at a ſmall diſtance from A, alſo perpendicular to the ſame line; with the centres C, C, C, &c. and diſtances C A, C A, &c. deſcribe circles cutting the line G H in the points *e*, *e*, &c. Now, the greater the radius A C is, the leſs is the part *e* G; but the radius may be augmented *in infinitum*, and therefore the part *e* G may be diminiſhed in the ſame manner; and yet it can never be reduced to nothing; becauſe the circle can never coincide with the right line B F. Conſequently, the parts of any magnitude may be diminiſhed *in infinitum*.

The chief objections againſt this doctrine are, that an infinite cannot be contained by a finite; and that it follows from a diviſibility *in infinitum*, either that all bodies are equal, or that one infinite is greater than another. To which it is anſwered, that to an infinite may be attributed the properties of a finite and determined quantity; and who has ever proved, that there could not be an infinite number of parts infinitely ſmall in a finite quantity: or that all infinites are equal? The contrary is demonſtrated by mathematicians in innumerable inſtances. We are not here contending for the poſſibility of an actual diviſion *in infinitum*; we only aſſert, that however ſmall a body is, it may be ſtill farther divided; which we imagine may be called a diviſion *in infinitum*, becauſe what has no limits, is called infinite.

All that is ſuppoſed, in ſtrict geometry, concerning the diviſibility of magnitude, amounts to no more than that a given magnitude may be conceived to be divided into a number of parts, equal to any given or propoſed number. It is true, that the number of parts, into which a given magnitude may be conceived to be divided, is not to be fixed or limited, becauſe no given number is ſo great but a greater may be conceived and aſſigned; but there is not, therefore, any neceſſity of ſuppoſing the number of parts actually infinite; and if ſome have drawn very abſtruſe conſequences from ſuch a ſuppoſition, yet geometry ought not to be loaded with them. Mac-Laurin's Fluxions, art. 290. See EXTENSION.

It is true that there are no ſuch things as parts infinitely ſmall; yet the ſubtility of the particles of ſeveral bodies is ſuch, that they very much ſurpaſs our conception; and there are innumerable inſtances in nature of ſuch parts actually ſeparated from one another.

Mr. Boyle gives us ſeveral inſtances of this. He ſpeaks of a ſilken thread 300 yards long, that weighed but two grains and a half. He meaſured leaf-gold, and found by weighing it, that fifty ſquare inches weighed but one grain: if the length of an inch be divided into 200 parts, the eye may diſtinguiſh them all; therefore there are in one ſquare inch 40000 viſible parts; and in one grain of it there are 2000000 of ſuch parts; which viſible parts no one will deny to be farther diviſible.

Again, a whole ounce of ſilver may be gilt with eight grains of gold, which may be afterwards drawn into a wire thirteen thouſand feet long.

In odoriferous bodies we can ſtill perceive a greater ſubtility of parts, and even ſuch as are actually ſeparated from one another; ſeveral bodies ſcarce loſe any ſenſible part of their weight in a long time, and yet continually fill a very large ſpace with odoriferous particles.

The particles of light, if light conſiſts of real particles, furniſh another ſurpriſing inſtance of the minuteneſs of ſome parts of matter. A lighted candle placed on a plane will be viſible two miles, and conſequently fill a ſphere, whoſe diameter is four miles, with luminous particles, before it has loſt any ſenſible part of its weight. And as the force of any body is directly in proportion to its quantity of matter multiplied by its velocity; and ſince the velocity of the particles of light is demonſtrated to be at leaſt a million of times greater than the velocity of a cannon ball, it is plain, that if a million of theſe particles were round, and as big as a ſmall grain of ſand, we duſt no more open our eyes to the light than to expoſe them to ſand ſhot point-blank from a cannon.

By help of microſcopes, ſuch objects as would otherwiſe eſcape our ſight, appear very large: there are ſome ſmall animals ſcarcely viſible with the beſt microſcopes; and yet theſe have all the parts neceſſary for life, as blood and other liquors. How wonderful muſt the ſubtility of the parts be, which make up ſuch fluids! (See ANIMALCULES.) Whence is deducible the following theorem:

Any particle of matter, how ſmall ſoever, and any finite ſpace, how large ſoever, being given; it is poſſible for that ſmall ſand, or particle of matter, to be diffuſed through all that great ſpace, and to fill it in ſuch manner, as that there ſhall be no pore in it, whoſe diameter ſhall exceed any given line; as is demonſtrated by Dr. Keil. Introduct. ad Ver. Phyſ.

DIVISION, the act of ſeparating a whole into the parts it contains.

If the whole be compoſed of parts really diſtinct, called integral parts, the diviſion made thereof is properly called partition; as when a houſe is divided into its apartments. If the whole be compoſed of parts, called ſubjective; that is, if the whole be only one common term, the ſubjects compriſed in the extent whereof are the parts, the diviſion thereof is what we properly call diviſion: ſuch is the diviſion of a genus into its ſpecies, &c.

Division, in *Algebra*, or *Species*, is performed by reducing the dividend and divisor into the form of a fraction: this fraction being the quotient.

Thus, if $a\,b$ were to be divided by $c\,d$, it must be placed thus, $\frac{a\,b}{c\,d}$, and that fraction is the quotient; though others choose to write it thus, $c\,d)\,a\,b$, or $c\,d : a\,b$, or $a\,b \div c\,d$, which last mark $\div$ is the most common character for division.

To perform the work of division algebraically, these rules are to be observed: 1. When the dividend is equal to the divisor, the quotient is unity, and must be placed in the quotient, because every thing contains itself once.

2. When the quotient is expressed fraction-wise (as in simple division) if the same letters are found equally repeated in each member of the numerator and denominator; cast away those letters, and the remainder is the quotient: thus, $\frac{a\,b}{a}(b$, and $\frac{a\,b\,c}{a\,b}(c$, &c.

3. When there are any co-efficients, divide them as in common arithmetic, or divide them by any common measure, and to the quotient annex the quantities expressed by letters: thus, $\frac{360\,a\,b}{24\,b}(= 15\,a$.

4. The general way of division of compound quantities, after ranging them according to the dimensions of one of their letters, is like the ordinary way in common arithmetic, respect being had to the rules of algebraic addition, subtraction, and multiplication; as also that the like signs give $+$, and unlike $-$ in the quotient; taking care to divide every part of the dividend by its corresponding divisor (that is, that whose letters shew it of the same kind with the other), to prevent a fraction, which would otherwise arise: thus,

$$
\begin{array}{l}
a + b)\,a\,a + a\,b - c\,a - c\,b\,(a - c \\
\qquad\quad a\,a + a\,b \\
\qquad\quad \overline{} \\
\qquad\quad\ \ 0 \\
\qquad\qquad\quad - c\,a - c\,b \\
\qquad\qquad\quad - c\,a - c\,b \\
\qquad\qquad\quad \overline{} \\
\qquad\qquad\quad\ \ 0
\end{array}
$$

That the same reason for like signs giving a positive and unlike a negative quotient, does hold in division, as in multiplication, is clear from considering the nature of division (which is only resolving the thing into its parts); consequently, since every dividend is nothing else but the product of the divisor and quotient multiplied by each other, the quotient must consist of such signs, which could produce the dividend; therefore, if the dividend be divided by a quantity, that has a similar sign with it, the quotient must be positive; if by a quantity having a dissimilar sign, the quotient must be negative. It may be a general rule in compound division in algebra, always to place such a letter in the quotient, as will, when multiplied into the divisor, produce the dividend; for that is always a rectangle under the divisor, and the quotient: as for example,

$$
\begin{array}{l}
zz - 16)\,z^6 - 8z^4 - 124zz - 64\,(z^4 + 8zz + 4. \\
\qquad\quad z^6 - 16z^4 \\
\qquad\quad \overline{} \\
\qquad\qquad 8z^4 - 124zz \\
\qquad\qquad 8z^4 - 128zz \\
\qquad\qquad \overline{} \\
\qquad\qquad\qquad 4zz - 64 \\
\qquad\qquad\qquad 4zz - 64 \\
\qquad\qquad\qquad \overline{} \\
\qquad\qquad\qquad\quad 0
\end{array}
$$

In some cases the quotient will form an infinite series, and then it is usual to set down the last remainder with the divisor under it.

Division, in *Arithmetic*, is the last of the four fundamental rules, being that whereby we find how often a less quantity is contained in a greater; and the overplus. Division, in reality, is only a compendious method of subtraction; its effect being to take a less number from another greater as often as possible; that is, as oft as it is contained therein. There are, therefore, three numbers concerned in division: 1. That given to be divided, called the dividend. 2. That whereby the dividend is to be divided, called the divisor. 3. That which expresses how often the divisor is contained in the dividend; or the number resulting from the division of the dividend by the divisor; called the quotient.

There are diverse ways of performing division, one called the English, another the Flemish, another the Italian, another the Spanish, another the German, and another the Indian way, all equally just, as finding the quotient with the same certainty, and only differing in the manner of arranging, and disposing the numbers.

We have likewise division in integers; division in fractions; and division in species, or algebra.

Division is performed by seeking how often the divisor is contained in the dividend; and when the latter consists of a greater number of figures than the former, the dividend must be taken into parts, beginning from the left, and proceeding to the right, and seeking how often the divisor is found in each of those parts.

For example, it is required to divide 6759 by 3. I first seek how oft 3 is contained in 6, *viz.* twice; then, how oft in 7, which is likewise twice, with one remaining. This 1, therefore, is joined to the next figure 5, which makes fifteen, and I seek how oft 3 in 15; and lastly, how oft 3 in 9. All the numbers expressing how oft 3 is contained in each of those parts, I write down according to the order of the parts of the dividend, that is, from left to right, and separate from the dividend itself, by a line, thus.

Divisor.	Dividend.	Quotient.
3)	6759	(2253

It appears, therefore, that 3 is contained 2253 times in 6759; or that 6759 being divided into 3 parts, each part will be 2253. If there be any remainder, that is, if the divisor repeated a certain number of times is not equal to the dividend, what remains is wrote over the divisor fraction-wise. Thus, if instead of 6759 the dividend were only 6758, the quotient will be the same as in the former case, except for the last figure 8: for 3 being only contained twice in 8, the last number in the quotient will be 2; and as twice 3 is only 6, there remains 2 of the dividend: which I write after the quotient, with the divisor underneath it, and a line to separate the two, thus:

$$3)\quad 6758\quad (2252\tfrac{2}{3}$$

If the divisor is a digit, the division may be easily performed without setting down any thing but the remainders. Again, if the divisor has cyphers in the first places towards the right hand, these may be cut off, provided that an equal number of figures be cut off from the right of the dividend; and when the division is finished, we obtain the integral quotient; then to the remainder annex all the excluded figures of the dividend, and subjoin the whole divisor. Thus,

$$8|00)\ 3678|54\ (459 \text{ integral quotient.}$$

Rem. 654, and the fractional part of the quotient is $\frac{654}{800}$

Moreover,

Moreover, if the divisor is the product of two or more digits, which may be easily discovered, divide first by any one of these, and then divide the quotient by the other, and so on; the last quotient is that required; and for the fractional part, multiply the last remainder by the preceding divisor, and to the product add the preceding remainder; multiply this sum by the next preceding divisor, and to the product add the next preceding remainder, and so on till you have got through all the divisors and remainders to the first. Thus, to divide 3428689 by 126, divide by 3, 6, and 7, because $3 \times 6 \times 7 = 126$; the first quotient is 1142896, and the remainder 1; the second quotient is 190482, and the remainder 4; the last quotient is 27211, and the remainder 5, which multiplied by the preceding divisor 6, produces 30, to which the preceding remainder 4 being added, we have 34; this multiplied by the preceding or first divisor, produces 102, and, the remainder 1 added, makes 103, the true remainder; and the fractional part of the quotient is $\frac{103}{126}$. For the division of concrete, or applicate numbers, see REDUCTION.

Proof of DIVISION.

Division is proved by multiplying the quotient by the divisor, or the divisor by the quotient; and adding what remains of the division, if there be any thing. If the sum be found equal to the dividend, the operation is just, otherwise there is a mistake.

DIVISION, in *Decimal Fractions*. See DECIMAL.

DIVISION, in *Geometry*, or *geometrical* DIVISION, is also called application; the design of which, when it is employed about the construction of plain problems, is this: *viz.* a rectangle being given, as also a right line; to find another right line, the rectangle contained under which, with the right line given, shall be equal to the rectangle first given. Such effection, or construction, is called the application of a given rectangle to a right line given; and the right line arising by such application, is called the geometrical quotient.

This is found by the rule of three, by saying as the line given is to one side of the rectangle, so is the other side to the line sought.

Not unlike to which is Des Cartes's way of working division in lines, by scale and compass: thus, suppose $a\,c$ $(= 6)$, were to be divided by $a\,d$ $(= 3)$ (*Plate* VI. *Geometry*, *fig.* 82) make any angle at pleasure, and therein set off first $a\,d$ $(= 3)$ the divisor, and then on the same leg, $a\,u$, $=$ to unity; then on the other leg of the angle set $a\,c$ $(= 6)$ the dividend, and join $d\,c$, and to it through u, draw $u\,b$ parallel to $d\,c$, which shall cut off $a\,b$ the quotient sought; for as $a\,d : a\,u :: a\,c : a\,b$; that is, as the divisor: is to unity :: so is the dividend: to the quotient: on which proportion depends all division.

DIVISION *of a word*, in *Grammar*, is a discourse explaining the latitude, or comprehension of a word: the latitude, when the word is universal; as when the genus is divided into species, and differences; the comprehension, when the word is ambiguous, as *taurus*, bull; which sometimes denotes a constellation, sometimes a beast, and sometimes a mountain.

DIVISION *by Logarithms*. See LOGARITHM.

DIVISION, in *Logic*, is the separating any thing into diverse parts or ideas. See DISTRIBUTION.

The schoolmen define it a discourse, explaining a thing by its parts; in which it approaches nearly to the nature of a definition, whose character is to define a thing by its parts.

Division, we have said, is a distribution of a whole, &c. But there are two sorts of wholes, as above expressed.

The first is what consists of integral parts; as the human body, which contains diverse members.

The second is properly no other than an abstract idea common to more things than one, as the universals; or a compound idea comprehending the substance and its accidents, or at least most of its accidents.

The whole admits of a triple division. 1. When the genus, or kind, is divided by its species or differences; as when substance is divided into body and spirit; or into extended, and thinking.

2. When any thing is divided into several classes, by opposite accidents; as when the stars are divided into those which shine by their own light, and those that only reflect a borrowed light.

3. When the accidents themselves are divided according to the subjects in which they inhere; as when goods are divided into those of the body, the mind, and fortune.

The laws of division are, 1. That it be full and adequate, that is, that the members of the division entirely exhaust the whole thing divided; as when all numbers are divided into equal, and unequal.

2. That the members of the division be opposite; as equal, and unequal: corporeal, and not corporeal; extended, and thinking.

3. That one member of the division be not contained in another, so as the other may be affirmed of it: though, in other respects, it might be included without any fault in the division: thus extension, geometrically considered, may be divided into a line, surface, and solid; though the line be included in the surface, and the surface in the solid.

4. The division must not be made into too many, or too general parts. Lastly, the members, unless the subject require it, are not to be too unequal; as if the universe were divided into heaven and earth.

DIVISION *of Mathematical Instruments*. See INSTRUMENT.

DIVISION, in a *Military Acceptation*, signifies any portion of an army under a separate commander, deriving his authority from some immediate superior. The term, when properly used, refers only to detachments from the main body, which is not called a division, but "the army" itself: thus, if several bodies attack a country on several sides, without acting under the same chiefs, they are not divisions, but armies; on the other hand, when various bodies are under one chief, or have been detached from any particular army, they are then termed divisions. In regard to the extent of such divisions, in point of number, we have no distinguishing term; that point being arbitrary, according to circumstances.

When an army is brigaded, and that the entire of a brigade is detached, it is usual to retain that designation; because it exhibits more pointedly to all within the range of operations the extent of the force, which might else be often misunderstood; whereas few persons in a camp are ignorant of the manner in which the various brigades are composed. But we often find in the same camp, that two, or more brigades, are formed into separate commands for subordinate general officers, and are termed divisions: in such case the whole are usually portioned in that manner, and the commander in chief retains no separate command over either of them; but occupies himself solely in the general concerns, and management of the whole force under his command. The French have a distinguishing rank in their service, *viz.* "general of division;" which, in every respect, corresponds with the commands of large bodies, under a commander in chief, in our service; though it often includes no more than two or three regiments: in the latter instance they must be considered merely as brigadier-generals.

When entire regiments are detached from brigades, with their usual proportions of artillery, &c. it is usual, and much the most convenient, to retain their designations, according to the numbers of the regiments respectively: it has even been remarked, that single corps thus detached have behaved with great gallantry; towards which, in all probability, the circumstance of being noticed as a single corps greatly, though unconsciously, contributes; whereas, under the term division, the reputation a regiment might acquire would be less subject to general distinction.

When companies are detached from a regiment, they are included under the term division of the regiment; or three, or four, or five, companies of the regiment: observing, that wherever the colours fly, that portion is called "the regiment;" though possibly the force remaining therewith may be comparatively small. But the colours are always under the commandant's own charge: they constitute the head-quarters.

The term division, in the formation of a regiment, always relates to one of the portions, ordinarily eight or ten, into which the corps is "told off," or divided, for firing in equal portions; or for marching in column. In the first intention, it is usual to "tell off" the battalion companies into divisions of equal strength; the grenadiers and light infantry being less attended to, both on account of their being so frequently detached; and because, from being on the flanks, they are not so much under the strict necessity of preserving that exact locality incumbent on the battalion companies. In marching in column of divisions; which is by far the most pleasant to the soldier, and most prompt for defence, the companies are not subject to occupy each others places in the line, as they are in manœuvring on a parade, and require less precision in respect to their extent of front. It is not, however, always practicable to proceed by divisions, or, in other words, by companies, on account of various roads: on such occasions the company divides into halves, which are called sub-divisions, or into four, which are called platoons, or into eight, which are called sections. Many term a company a platoon, and some call the fourth part of the company a section. When two companies, or two divisions, act within the regiment under one commander, they unite under the designation of "grand divisions." Therefore a battalion of eight companies contains four grand divisions, eight divisions, and sixteen sub-divisions. A column of divisions is the drawing up of a battalion with all the divisions separate from each other, at distances equal to their respective fronts; the one division behind the other, in regular succession. Thus, when a corps has wheeled to the right, or to the left, by divisions, it presents a column of divisions, of which the front will be seen on that side to which it wheeled.

From the foregoing it will be seen, that the term division is, in many respects, arbitrary, or circumstantially appropriate; the only instance in which it appears specifically applicable being that we have described, regarding the "telling off" of a corps for firing or for marching. Thus, when we say "a firing by divisions," we mean that a regular fire was kept, either from right to left, or *vice versâ*; or from flanks to centre, or from centre to flanks; the several divisions firing in succession according to their situation, and to the order of firing. Under these terms military persons always understand, that the firing is supported by the vollies of divisions, in contradistinction to the firing in lesser portions, such as by platoons, or sections; in which case each division may be considered as a small battalion, having an order of fire within itself, and acting quite independently, in that respect, from the rest of the corps.

Division, in *Music*, imports the dividing of the interval of an octave into a number of lesser intervals.

The 4th and 5th, each of them, divide or measure the octave perfectly, though differently. When the fifth is below, and serves as a bass to the 4th, the division is called harmonical; when the 4th is below, the division is called authentic.

Besides the harmonical, and arithmetical division of the octave, the word frequently occurs in music: as the division of the monochord, or division of a single string, into ratios by numbers, or reducing by moveable bridges, a single string to every kind of proportion allowable in music. See Monochord.

Point of Division in the time-table. See Point, and Time-table.

Division, in *Melody*, a rapid passage of execution in a song. (See Neuma.) In singing, many sounds applied to one syllable constitute a division, volée, roulade, volata, passaggio; and in playing upon an instrument, a rapid succession of sounds without a rest, or slow note, has generally the same appellation. Such as are chiefly pleased with grave and sober music censure those flights as capricious, unmeaning, and trivial. Others are however captivated by them, when executed with precision, and regard them as proofs of the composer's invention, and the performer's abilities. And it is perhaps a popular prejudice to imagine that all such inflexions are absurd, and ill placed, even in a slow and plaintive melody. On the contrary, when the heart is much moved and affected, the voice can more easily find sounds to express passion than the mind can furnish words; and hence came the use of interjections and exclamations in all languages. It is no less a prejudice to assert that a division is always proper on a favourable word or syllable, without considering the situation of the singer, or the sentiment he has to express.

Division *by Neper's Bones*. See Neper's *Bones*.

Division, in *Physics*, or Divisio *continui*, is the separation of the parts of a quantity; whereby, what before was one, is now reduced into several. See Continuity, and Dissolution.

This division is effected by means of motion, without which there can be no separation of any continuum, or even contiguum.

This motion is performed diverse ways, by fraction, scission, section, fission, resolution, dilution, maceration, dispersion, effusion, distraction, &c.

Division *of Powers*. See Powers.

Division *of Proportion*. See Proportion.

Division *of Ratios*. See Ratio.

Division, in *Rhetoric*, the arrangement of a discourse under several heads, to be spoken to separately. See Disposition.

Division *of Surds*. See Surd.

Division *of Vulgar Fractions*. See Fraction.

Division, in the *Sea Language*, the third part of a naval army, or fleet; or one of the squadrons thereof, distinguished by a particular flag or pendant, under the command of some flag-officer. Or, in large fleets, the squadrons are subdivided into three divisions, which, like the squadrons, are denominated the van, the centre, and the rear. See Squadron.

The white flag denotes the first squadron of France, the white and blue the second, and the third is characterized by the blue. In England, the first admiral, or the admiral of the fleet, displays the union flag at the main-top-mast-head; next follows the white flag with St. George's cross; and afterwards the blue. The private ships carry pendants of the same colour with their respective squadrons at the masts

of

of their particular divisions; so that the last ship in the division of the blue squadron carries a blue pendant at her mizen-top-mast-head. Naval battles are usually ranged in three lines, according to their three divisions.

DIVISIONES, in *Antiquity*, certain persons of money, oil, bread, wine, or the like, appointed by will to be distributed annually among certain persons or companies, and sometimes to the people in general.

DIVISOR, the dividing number; or that which shews how many parts the dividend is to be divided into.

Divisor, *common*. See Common *measure*.

Divisors, *Invention of*, denotes the investigation of all those quantities by which any given quantity, simple or compound, may be divided without a remainder. If the quantity whose divisors are sought be a simple quantity, divide it by its least divisor, and then the quotient by its least divisor, and so on till you come to a quotient that is not farther divisible: you will thus have all the prime numbers or divisors by which the quantity proposed can be divided: then multiplying these prime divisors two and two together, find as many different products as you can this way; then find as many more products as you can by multiplying them three and three together, and so on; and these products, so found, will be all the composite divisors, of which the given quantity will admit. *E. G.* Let it be required to assign all the divisors of the number 60. First divide 60 by its least divisor 2, and then the quotient 30 by its least divisor 2, and the quotient 15 by 3, whence will result the quotient 5, incapable of any farther division. Having obtained all the prime divisors of the number 60, *viz.* 1, 2, 2, 3, 5, or leaving out 1, because it is a common divisor of all numbers, 2, 2, 3, 5; multiply these together, as, 2×2, 2×3, 2×5, 3×5, and you obtain other divisors, 4, 6, 10, 15; then multiply them three and three together, and you will have other divisors, as $2 \times 2 \times 3$, $2 \times 2 \times 5$, $2 \times 3 \times 5$, that is, 12, 20, 30; and lastly multiply them all four together, and you will have the divisor $2 \times 2 \times 3 \times 5$, or 60. Again, let it be required to find all the divisors which will divide the quantity $21abb$ without a remainder. Divide $21abb$ by 3, and the quotient $7abb$ by 7, and the quotient abb by a, and the quotient bb by b, and you will at last obtain the prime quotient b; consequently the prime divisors of the quantity $21abb$ are 3, 7, a, b: these multiplied two and two together will give 21, $3a$, $3b$, $7a$, $7b$, ab, and bb; multiply them three and three together, and you will have $21a$, $21b$, $3ab$, $3bb$, $7ab$, $7bb$, abb; multiply them four and four together, and you will have $21ab$, $21bb$, $3abb$, $7abb$; multiply all five together, and you will have the quantity itself that was at first proposed, *viz.* $21abb$.

If a quantity, after having been divided by all its simple divisors, remains still a compound quantity, and there be any suspicion that it will admit of some compound divisor, range its several members according to the dimensions of some letter in it; then substitute for that letter three or more terms of this arithmetical progression 3, 2, 1, 0, -1, -2; then place the numbers resulting hence over-against them, together with all their divisors both affirmative and negative; or if the negative divisors be not actually put down, they are at least to be understood; lastly over-against these divisors put down all the decreasing arithmetical progressions that can be made out of them, proceeding from the highest to the lowest rank, as is the case with the terms of the progression 3, 2, 1, 0, -1, -2; but the difference of the terms of the progression made out of the divisors must be either unity, or some other number that will divide the highest power of the dividend proposed: if any such progression can be found, take that term which stands against 0 in the first progression, 1, 0, -1, &c. and dividing it by the common difference of the progression, join the quotient with its proper sign to the letter according to the dimensions whereof the dividend was disposed, and you will have a quantity with which a division is to be tried. *E. G.* Let the quantity whose compound divisor is sought be $x^3 - xx - 10x + 6$. Here substituting the terms 1, 0, -1 for x successively, we find the resulting numbers to be -4, 6, 14; placing these together with their divisors, over-against the respective terms of the progressions whence they arise, they will stand in the following order:

1	4	1, 2, 4.	+4
0	6	1, 2, 3, 6.	+3
-1	14	1, 2, 7, 14.	+2

Then because the highest power of the dividend, *viz.* x^3, admits of no numeral divisor but unity, we find among the divisors an arithmetical progression, whose common difference is unity, and whose terms decrease after the same manner as the terms of the first progression 1, 0, -1; and of this sort of progression we find among the divisors only one, *viz.* 4, 3, 2; the number 4 being one of the divisors that stand over against 1, the number 3 one of those over-against 0, and 2 over-against -1: of this progression 4, 3, 2, we take the number 3 that stands over-against 0, and joining it with the letter x, we try a division with the quantity $x + 3$, and find that it succeeds; for $x^3 - xx - 10x + 6$, being divided by $x + 3$, gives $xx - 4x + 2$ for a quotient, without any remainder.

If no divisor can be found this way, we may conclude that the quantity proposed admits of no compound divisor of one dimension: nevertheless, it may still have a divisor where the indeterminate quantity arises to two or more dimensions.

If the quantity proposed does not rise to above three dimensions, and admits of a compound divisor of two, it must necessarily have another divisor of one dimension, which being found (as above) and dividing the quantity proposed, the quotient will be the other divisor; but if it rises to above three dimensions, and hath no divisor of less than two, such a divisor must be found by the following method. Let x be the indeterminate quantity of whose powers the quantity proposed consists, then substituting the terms of this progression 3, 2, 1, 0, -1, -2, successively for x, and putting down over-against them the numbers resulting, together with all their affirmative divisors, as before, the negative ones being understood: multiply the squares of the terms of the progression by some numeral divisor of the highest term of the quantity proposed, which we will call e, and put down the products $9e$, $4e$, $1e$, 0, $1e$, $4e$ over-against the terms of the progression. This done, subtract these products from all the divisors of their respective ranks, both affirmative and negative, and put down the remainders in the same ranks under their proper signs; then try if, in passing from the highest to the lowest rank of remainders, you can find an arithmetical progression of any sort, whether increasing or decreasing: if one or more such progressions can be found, put them down over-against the terms of the first progression, and then examine them one after another thus: let (in any of those progressions) $\pm g$ be the term that stands over-against 0 in the first progression; then subtracting this term, $\pm g$, from the next above it in the same progression, let the remainder be $\pm f$; then the compound quantity, with which the division is to be tried, will be $exx \pm fx \pm g$. But if no divisor can be found this way, try another divisor of the co-efficient of the highest term of the quantity proposed for e, and so proceed till you

have passed over all the affirmative numeral divisors of the highest term; and then if no compound divisor can be found, it will infallibly prove that the quantity proposed admits of none. *E. G.* Let the quantity proposed be $x^4 - x^3 - 5xx + 12x + 6$. Here substituting the numbers 3, 2, 1, 0, -1, -2 successively for x, we find the numbers resulting to be 39, 6, 1, -6, -21, -26; these, without any regard to their signs, together with their divisors, are to be put down as usual; then multiplying the squares of the terms of the progression by 1, which is the only affirmative-numeral divisor of x^4, the highest term of the quantity proposed, and putting down the products 9, 4, 1, 0, 1, 4, over-against the terms of the progression, we subtract 9 from all the divisors of its rank, both affirmative and negative, that is, from 39, 13, 3, 1, -1, -3, -13, -39, and the remainders, *viz.* 30, 4, -6, -8, -10, -12, -22, -48, are placed over-against 9 in the highest rank; the same is done with the next number 4, with respect to the divisors of its rank; and so of all the rest. Then, the remainders being examined, we find among them two arithmetical progressions passing from the highest to the lowest rank, *viz.* 4, 2, 0, -2, -4, -6, and -6, -3, 0, $+3$, $+6$, $+9$, both which are put down over-against the terms of the first progression 3, 2, 1, 0, -1, -2. In the former of these two progressions we find the term -2 standing over-against 0 in the first progression; therefore $g = -2$; this subtracted from 0, the next term above it in the same progression, gives $+2$ for f; hence, since $e = 1$, the divisor to be tried, drawn from this progression, will be $xx + 2x - 2$. In the other progression we find the term over-against 0 to be 3, therefore $g = 3$; and this, subtracted from 0 above, leaves -3 for f; therefore the divisor from this progression, by which the division is to be tried, is $xx - 3x + 3$. Both, being tried, succeed; that is, if the quantity proposed be divided by either of these divisors, the quotient will be the other.

3	39	39, 13, 3, 1.	9	30, 4, -6, -8, -10, -12, -22, -48.		4, -6.
2	6	6, 3, 2, 1.	4	2, -1, -2, -3, -5, -6, -7, -10.		2, -3.
1	1	1	1	0, -2		0, 0.
0	6	6, 3, 2, 1.	0	6, 3, 2, 1, -1, -2, -3, -6.		-2, 3.
-1	21	21, 7, 3, 1.	1	20, 6, 2, 0, -2, -4, -8, -22.		-4, 6.
-2	26	26, 13, 2, 1.	4	22, 9, -2, -3, -5, -6, -17, -30.		-6, 9.

These operations may (when necessary) be contracted a little thus: let p, q, r, s, t, v, be the numbers resulting from the positions 3, 2, 1, 0, -1, -2, and as such let them be put down over-against them; then if the extreme numbers p and v be pretty large, or contain many divisors, let these divisors, as well as the remainders arising from them, be omitted, and try if you can find an arithmetical progression, passing through the remainders belonging to the intermediate numbers q, r, s, t; if such a one can be found, let the terms be $2f + g$, $f + g$, g, $-f + g$; then it is plain that in this progression, the next term above $2f + g$ will be $3f + g$, and the next below $-f + g$ will be $-2f + g$; add the number, $9e$, to the term $3f + g$, and try whether the number $9e + 3f + g$ will divide the number p; if it does, then add also $4e$ to $-2f + g$, and try whether the number $4e - 2f + g$ will divide the number v: if this division also succeeds, you will then have as full a progression to try with, as if the divisors and remainders of the extreme numbers p and v had been put down; but if neither, or but one of these divisions succeeds, it shews that the progression thus found was accidental, and did not spring from any compound divisor.

If the quantity proposed be made out of the powers of two different letters, so as to have all its terms of the same number of dimensions, instead of one of the letters put unity; then finding (by the foregoing rules) a compound divisor, if any such there be, fill up the deficient dimensions of the divisor by those of the letter that was before suppressed, and you will have the divisor compleated. *E. g.* Let the quantity proposed be $6y^4 - ay^3 - 21a^2y^2 + 3a^3y + 20a^4$, every term of which consists of four dimensions, either of the letter y, or of the letter a, or of both together. Here then substituting 1 for a, the former quantity will be changed into $6y^4 - y^3 - 21y^2 + 3y + 20$, of which $3y + 4$ is a compound divisor, found above. Now as $3y$, the first term of this divisor, hath one dimension of the letter y, and as the other term 4 hath no dimension of any letter, one dimension may be supplied from the letter a, and the divisor will become $3y + 4a$.

Again, let the quantity proposed be $x^4 - ax^3 - 5a^2x^2 + 12a^3x - 6a^4$; this quantity, substituting 1 for a, becomes $x^4 - x^3 - 5x^2 + 12x - 6$; of which $xx + 2x - 2$ is a compound divisor, found above; supply the deficient dimensions of this divisor from those of the letter a, so that every term may have two dimensions as well as the first, and it will be $xx + 2ax - 2aa$. Newton's Arithmetica Universalis, c. 7. § 2. Apud Opera ed. Horsl. tom. 1. p. 40, &c. Saunderson's Algebra, book ix. p. 3. vol. ii. p. 647, &c.

DIUM, in *Ancient Geography*, a town of Macedonia, situated at the foot of mount Olympus, about 7 stadia from the gulf of Thessalonica, according to Strabo: now called *Standia*. —Also, a town of the peninsula of mount Athos, upon the Strymonian gulf.—Also, a town of the island of Crete. (See DIA.)—Also, a town of the island of Eubœa; the same which Strabo calls "Athenæ Diades," placed by M D'Anville upon the northern coast of Eubœa, S.W. of Oreus, and opposite, on the other side of the sea, the Pelasgic gulf and the pass of Thermopylæ.—Also, a town of Asia, in Cœlesyria; placed by Ptolemy between Pella and Gadera.

DIVO, a town of Spain, on the coast of the country of the Caristi, near *Tritium*, and E. of it.

DIVODURUM, afterwards called *Medimatrici*, and now *Metz*, which see.

DIVONA, now *Cahors*, a town of Aquitania Prima, called Carduci, and belonging to a people of that name.

DIVORCE, from *diverto*, I turn away, a breach or dissolution of the bond of marriage.

In our law divorce is of two kinds; the one total, *a vinculo matrimonii*; which alone is properly divorce; the other partial, *a mensa & thoro*; a separation from bed and board.

The woman divorced *a vinculo matrimonii* receives all again that she brought with her; the other has a suitable separate maintenance allowed her out of her husband's effects. See ALIMONY.

The first only happens through some essential impediment, as consanguinity or affinity within the degrees forbidden, precontract, impotency, &c. of which impediments the canon law allows fourteen, comprehended in these verses.

"Error, conditio, votum, cognatio, crimen,
Cultus, disparitas, vis, ordo, ligamen, honestas,
Si sis affinis, si forte coire nequibus,

Si

Si parochi & duplicis deſit præſentia teſtis,
Raptave ſit mulier, nec parti reddita tutæ."

In this kind of divorce, the marriage is declared null, as having been abſolutely unlawful, *ab initio*, and the parties are ſeparated *pro ſalute animarum*, and allowed to marry again; the iſſue of ſuch marriage as is thus entirely diſſolved, are baſtards. (Co. Litt. 235.)

Divorce *a menſa & thoro* diſſolveth not the marriage, becauſe it was juſt and lawful *ab initio;* but for ſome ſupervenient cauſe, it becomes improper or impoſſible for the parties to live together; as in the caſe of intolerable ill temper, or adultery in either of the parties. For the canon law, which is followed by the common law in this caſe, has ſuch reſpect for the nuptial tie, that it will not allow it to be unloſed for any cauſe whatſoever, that ariſes after the union is made. And this is ſaid to be built on the divine revealed law; though that expreſsly aſſigns incontinence as a cauſe, and indeed the only cauſe, why a man may put away his wife and marry another. (Matt. xix. 9.) The civil law, which is partly of pagan original, allows many cauſes of abſolute divorce; and ſome of them pretty ſevere ones: (as if a wife goes to the theatre or the public games, without the knowledge and conſent of the huſband, Nov. 117.) but among them adultery is the principal, and with reaſon named the firſt. (Cod. 5. 17. 8.) But with us in England adultery is only a cauſe of ſeparation from bed and board; (Moor 683) for which the beſt reaſon that can be given is, that if divorces were allowed to depend upon a matter within the power of either of the parties, they would probably be extremely frequent; as was the caſe when divorces were allowed for canonical diſabilities, on the mere confeſſion of the parties (2 Mod. 314), which is now prohibited by the canons (Can. 1603. c. 100.) However, divorces *a vinculo matrimonii*, for adultery, have of late years been frequently granted in England, by act of parliament.

Divorce is a ſpiritual judgment, and therefore is paſſed in the ſpiritual court. Under the old law, the woman divorced was to have of her huſband a writing, as St. Jerom and Joſephus teſtify, to this effect: "I promiſe that hereafter I will lay no claim to thee;" which was called a bill of divorce.

Divorce was allowed with great latitude both among the Pagans and Jews. The Roman lawyers diſtinguiſh between repudium and divortium, or repudiation and divorce; making the former to be the breaking of a contract or eſpouſal, and the latter ſeparation after matrimony. Monteſquieu (Sp. of Laws, vol. i. p. 370.) thus diſtinguiſhes between a divorce and a repudiation: the former, he ſays, is made by a mutual conſent occaſioned by a mutual antipathy; while a repudiation is made by the will and for the advantage of one of the two parties independently of the will and advantage of the other. This writer eſtabliſhes it as a general rule, that in all countries where the laws have given to men the power of repudiating, they ought alſo to give it to women. Repudiation, he adds, ſeems chiefly to proceed from a haſtineſs of temper, and from the dictates of ſome of the paſſions; whereas divorce appears to be an affair of deliberation. Romulus enacted a ſevere law, which ſuffered not the wife to repudiate her huſband, but gave the man the liberty of repudiating his wife, either upon poiſoning her children, counterfeiting his private keys, or for the crime of adultery; but if the huſband on any other occaſion put her away, he ordered one moiety of his eſtate for the wife, and the other to the goddeſs Ceres; beſides an atonement to the gods of the earth. They might then repudiate in all caſes, if they were willing to ſubmit to the penalty. (Plut. in Rom.)

The firſt inſtance of a divorce that occurred at Rome was that of Spurius Carvilius Ruga, A. U. C. 523. B. C. 231, who repudiated his wife, whom he much loved, ſolely on account of her barrenneſs; to which he was determined by an oath which the cenſors obliged him to take, to the end that he might give children to the republic. It has been ſaid, that though he thus acted through neceſſity, and with the advice of his friends, his conduct was univerſally condemned, and rendered him extremely odious. Monteſquieu, however, ſuggeſts, that he did not incur diſgrace with the people for repudiating his wife; but they were offended by his oath to the cenſors, that he would repudiate her on account of her ſterility, that he might give children to the republic. This, it is alleged, was a yoke which the people perceived that the cenſors were going to put upon them. Plutarch, in his "Roman Queſtions," maintains, that Domitian was the firſt who permitted divorces. The law of Romulus is conſidered by others as temporary and tranſient; and it has been thought improbable that ſuch a law, which gave to the people a right of repudiation for certain cauſes, ſhould have ſubſiſted for above 500 years, and yet that no one ſhould avail himſelf of it in that long interval of time. The teſtimony of Dionyſius Halicarnaſſenſis, Valerius Maximus, and Aulus Gellius, to the contrary, is thought to be very improbable; more eſpecially as the law of the Twelve Tables ratified in the year 451. B. C., and the manners of the Romans, greatly extended the law of Romulus. To what end, it may be ſaid, were theſe extenſions, if the people never made uſe of a power to repudiate? Beſides, if the citizens had ſuch a reſpect for the auſpices, as the authors above-named pretend they had, ſo that they would never repudiate, how came the legiſlature of Rome to have leſs than they? and how came the laws inceſſantly to corrupt their manners? Moreover, it is mentioned as a fact, that Coriolanus, when he ſet out on his exile B. C. 491, adviſed his wife to marry a man more happy than himſelf. The right of the women to repudiate their huſbands ſubſiſted among the firſt Romans, notwithſtanding the law of Romulus; and it is well known that this inſtitution was one of thoſe which the deputies of Rome brought from Athens, and which were inſerted in the laws of the Twelve Tables. (See Juvenal, ſat. ix. Martial. lib. 1. Ep. 41.) Cicero ſays, that the reaſons of repudiation ſprung from the laws of the Twelve Tables; and we may, therefore, conclude, that this law increaſed the number of the reaſons for repudiation eſtabliſhed by Romulus. The power of divorce was alſo an appointment, or at leaſt a conſequence of the law of the Twelve Tables: for from the moment that the wife or the huſband had ſeparately the right of repudiation, there was a much ſtronger reaſon for their having the power of parting in concert, and quitting each other by mutual conſent. The law at firſt did not require that they ſhould diſcloſe the cauſes of divorce; though Juſtinian afterwards altered the law in this reſpect (Nov. 117. c. 10.)

At Rome, barrenneſs, age, diſeaſe, madneſs, and baniſhment, were the ordinary cauſes of divorce. Juſtinian afterwards added impotence, a vow of chaſtity, and the profeſſion of a monaſtic life, as valid reaſons of divorce. The cauſes of the diſſolution of matrimony have much varied among the Romans; but the moſt ſolemn ſacrament, the conſarreation itſelf, might always be done away by rites of a contrary tendency. In the firſt ages, the father of a fa-

mily might fell his children, and his wife was reckoned in their number; the domeſtic judge might pronounce the death of the offender, or his mercy might expel her from his bed and houſe; but the ſlavery of the wretched female was, for a long period, hopeleſs and perpetual, unleſs he aſſerted for his own convenience the manly prerogative of divorce.

At length, when the Roman matrons became the equal and voluntary companions of their lords, a new juriſprudence was introduced, that marriage, like other partnerſhips, might be diſſolved by the abdication of one of the aſſociates. During an interval of proſperity and corruption, this principle was enlarged to frequent practice and pernicious abuſe. Paſſion, intereſt, or caprice, ſuggeſted daily motives for the diſſolution of marriage; a word, a ſign, a meſſage, a letter, the mandate of a freedman, declared the ſeparation: the moſt tender of human connections was degraded to a tranſient ſociety of profit or pleaſure. According to the various conditions of life, both ſexes alternately felt the diſgrace and injury: an inconſtant ſpouſe transferred her wealth to a new family, abandoning a numerous, perhaps a ſpurious progeny to the paternal authority and care of her late huſband; a beautiful virgin might be diſmiſſed to the world, old, indigent, and friendleſs; but the reluctance of the Romans, when they were preſſed to marriage by Auguſtus, ſufficiently marks, that the prevailing inſtitutions were leaſt favourable to the males. A ſpecious theory, ſays Mr. Gibbon, (Hiſt. Decl. and Fall of Rom. Emp. vol. viii.) is confuted by this free and perfect experiment, which demonſtrates, that the liberty of divorce does not contribute to happineſs and virtue. The facility of ſeparation would deſtroy all mutual confidence, and inflame every trifling diſpute; the minute difference between an huſband and a ſtranger, which might ſo eaſily be removed, might ſtill more eaſily be forgotten; and the matron, who in five years can ſubmit to the embraces of five huſbands, muſt ceaſe to reverence the chaſtity of her own perſon. Inſufficient remedies followed with diſtant and tardy ſteps the rapid progreſs of the evil. Auguſtus adopted different modes of repreſſing or chaſtiſing the licence of divorce. The preſence of ſeven Roman witneſſes was required for the validity of this ſolemn and deliberate act; if any adequate provocation had been given by the huſband, inſtead of the delay of two years, he was compelled to refund immediately, or in the ſpace of ſix months; but if he could arraign the manners of his wife, her guilt or levity was expiated by the loſs of the ſixth or eighth part of her marriage portion. The Chriſtian princes were the firſt who ſpecified the juſt cauſes of a private divorce. Conſtantine attempted to remedy the evil, which was very prevalent, by diminiſhing the number of caſes in which a divorce ſhould be allowed, and increaſing the penalty annexed to unjuſt and needleſs ſeparation. Juſtinian alſo introduced ſome uſeful regulations and reſtrictions. In the moſt rigorous laws, a wife was condemned to ſupport a gameſter, a drunkard, or a libertine, unleſs he were guilty of homicide, poiſon, or ſacrilege, in which caſes the marriage, as it ſhould ſeem, might have been diſſolved by the hand of the executioner. But the ſacred right of the huſband was invariably maintained, to deliver his name and family from the diſgrace of adultery; the liſt of *mortal* ſins, either male or female, was curtailed and enlarged by ſucceſſive regulations, and the obſtacles of incurable impotence, long abſence, and monaſtic profeſſion were allowed to reſcind the matrimonial obligation. Whoſo tranſgreſſed the permiſſion of the law, was ſubject to various and heavy penalties. The woman was ſtripped of her wealth and ornaments, without excepting the bodkin of her hair; if a man introduced a new bride into his bed, *her* fortune might be lawfully ſeized by the vengeance of his exiled wife. Forfeiture was ſometimes commuted to a fine; the fine was ſometimes aggravated by tranſportation to an iſland, or impriſonment in a monaſtery; the injured party was releaſed from the bonds of marriage; but the offender during life or a term of years, was diſabled from the repetition of nuptials. The ſucceſſor of Juſtinian yielded to the prayers of his unhappy ſubjects, and reſtored the liberty of divorce by mutual conſent.

The common way of divorcing, was by ſending a bill to the woman, containing the reaſons of ſeparation, and the tender of all her goods which ſhe brought with her; and this was called repudium mittere; or elſe it was performed in her preſence, and before ſeven witneſſes, and accompanied with the formalities of tearing the writings, refunding the portion, taking away the keys, and turning the woman out of doors.

The Grecian laws concerning divorces were different: the Cretans allowed divorce to any man that was afraid of having too many children. The Spartans ſeldom divorced their wives; and it was extremely ſcandalous for a woman to depart from her huſband. The Athenians allowed divorce on very ſmall grounds, by a bill, containing the reaſon of the divorce, and approved, if the party appealed, by the chief magiſtrate; and women alſo were allowed to leave their huſbands on juſt occaſions. Perſons divorcing their wives were obliged to return their portions; otherwiſe, the Athenian laws obliged them to pay nine oboli a month for alimony. The terms expreſſing the ſeparation of men and women from each other were different; the men were ſaid αποπεμπειν or απολυειν, *to diſmiſs their wives*, but wives απολειπειν, *to leave their huſbands*. Port. Arch. Græc. vol. ii. book iv. chap. 12.

Among the Jews, beſides incontinence and adultery, uglineſs, old age, or ill humour in a wife, were ſufficient reaſons for giving her a bill of divorce. Nay, even the man's own pleaſure, or the repenting of his match, were admitted as good reaſons. Selden de Uxore Heb. lib. iii. cap. 17.

Although divorce was permitted to the Jews, it had never been practiſed by any of the patriarchs, whatever might have been the caſe among other nations. The law relating to it, is expreſſed to this effect: (Deut. xxiv. 1, &c.) "When a man hath taken a wife, and married her, and it come to paſs that ſhe finds no fav ur in his eyes, becauſe he has found in her ſome uncleanneſs; then let him write her a bill of divorcement, and give it into her hand, and ſend her out of his houſe. And when ſhe is departed, ſhe may go, and be another man's wife; and if her ſecond huſband hate her, and write her a bill of divorce, or if he chance to die, her former huſband ſhall not take her again to be his wife, after ſhe is defiled, for that is an abomination to the Lord." Upon the interpretation of this law a queſtion has occurred, what is meant by the words, "if he find any uncleanneſs, turpitude, or nakedneſs in her?" The Jews are divided in their opinion about it. The Hebrew words, which Dr. Geddes, in his tranſlation, hath rendered "ſome defect," ערות דבר, are by Montanus rendered *nuditatem verbi*—by our tranſlators, *ſomething unclean*. Sept. ασχημον πραγμα. Vulg. *aliquam fœditatem*, and ſo equivalently Onk. Syr. and both Arabs. But Targ. פתגם עבירת, *ſome tranſgreſſion*; and this *tranſgreſſion* is ſuppoſed by Rabbi Sammai and his followers to be adultery. But R. Hillel and his party extend the ערות דבר to whatever may diſpleaſe the huſband. The opinion of the Sammaites is untenable; for adultery was puniſhed with death; but the opinion of the Hillelites appears to be too lax.

lax. It was probably either some very great bodily blemish, or some base immoral habit, that was meant by the legislator. The form of the bill of divorce was to this effect: "Such a day, month, or year, I, such an one, of such a place, upon, or near such a river, do, of my own free consent and choice, repudiate thee, such an one, my late wife, banish thee from me, and restore thee to thy own liberty; and thou mayest henceforth go whither, and marry whom thou wilt: and this is thy bill of divorcement, and writing of expulsion, according to the law of Moses and Israel." This writing was signed by two witnesses, and delivered in the presence of as many, at least. From this time, the wife was as much at her liberty, as if she had been a widow; only, in both cases, she was obliged to stay, at least 90 days, before she was married to another, lest she should prove pregnant by the last. It does not appear that women were indulged by the law of Moses with the privilege of divorcing their husbands upon the same ground; unless in the case of a virgin betrothed by her parents before she was twelve years of age, who might then refuse to ratify the contract which her parents had made, without giving any other reason than that she did not like the person designed for her; but this cannot be called a divorcement, because there is no marriage in the case. Josephus, therefore, thinks (Ant. lib. xv. c. 11. xviii. 7. xx. 15.) that a divorce was so far from being permitted to women, that if the husband forsook his wife, it was not lawful for her to marry another, till she had first obtained a divorce from him. He adds, that Salome, sister of Herod the Great, was the first who took upon her to repudiate her husband, whose example was soon followed by others, mentioned by the same author.

Divorce is allowed by the Mahometan law, as it was by the Mosaic, with this difference only, that according to the latter a man could not take again a woman whom he had divorced, and who had been married or betrothed to another (Deut. xxiv. 3, 4. Jerem. iii. 1. Selden, ubi sup. l. i. c. 11.); whereas Mahomet, to prevent his followers from divorcing their wives on every light occasion, or from an inconstant humour, ordained, that if a man divorced his wife the third time (for he might divorce her twice without being obliged to part with her, if he repented of what he had done), it should not be lawful for him to take her again, until she had been first married and bedded by another, and divorced by such second husband. (Koran. ch. ii. p. 27.) This precaution has had so good an effect, that the Mahometans are seldom known to proceed to the extremity of divorce, notwithstanding the liberty given them; it being reckoned a great disgrace so to do: and there are few besides those who have little or no sense of honour, that will take a wife again, on the condition enjoined. (Seld. ubi. sup. l. iii. c. 21. Ricaut's Ottom. Emp. b. ii. c. 21.) It must be observed, that though a man is allowed by the Mahometan, as well as by the Jewish law, to repudiate his wife even on the slightest disgust, yet the women are not allowed to separate themselves from their husbands, unless it be for ill usage, want of proper maintenance, neglect of conjugal duty, impotency, or some cause of equal import; but then she generally loses her dowry; which she does not lose if divorced by her husband, unless she has been guilty of impudicity, or notorious disobedience. (Koran, ch. iv. p. 62.) When a woman is divorced, she is obliged, by the direction of the Koran, to wait three months before she marry another; after which time, in case she be not found with child, she is at full liberty to dispose of herself as she pleases; but if she prove with child, she must wait till she be delivered: and during her whole term of waiting, she may continue in her husband's house, and is to be maintained at his expence; it being forbidden to turn a woman out before the expiration of the term, unless she be guilty of dishonesty. (Koran, ch. ii. p. 26, 27. ch. 65. p. 454.) Where a man divorces a woman before consummation, she is not obliged to wait any particular time (Koran, ch. xxxiii. p. 348.); nor is he obliged to give her more than one half of her dower. (Koran, ch. ii. p. 28.) If the divorced woman have a young child, she is to suckle it till it be two years old; the father, in the mean time, maintaining her in all respects: a widow is also obliged to do the same, and to wait four months and ten days before she marry again. (Koran, ch. ii. p. 27. ch. 65.) These rules are copied from those of the Jews, according to whom a divorced woman, or a widow, cannot marry another man, till 90 days be past, after the divorce or death of the husband: and she who gives suck is to be maintained for two years from the birth of the child; within which time she must not marry, unless the child die, or her milk be dried up. (Mishna. Gemara. Maimonides. Selden ubi. sup. l. ii. c. 11. l. iii. c. 10.) See the Preliminary Disc. to Sale's Koran, p. 134.

According to Rycaut (State, Ottom. Emp. ch. xxi.) there are among the Turks three degrees of divorce. The first only separates the man and wife from the same house and bed, the maintenance of the wife being still continued: the second not only divides them in that manner, but the husband is compelled to make good her "Kabin," which is a jointure, or dowry promised at her marriage, so as to have no interest in him or his estate, and to remain in a free condition to marry another. The third sort of divorce (which is called "Ouch Talae") is made in a solemn and more serious manner, with more rigorous terms of separation; and in this case, the husband, repenting of his divorce, and desirous of retaking his wife, cannot by the law be admitted to her without first consenting and contenting himself to see another man enjoy her before his face, which condition the law requires as a punishment of the husband's lightness and inconstancy.

It appears from the preceding part of this article, that the power of divorce, or of dissolving the marriage contract, was allowed to the husband among the Jews, the Greeks, and later Romans; and that it is at this day exercised by the Turks, as it is also by the Persians. The late archdeacon Paley has inquired in his "Principles of moral and political Philosophy" (vol. i. p. 326, &c.) how far such a right is congruous with the law of nature: and he observes, that it is manifestly inconsistent with the duty which parents owe to their children; which duty can never be so well fulfilled as by their cohabitation and united care. It is also incompatible with the right which the mother possesses, as well as the father, to the gratitude of her children and the comfort of their society; of both which she is almost necessarily deprived by her dismission from her husband's family. Where this objection does not interfere, the ingenious writer is of opinion, that no principle of the law of nature is applicable to the question, beside that of general expediency. Reasons of expediency, he says, amply justify the policy of those laws, which refuse to the husband the power of divorce, or restrain it to be for extreme and specific provocations; and upon the principles of our author, that is contrary to the law of nature, which can be proved to be detrimental to the common happiness of the human species. A lawgiver, whose counsels were directed by views of general utility, and obstructed by no local impediment, would make the marriage contract indissoluble during the joint lives of the parties, for the sake of the following advantages.

Because, in the first place, this tends to preserve peace and concord between married persons, by perpetuating their common

common interest, and by inducing a necessity of mutual compliance; and, secondly, because new objects of desire would be continually sought after, if men could, at will, be released from their subsisting engagements. Constituted as mankind are, and injured as the repudiated wife must generally be, it is necessary to add a stability to the condition of married women, more secure than the continuance of their husband's affection; and to supply to both sides, by a sense of duty and of obligation, what satiety has impaired of passion and of personal attachment. Upon the whole, the power of divorce, possessed and exercised by the husband, is evidently and greatly to the disadvantage of the woman; and the only question appears to be, whether the real and permanent happiness of one half of the species should be surrendered to the caprice and voluptuousness of the other? The same objections, which may be urged against divorces, as depending upon the will of the husband, apply, in a great degree, to divorces by mutual consent; especially when we consider the indelicate situation and small prospect of happiness, which remain to the party, who opposed his or her dissent to the liberty and desires of the other. The law of nature admits of an exception in favour of the injured party, in cases of adultery, of obstinate desertion, of attempts upon life, of outrageous cruelty, of incurable madness, and, perhaps, of personal imbecility; but by no means indulges the same privilege to mere dislike, to opposition of humours and inclinations, to contrariety of taste and temper, to complaints of coldness, neglect, severity, peevishness, and jealousy; which are difficult to be ascertained; and if marriages were dissolved in consequence of such pleas, real or pretended, the effect would be the licentiousness of arbitrary divorces. Milton's story is well known. Upon a quarrel with his wife, he paid his addresses to another woman, and set forth a public vindication of his conduct, by attempting to prove, that confirmed dislike was as just a foundation for dissolving the marriage contract as adultery. But it may be argued, in addition to the observations already made, that if a married pair, in actual and irreconcileable discord, complain that their happiness would be better consulted, by permitting them to terminate a connection, which is become odious to both, the same permission, as a general rule, would produce libertinism, dissension, and misery, among thousands who are now virtuous, and quiet, and happy, in their condition; and it ought to satisfy them to reflect, that when their happiness is sacrificed to the operation of an unrelenting rule, it is sacrificed to the happiness of the community.

The law of Moses, as we have already seen, for reasons of local expediency, permitted the Jewish husband to put away his wife; but Christ, the precepts of whose religion were calculated for more general use and observance, revokes this permission, and promulges a law, which was thenceforward to confine divorces to the single cause of adultery in the wife. (Matt. xix. 9.) Nor is there any reason to depart from the plain and strict meaning of the words; though some maintain, that divorce is no where permitted in the New Testament for adultery, but only a separation. (See Matt. xix. 9. Mark, x. 11. 1 Cor. vii. 27. See also the council of Florence, at the end, after the questions proposed to the Greeks. Tertull. de Monogam. cap. 9 & 10. Augustin. de bono conjugio, et de Adult. conjug. See also Adultery.) The rule laid down by our blessed Lord was new. It both surprised and offended his disciples; yet Christ added nothing to relax or explain it.

Inferior causes may justify the separation of husband and wife, although they will not allow such a dissolution of the marriage contract, as would leave either party at liberty to marry again; for it is that liberty in which the danger and mischief of divorces consist. The law provides for separation in extraordinary cases, and has constituted a judicial relief from the tyranny of a husband, by the divorce *à mensa et thoro*, and by the provision which it makes for the separate maintenance of the injured wife. St. Paul likewise distinguishes between a wife's merely separating herself from the family of her husband, and her marrying again. "Let not the wife depart from her husband; but, and if she do depart, let her remain unmarried." The law of our country, as we have already stated it, conforms to our Saviour's injunctions, by confining the dissolution of the marriage contract to the single case of adultery in the wife; and a divorce, even in that case, can only be brought about by the operation of an act of parliament, founded upon a previous sentence in the ecclesiastical court, and a verdict against the adulterer at common law; which proceedings taken together compose as complete an investigation of the complaint as a cause can receive. The rite of marriage itself comprehends an exception of those impediments which justify those sentences of the ecclesiastical courts that release the parties *a vinculo matrimonii*.

Pope Innocent I. in his decretal to Exuperius, declares such as contract a new marriage after divorce, adulterers; as well as the persons with whom they marry. The occasion of this decree was, that such marriages were then allowed of by the Roman laws. There is an exception, however, in case of marriage between two heathens, which the decrees allow to be dissolved after the conversion of one of the parties. And St. Paul says the same, 1 Cor. vii. 15. Yet even in this case, 1. The marriage is not immediately dissolved by the conversion of one of the parties, but they may still live together, and even on some occasions they ought to do so. Nor is it even dissolved by the separation of the infidel party; for if she be afterwards converted, he is obliged to take back his wife. But the marriage is totally dissolved by a second marriage of the converted party with another person.

2. Though the party converted to the faith may, the minute of his conversion, legally separate himself, and contract with another, a liberty the Christian law allows him, as in justice he is not deemed to owe any thing to an infidel; yet charity frequently forbids such divorce, and separation: as, *e. g.* if the infidel consent to live with him, and do not molest him in his religion; if his faith be not at all in danger; if there be any hopes of converting her, or of gaining the children; if the separation would prove a scandal to the heathens, and render Christianity odious, &c. See St. Paul, 1 Cor. vii. 13, 14.

The fourth council of Toledo decrees, that in a country where Christianity is the prevailing religion, the infidel party must be advertised to become Christian; which if she refuse, the marriage must be dissolved.

The council of Trent prohibits divorce on any occasion whatever. The papal dispensations, however, are a salvo for this instance of rigour.

DIUR, in *Ancient Geography*, a river of Africa, in Mauritania Tingitania, according to Ptolemy; it is called *Viar* by Pliny.

DIURESIS, in *Medicine*, a free excretion of urine, whether produced spontaneously by an effort of the constitution, or artificially by the action of medicines. Vogel has constituted a genus of disease under this term, including the casual, or periodical discharge of urine, symptomatic of hysteria, &c. and distinct from diabetes. Gen. Morbor, Cl. ii.

DIURETICS, in the *Materia Medica*, from διὰ and οὖρον, the

the urine, those medicines which promote the secretion of urine.

The secretion of the urine may be promoted, either by increasing the quantity of water in the mass of the blood, (see DILUENT); or, that remaining the same, by introducing a matter which may be a stimulus to the secerning vessels of the kidnies, and excite them to increased action.

If much liquid is taken into the stomach, and thence into the mass of blood, it must necessarily pass off by one of the excretions, perspiration, or urine; and we commonly find, indeed, that an increase of the quantity of drink is attended with a proportional increase in the quantity of urine secreted. Accordingly this increase of drink has always been considered as the chief of diuretics. There are, however, certain states of the body, in which it may be doubtful, whether this means of increasing the secretion of urine may be safely employed. It sometimes happens that the water of the blood, instead of passing off by the excretions, is effused into some of the cavities of the body, giving rise to the well-known disease of dropsy: and in such a case it may be suspected, that an increase of the water in the blood, occasioned by an increase of drinking, may augment the effusion just mentioned, and aggravate the disease. This suspicion has prevailed so much with physicians, as to lead them in such cases to enjoin, as much as possible, an abstinence from drinking; and it is alleged that such an abstinence has, in some cases, entirely cured the disease.

But the truth of this statement will perhaps not bear a very rigorous inquiry; and it may be confidently asserted, that such facts are, at least, of extremely rare occurrence; and the numerous instances in which such abstinence has been attempted with little or no benefit, have led many physicians to recommend that it should not be attempted at all. It is, in fact, an extremely painful measure, to resist the urgent desire of drink, which commonly attends this disorder: and as far as careful observation has gone, we believe it to have been decided that the use of drink is safe in dropsy; and that the quantity of urine voided, where it is permitted, is usually equal to the quantity of drink taken in. Sometimes it is even greater; especially when the drink is taken tepid, or is mixed with materials, that are slightly stimulant to the kidnies, such as weak gin punch, &c.; for in whatever way the kidnies are incited to action, that action sometimes goes on, after the immediate stimulus has passed off; while, on the contrary, the want of action, whether from absence of the watery part of the blood, or other causes, itself conduces to a farther inactivity. Thus Dr. Cullen affirms, "I have frequently found that a very entire abstinence from drinking, by diminishing the quantity of urine voided, allowed the secretories of the kidnies to fall into a contracted state, so that the quantity of urine voided was still farther diminished, and, as I judged, tended to increase the effusion, and thereby to aggravate the disease. In other cases I found, that when a quantity of drink was taken in, a considerable portion of it passed by the kidnies; and when, as sometimes happened, the quantity of urine voided was equal to the drink taken in, I concluded that the giving so much drink was a perfectly safe measure." Materia Medica, vol. ii. p. 547.

To illustrate the matter still farther, the same intelligent physician has remarked, that the water of the blood, carrying the saline matters of it, is, by the nature of the animal economy, determined to the excretions, and particularly to the kidnies; and therefore, that drinks impregnated with saline matters are naturally determined this way, rather than by the preternatural effusions of dropsy. The fluid poured out in these effusions is nearly insipid; whilst, though the watery part of the blood is by these withdrawn from the secretories of the kidnies, yet a great quantity of the saline matter of the blood continues to pass this way; and therefore he had been led to give for drinks, not simple water, but always water impregnated with saline matters; and he asserts, that water, so impregnated, passes more certainly to the kidnies, than perfectly insipid liquors. Thus water impregnated with vegetable acids is not only more grateful to the patient than simple barley-water, or watergruel, but passes always in greater quantity, in proportion to the liquid taken in. In the same way some other liquors are particularly well suited for drinks in the dropsical state; such as fermented liquors of all kinds, when these are either weak in their quality, or taken pretty well diluted with water. Even ardent spirits, if largely diluted, and joined with a portion of vegetable acid, have been found to stimulate the kidnies, and hence to make a proper part of the ordinary drink. The milk of the non-ruminant animals, and the products of whey and butter-milk from the other sorts of milk, especially when these products are in their most acid states, are useful as drinks in the disorders in question.

In a word, with respect to the propriety of taking drink in dropsy it may be observed, that whenever we perceive that the quantity of urine voided is equal to the quantity of drink for the same time taken in, it is obviously safe to allow as much drink as the patient may desire; and there is no doubt, that, by such indulgence, the disease may be often entirely cured. There are in fact many instances of the cure of dropsy, in this manner, on record; as the cases published by sir George Baker, in the Medical Transactions, and those quoted by sir Francis Milman from several authors, and especially the instances given by that ingenious author from his own experience; see his Treatise on Dropsy. "From my own practice," Dr. Cullen justly observes, "I always thought it absurd in physicians to employ diuretics, while they enjoined an abstinence from drink, which is almost the only means of conveying these diuretics to the kidnies: so, whenever I employ diuretics, I at the same time advise drinking freely; and I am persuaded that drinking largely has often contributed to the cures I have made." Loc. cit.

The number of substances, which have been praised by different writers, as possessed of diuretic powers, or capable of stimulating the action of the kidnies, is very great, especially from the vegetable world. Many of them, however, are very inefficacious; and it is the common imperfection of the whole of this class to be very uncertain in their operation: sometimes the more feeble diuretics will succeed, when the stronger have failed; and often after every variety of kind and combination has been tried, the secretion of urine remains unaltered. Digitalis, squill, mercury, and crystals of tartar separately or combined, are the most efficacious of the class; but the alkalies both fixed and volatile, some of the neutral salts, the nitrous ether, the terebinthates, &c. are by no means useless as auxiliaries. There is, perhaps, no class of medicines, in which a combination of two or more substances, possessing similar powers, is so frequently important, as in that of the diuretics. Thus the use of potass, joined with bitter vegetables, is recommended by sir John Pringle, as an efficacious medicine: and as the alkaline substances may be often prevented, by purging, from reaching the kidnies, so their diuretic effect may be often more certainly secured by giving an opiate at the same time, according to the practice of Dr. Mead. A combination of the squill, with digitalis, and some of the less purgative preparations of mercury, as the common blue pill, is occasionally very active in its diuretic operation; and, in children, or in old and feeble people, the union of the spirit of nitrous ether, or of other diuretic substances, with the bark, or other vegetable tonics, appears to be often very serviceable.

The mode in which diuretic medicines effect the removal of dropsies is not satisfactorily understood. The discharge of the water by the kidnies implies the previous absorption of it, from the cavities into which it was effused. Whether, therefore the primary action of diuretics is on the absorbent system, which takes up the serum, and excites diuresis by increasing the water of the blood, as stated with respect to diluent drinks; or whether the diminution of the water of the blood, in consequence of increased action in the kidnies, may occasion an extraordinary action of the absorbents, to supply the deficiency, it is not easy to determine. It is sufficient, however, that we know the practical fact, that diuretics do, at the same time, increase the discharge of urine, and diminish the watery effusions which constitute dropsy.

In asthma, dyspnœa, chronic catarrh, and other chronic diseases of the lungs, diuretics afford relief; perhaps in consequence of the balance between the halitus of the lungs, (as well as of the skin) and the urinary secretion. "In omnibus morbis pectoris," says Baglivi, "ad urinam spectandum."

It may be added that a suppression of urine sometimes takes place, particularly in children, from a slight weakness, or temporary paralysis of the fibres of the bladder, which is readily removed by the application of cold to the lower extremities, so that the urine will speedily begin to flow, when the patient is placed with his naked feet on a cold hearth, or cold water is dashed over his legs.

DIURETIC *Salt* is the old name for *acetite of potash*, which see.

DIURIS, in *Botany*, (from δις, *double*, and ουρα, *a tail*, expressive of the long lower leaves of the calyx hanging down like two tails,) Sm. Transf. of Linn. Soc. v. 4. 222. Swartz. Orchid. 58. t. 1. f. M. Willd. Sp. Pl. v. 4. 79. Class and order, *Gynandria Monandria*. Nat. Ord. *Orchideæ*.

Gen. Ch. *Cal.* Perianth spreading, of five leaves; the three uppermost coloured, of which the central one is sessile, somewhat vaulted, the two lateral ones with claws, ovate; two lowermost elongated, channelled, linear-lanceolate, pointing downwards, under the lip. *Cor.* Petals four, much smaller than the calyx, lateral; the two outermost obovate, rather spreading; two inner erect, acute, sometimes lobed. Nectary an ovate convex pendulous lip, shorter than the calyx, without a spur, with two erect teeth reaching from the base to the middle of its upper surface. *Stam.* and *Pist.* Germen inferior, oblong, somewhat cylindrical, furrowed; style short, reversed, pointed; stigma near the extremity, oblique. Anther parallel to the style, on the side opposite to the lip; its lid elliptical, with two parallel oblong cells. *Peric.* Capsule of one cell, with many seeds.

Ess. Ch. Nectary a pendulous lip without a spur. Calyx of five leaves; the three uppermost coloured. Petals four, lateral. Style reversed.

1. D. *punctata*. Sm. Exot. Bot. v. 1. 13. t. 8. Blue dotted Diuris. "Two lower calyx-leaves linear, thrice as long as the lip; two lateral ones rounded, entire."—Native of New South Wales, near Port Jackson, in a good soil, flowering from July to October. *Stem* about two feet high, clothed with a few sheathing scale-like leaves. *Flowers* large and handsome, about four in a loose, upright, terminal spike, with linear channelled bracteas shorter than the flowers. The two lower calyx-leaves are green, an inch and half long; the rest, as well as the lip and petals, are of a delicate lilac hue, dotted, represented much too deep and too blue in the figure of Exot. Bot. and the two lateral upper calyx-leaves there also seem too pointed. 2. D. *aurea*. Sm. Exot. Bot. v. 1. 15. t. 9. (D. spatulata; Sw. Orchid. 107.) Golden Diuris.—"Two lower calyx leaves lanceolate, not twice as long as the lip; two lateral ones elliptical, acute, with short claws."—From the same country, where it blossoms in October. *Root* a double bulb, as in most Orchises. *Stem* twelve or fourteen inches high, bearing one or two concave sheathing scales. *Leaves* one or two, radical, erect, linear-lanceolate. *Flowers* from three to five in the spike, but half the size of the last, of a bright golden yellow, their claws stained, and the lip spotted with red. Two inner petals lanceolate, entire, which in the former have a notch on one side. 3. D. *maculata*. Sm. Exot. Bot. v. 1. 57. t. 30. Willd. Sp. Pl. v. 4. 79. Yellow Spotted Diuris.—"Two lower calyx-leaves lanceolate, twice as long as the lip; two lateral ones rounded, obtuse, with long claws."—Native also of New South Wales. It differs from the last in having a more zig-zag flower-stalk, and especially in the three upper leaves of the calyx being rounded, all spotted like the lip and outermost petals with blotches of red. The two lower green calyx leaves often cross each other.

These plants would be a very desirable acquisition to our gardens, and perhaps might be brought over alive if their roots were taken up while in flower, and replanted in pots of dry sifted earth, being afterwards duly watered occasionally, according to the method recommended by Mr. Crowe for European *Orchideæ*; see Sm. Introd. to Botany, 110.

DIURNAL, from *dies*, day, in *Astronomy*, something relating to the day; in opposition to nocturnal, which regards the night.

DIURNAL *arch*. See ARCH.

DIURNAL *circle*. See CIRCLE *Diurnal*.

DIURNAL *motion of a Planet*, is so many degrees and minutes, &c. as any planet moves in twenty-four hours.

The DIURNAL *motion of the earth*, is its rotation round its axis, the space whereof constitutes the natural day. See *Motion of the* EARTH.

DIURNAL is also used in speaking of what belongs to the nycthemeron, or natural day of twenty-four hours. In which sense it stands opposed to annual, menstrual, &c.

DIURNAL, *Diurnale*, low Latin, a book containing those canonical hours of the Roman breviary, which are to be said in the day time, namely, lauds, prime, terce, &c. in opposition to the nocturns which were appointed to be said in the night.

DIURNARY, DIURNARIUS, an officer in the Greek empire, who wrote down, in a book for that purpose, whatever the prince did, ordered, regulated, &c. every day.

DIUTURNITY, the long continuance or duration of any being.

DIVUS, DIVA, in *Antiquity*, appellations given to men and women who had been deified, or placed in the number of the gods.

Hence it is, that on medals struck for the consecration of an emperor or empress, they gave them the title of Divus, or Diva. For example: DIVUS JULIUS. DIVO ANTONINO PIO. DIVO PIO. DIVO CLAUDIO. DIVA FAUSTINA AUG. &c.

DIVY, in *Geography*, an island of the East Indies, on the coast of Orixa, south-west of Mazulipatam, which formerly belonged to the French. It is formed partly by the sea and partly by the river Crichena, which being divided into two arms, surrounds a country of about 75 miles in circumference, and from 15 to 18 miles in diameter, and discharges itself into the ocean by means of two unequal æstuaries, one of which, to the north-east of the island, is called Ampfaldivy, and the other to the south-west, which is the real Crichena, but commonly called Chipler mouth. (Herbin Statistique de la France.) The benefit which France derived from this island is computed at 240,000 livres *per annum*.

DIVY *point*, a cape of Hindoostan, on the east-coast of the

the circar of Condapilly, in the bay of Bengal. N. lat. 15° 55′. E. long. 81° 20′.

DIXAN, a town of Abyſſinia, ſeated on the top of a hill in the form of a ſugar-loaf; ſurrounded by a deep valley like a trench, and having a road that winds ſpirally up the hill till it terminates among the houſes. It is inhabited partly by Moors, and partly by Chriſtians, and is very well peopled; and the only trade of the place is that of ſelling children. The Chriſtians bring ſuch as they have ſtolen in Abyſſinia to this frontier town as to a ſure depoſit; and the Moors receive them there, and carry them to a certain market at Maſuah, whence they are ſent over to Arabia or India. The prieſts of the province of Tigré, eſpecially thoſe near the rock Damo, are concerned in this infamous traffick, and ſome of them are licenſed to carry it on as a fair trade, upon paying ſo many ſirelocks for each dozen or ſcore of ſlaves. The Naybe of Dixan receives ſix patakas of duty for each one exported. N. lat. 14° 57′ 55″. E. long. 40° 7′ 30″.

DIXAIN, a topical diviſion of the Vallais; which ſee.

DIXBILLS, a poſt town of America, in the county of Suffolk and ſtate of New York; 290 miles N. E. of Waſhington.

DIXFIELD, a town of America, in the ſtate of Maine and county of Cumberland, on the north bank of Androſcoggin river, having Jay on the E. and Wilton N.; about 70 miles N. of Portland.

DIXIEME, *Fr.* the 10th in *Muſic*, that is to ſay, the octave of the 3d, or 3d of an octave.

DIXMONT, in *Geography*, a ſmall town of France, in the department of the Yonne; ſix miles north of Joigny.

DIXMUDE, a ſmall town of France, in the department of the Lys, chief place of a canton in the diſtrict of Furnes, with a population of 2521 individuals. It is ſituated in a fertile plain on the river Yperlée; nine miles north of Furnes and Nieuport, and 24 eaſt of Dunkirk, lat. 51° 2′ 6″, and remarkable for its excellent butter, which is really of the very firſt quality. The canton has 10 communes and 15,256 inhabitants, upon a territorial extent of 147½ kiliometres.

DIXNEUVIEME, 19th double octave of the 5th in *Muſic*.

DIXON, in *Geography*, a town of America, in South Carolina; 27 miles eaſt of Camden.

Dixon's *Entrance*, lies on the N. W. coaſt of North America, and is the paſſage into the ſound between the Main land and Waſhington's or Queen Charlotte's iſlands, from the north-weſt. It ſeems to be what is called in America *Barrell's Sound*.

Dixon's *Springs*, in Smith's county, Teneſſee. Here is a poſt-office; 691 miles W. by S. from Waſhington.

DIXSEPTIEME, *Fr.* 17th double octave of the 3d in *Muſic*. Every ſounding body gives with its principal ſound, its major 17th preferably to its immediate 3d, or 10th, becauſe the 17th is produced by an aliquot part of the whole ſtring, *i. e.* a 5th part; whereas, neither ⅘, which would give the 3d, nor ⅔, which would give the 10th, are aliquot parts of a ſtring. See Sound, Interval, Harmony.

DIZABAD, in *Geography*, a town of Perſia, in the province of Irak; 60 miles S.S.E. of Amadan.

DIZIER, Saint, in Latin *Sancti Deſiderii Fanum*, a town of France, in the department of the Upper Marne, chief place of a canton in the diſtrict of Waſſy, with a population of 5824 individuals. It is ſituated on the river Marne, at the ſpot where this river becomes navigable, 18 miles E. of Vitry, 15 S. W. of Bar le Duc, 168 E. of Paris, lat. 48° 35′; and chiefly remarkable for ſeveral iron mines and forges, and manufactures of caſt-iron, linen-cloth, leather, hoſiery, and hats. The canton has 14 communes, a territorial extent of 172 kiliometres and a half, and 11,449 inhabitants.

DIZOSTOS, in *Botany*, a name given by ſome of the old Greek writers to the apios, or knobby-rooted ſpurge: it is ſo called, becauſe of its having uſually two or three ſlender and ruſh-like ſtalks, growing up from the roots, which ſeem as if they were fit to be uſed as cords or bandages. See Apios.

DIZUM, or Ditsum, in *Geography*, a town of Germany, in the circle of Weſtphalia, and county of Eaſt Frieſland; four miles S.S.E. of Emden.

DIZZINESS, in *Medicine*. See Vertigo.

DMITREVSKOI, in *Geography*, a town of Ruſſia, in the government of Jaroſlavi, or Yaroſlaf; 68 miles N.N.W. of Jaroſlavi or Yaroſlaf.

DMITRIEV Svopa, a town of Ruſſia, in the government of Kurſk, on the Svopa; 20 miles N.N.W. of Kurſk, and 432 S.S.E. of Peterſburg. N. lat. 52° 5′. E. long. 71° 16′.

DMITRIJA Rostovskoi, a town of Ruſſia, in the province of Uſting, on the Sula; 140 miles E.S.E. of Uſting.

DMITROFSK, a town of Ruſſia, in the government of Orel, ſeated on the rivulet Neruſer, falling into the Sioſ.

DMITROV, a town of Ruſſia, in the government of Moſcow, ſeated on the ſmall river Vakhroma, which, uniting with the Seſtra, forms the river Dubnia. The environs are celebrated for yellow and white apples, which are ſo tranſparent, that the pips may be ſeen through the rind; 32 miles north of Moſcow.

DNEPROVSK, a town of Ruſſia, in the government of Tauris, or Crim Tartary, on the Dnieper; 80 miles S.S.W. of Ekaterinoſlav.

DNIEPER, Dniepr, Niepeg, Danapris, the Boryſthenes of ancient geographers, one of the largeſt rivers in Europe, has its ſource in Ruſſia, in the government of Smolenſk, not far from the mountains whence iſſue the Duna and the Wolga, and runs ſouthwards through Lithuania, the country of the Zaporog Coſſacks, and that of the Nogaï Tartars into the Euxine or the Black ſea, at Kinburn, near Oczakow. It purſues a courſe of about 1500 verſts through the fertile provinces of Smolenſko, Mohilef, Tſchernigof, Kief, and Ekaterinoſlav. At Smolenſk it generally freezes in November, at Krementſchuk in December, and at Kief in January. Its bed is partly ſandy and ſtony, and partly of marle. The water, though calcareous, is not reckoned unwholeſome. The iſlands which the Dnieper forms in its windings are extremely numerous. In many places it has commodious ferries. At Kief there is a bridge of boats 1638 feet, or 546 fathoms in length; this bridge is opened at the breaking of the ice.

The Dnieper abounds with fiſh, particularly ſturgeon, carp, and pike. It is navigable from Smolenſko to Kief: but below this town, at the diſtance of 60 verſts from the influx of the Siera, down to Alexandroſkaia, thirteen cataracts, cauſed by a multitude of blocks of granite projecting into the river, impede its navigation. Empty barks only can get over the cataracts at high water. The cargoes are re-ſhipped in other veſſels, 70 verſts lower down.

From the waterfalls, to the mouth of the Dnieper, the diſtance of about 400 verſts, this river is navigable with perfect ſafety. But at Cherſon there are only five to ſix feet water in the deepeſt channel of the Dnieper, near the diſgorging of all its branches into the Liman, which is a ma[illegible] lake about 60 verſts in length and 10 in breadth. Mr. W. Elton, aſſerts, however, that this bar is not very broad, and

that to deepen it would not require more than 40,000*l.* sterling, according to the calculation of a Dutch engineer.

The banks of the Dnieper, as far as Kief, are covered with thick forests, which yield those fine masts that are exported from Riga. Below Kief the shores are mostly bare; but the contiguous provinces yield such an abundance of corn, that as much might be exported from the Dnieper and Caffa as would supply almost all Europe.

The forests which contain the best masts are situated on the Bransk river, which, together with several other streamlets, as the Soshi, the Desna, the Soola, the Psiol, the Vorskla, the Sammara, the Ingulatz, falls into the Dnieper. Tooke's View of the Russian Empire.

DNIEPER, *the Steppe of the*, is one of the numerous vast plains of Russia, in the government of Ekaterinoslav, between the Dnieper and the Bogue. It includes the Crimæan Steppe on the left side of the Dnieper, and the whole space which extends over the Donetz to the Don, the sea of Azof, and the Black sea; consequently the greatest part of the governments of Ekaterinoslav, Taurida, and a part of Voronetz, Karkhof, and Kief. It is in general very dry and sandy, has many salt lakes, and is as yet but little inhabited, although some of its districts seem fit to be adapted to pasturage and agriculture. Tooke's View of the Russian Empire.

DNIESTR, or NIESTER, a river of Poland, which passes by Halics, Choczim, Sarska, Rafzcow, Egerlik, Bender, &c. and discharges itself into the Black sea, at Akerman. See NIESTER.

DO, in *Music*, a syllable substituted by the Italians to *ut* in solemnization, as more vocal and fit for the exercise of the voice, for which *u* is the most unfavourable of all the vowels, and *t* totally stops all emission of sound.

Do *Law*.—To *do law facere legem*, is the same as to *make law*, anno 23 Hen. VI cap. 14. See MAKE.

Do, *ut d's* and *ut facias*. See CONSIDERATION.

DOABEH, in *Geography*, a river of Asia, which changes its name to Kameh, near Cabul.

DOAN, a town of Arabia, in the province of Hadramaut, the residence of a schiech; 25 days' journey east from Sana, and 11 from Keschim; said to be a larger and more elegant city than Sana.

DOANÆ, in *Ancient Geography*, a people of India, on the other side of the Ganges, placed by Ptolemy on the river *Doanas*. The mouth of this river is referred by M. D'Anville to the bay, in which was situated the town of Berobe. *Doanas* is also the name of a town of India, on the other side of the Ganges; called *Tanx-Serim*.

DOARA, an episcopal see of Asia, in Cappadocia.

DOARÇON, or DOIARÇON, or *Oiarçon*, in *Geography*, a river of Spain, which runs into the bay of Biscay, near port Passage.

DOBA, or DABA, a town of Arabia, in the province of Oman; 144 miles N.N.W. of Mascat.

DOBARUA, or DOBAROWA, a town of Abyssinia; 120 miles E. of Siré.

DOBB'S FERRY, a ferry on Hudson's river in America; 26 miles above the city of New York.

DOBBER, a town of Arabia; 36 miles N.W. of Sana.

DOBBERAN, a small town of Germany, in the duchy of Mecklenburg-Schwerin, about ten miles N.E. of Rostock, and two S. of the Baltic sea, had formerly a celebrated monastery founded in 1170, and rebuilt in 1185, in the church of which are the tombs of two kings of the Obotrites, and of several princes of Mecklenburg. But it has acquired far greater celebrity within the last twenty years as a watering place, the first for sea-bathing in Germany. The bathing-house is charmingly situated in a wood on the shore of the Baltic, about two miles from the town. There are nine cold and one warm baths, and excellent bathing machines for those who wish to bathe in the sea. There are also good accommodations for invalids and infirm persons, who cannot walk or ride from Dobberan to the bathing place. Dobberan itself has very good lodging houses, and two extensive and well kept hotels, in which the company dine together, as at the hotels of Harrowgate. The duke of Mecklenburg-Schwerin patronizes this establishment, and frequently dines with the company, which is generally select, and composed of the first families in the north of Germany. The situation of the town is cheerful, the climate salubrious, and the place affords all the amusements that are fought for in the best watering places. F. L. Röper's Geschichte und Anecdoten von Dobberan in Mecklenburg nebst einer Beschreibung der Bæder und des Badenzuses. Neu Strelitz 1797.

DOBBS, a county of North Carolina.

DOBBS, *Cape*, a cape in Hudson's bay, at the S. side of the entrance of Wager's river. N. lat. 65°. W. long. 86° 30'.

DOBCHICK, in *Ornithology*. See DIDAPPER.

DOBELEHN, or DOBLEHN, in *Geography*, a small town of Russia, in the government of Courland, in the province of Semgallen, or Semigallia, with an old castle.

DOBELN, a town of Germany, in the circle of Upper Saxony, and circle of Leipsic; 24 miles W.N.W. of Dresden, and 14 W. of Meissen.

DOBERA, in *Botany*. (Dober of the Arabians,) Juss. 405. Class and order, *Tetrandria Monogynia*. Nat. Ord. uncertain. Juss.

Gen. Ch. *Cal.* Perianth, urceolate, with four spreading teeth. *Cor.* Petals four, twice as long as the calyx, linear-lanceolate, somewhat spreading. Nectary of four erect, roundish abrupt, green, fleshy glands, between the petals and stamens, one third as long as the filaments. *Stam.* Filaments four, erect, awl-shaped, united at their base into a square tube; anthers erect, lanceolate, as long as the filaments. *Pist.* Germen superior, cylindrical, somewhat swelling, half the length of the calyx; style half the length of the germen; stigma capitate, of two lobes. *Peric.* Drupa oval, fleshy, internally viscid. *Seed* one, ovate-oblong, fleshy.

Ess. Ch. Calyx four-toothed. Petals four. Nectary of four glands, betwixt the petals and stamens. Drupa superior, with one seed.

D. *glabra*. (Tomex glabra; Forsk. Ægypt. Arab. 32.) Frequent at Surdûd, and called by the Arabians Dober. It is, according to Forskâl, the only botanist who has seen it, a very large tree, with opposite, ovate, flaked, coriaceous, entire *leaves*, tapering at each end. *Flowers* white. *Fruit* eatable, an inch long, green, with violet-coloured viscid insipid pulp.

DOBERI, in *Ancient Geography*, a people of Macedonia, in Pæonia, called *Doberes* by Herodotus, and probably the inhabitants of the town called *Deb.ros* by Thucydides.

DOBERSCHAU, anciently *Dobrus* in *Geography*, a small, but very old town of Saxony, in the circle of Meissen, on the river Soree; 3 miles S. of Bautzen. It is mentioned as a strong place in a document of the year 1228, which fixes the limit between the kingdom of Bohemia and Misnia.

DOBERSDORP, a town of Germany, in the duchy of Holstein; 10 miles W. of Lutkenburg.

DOBERSPERG, a town of Germany, in the archduchy of Austria; 4 miles N. of Bohmisch Waidrofen.

DOBERTIN, or DOBBERTIN, a small town of Germany, in the duchy of Mecklenburg-Schwerin, situated on

a fmall lake; 15 miles S. of Guftrow, with a Lutheran convent for ladies, which poffeffes twenty-eight villages.

DOBLEN. See Dobelehn.

DOBORBICA, in *Ancient Geography*, a ftrong town of Illyria.

DOBOREVA, in *Geography*, a town of Bofnia; 28 miles S.S.E. of Serajo.

DOBOSNA, a town of Lithuania, in the palatinate of Minfk; 12 miles N.W. of Rohaczow.

DOBOY, a fmall American ifland in the Atlantic, near the coaft of Georgia. N. lat. 31° 28'. W. long. 81° 31'.

DOBRA, a town of Tranfilvania; 20 miles W.N.W. of Millenbach.—Alfo, a town of Servia; 17 miles W. of Orfova.

DOBRADIEN. See Gutentag.

DOBRAKOTZ, a town of Hungary; 19 miles S. of Symontornya.

DOBRATA, a town of European Turkey, in the province of Moldavia; 40 miles W. of Jaffy.

DOBRATICZ, a town of Lithuania, in the palatinate of Brzefc; 6 miles S. of Brzefc.

DOBRAWIZ, a town of Bohemia, in the circle of Boleflau; 4 miles S. of Jung-Buntzlau.

DOBRE, a town of Poland, in the palatinate of Belez; 56 miles W.S.W. of Belez.

DOBRENIZ, a town of Bohemia, in the circle of Konigingratz; 8 miles S.W. of Konigingratz.

DOBRIANKA, a town of Ruffia, in the government of Mogilev; 116 miles S. of Mogilev.

DOBRILOW, a town of Poland, in the palatinate of Red Ruffia; 32 miles S of Halicz.

DOBRILUGK, Doberlug or *Dobralug*, a fmall town of Saxony, in Lower Lufatia; 15 miles from Luckau, with an ancient caftle, which originally was a monaftery founded in 1181. It has 800 inhabitants.

DOBRITZ, a fmall town of Saxony, in the circle of Mifnia, not far from the town of Meiffen, or Mifnia; at the foot of a mountain called the *Hohe Eyfer*, the top of which has fome ruins of an old caftle, known by the name of *Altenburg*. This caftle is fuppofed to have been built in 1068, by Wratiflaus, king of Bohemia, and margrave of Mifnia, and to have been deftroyed by the Saxons, who refufed to acknowledge him for their ruler.

DOBROFORT, a town of Poland, in the palatinate of Belez; 8 miles S. E. of Belez.

DOBROMIL, a town of Poland, in the palatinate of Lemberg; 32 miles S.W. of Lemberg.

DOBRONIVA, a town and caftle of Hungary; 6 miles N.E. of Schemnitz.

DOBRUSKA, a town of Bohemia, in the circle of Konigingratz; 3 miles N.E. of Konigingratz.

DOBRZIN, or Dobrzyn, a fmall town of the grand duchy of Warfaw, not far from the Viftula, fituated on a rock; 15 miles E. of Wladiflaw of Jungenleflau, in a diftrict of the fame name; in that part of Poland called Cujavia, which at the partition of that kingdom fell to the lot of Pruffia; but by the peace of Tilfit has been tranferred to the king of Saxony.

DOBSHENA, a town of Hungary; 12 miles S.S.W. of Kopfdorf.

DOBSON, William, in *Biography*, an eminent painter and engraver, was born at London in 1610; and having received fome inftruction from Francis Cleyn, was indebted for his principal improvement to fome pictures of Titian and Vandyck, which he copied, retaining in fome degree the manner of thefe two maffers. It is faid that his advancement from an obfcure condition was owing to the following circumftance: as Vandyck was paffing by a fhop on Snow-hill, in London, he faw in a window a picture of Dobfon's painting, which ftruck him fo much, as to induce him immediately to enquire after the author. He foon found him at work in a poor garret, refcued him from this fituation fo unfuitable to a perfon of his diftinguifhed merit, and provided him with accommodations, correfponding to his talents. He afterwards recommended him to king Charles I., who took him into his fervice, and honoured him with the flattering appellation of the Englifh Tintoret. His profpects of thus acquiring an eafy fortune were beclouded by his diffolute life, by which he ruined his conftitution, and diffipated all his gains, fo that he was imprifoned for debt and died in London, foon after his releafe, A. D. 1646, at the age of 36, or, as Strutt fays, A.D. 1647, aged 37 years. "The manner of this artift is bold, free, and fweet, with a charming tone of colour; and although he was inferior to Vandyck in the gracefulnefs of his figures, yet he gave life, dignity, and fentiment to his portraits; and for truth, character, and refemblance, few have furpaffed him." At Wilton there is a picture of the "Decollation of St. John" by Dobfon; and at Blenheim, Northumberland Houfe, and the duke of Devonfhire's, there are feveral capital pictures of this mafter. Pilkington and Strutt.

DOBULA, in *Ichthyology*, a fpecies of *Cyprinus*; which fee.

DOBUNI, in *Ancient Geography*, called by Dio *Boduni*, ancient inhabitants of Britain, who were feated in the counties of Glouceftcr and Oxford. Both the names of this Britifh nation feem to have been derived from the low fituation of a great part of the country which they inhabited: for both *Duvn* and *Bodun* fignify profound or low, in the ancient language of Gaul and Britain. (Baxt. Gloff. Brit.) The Dobuni are not mentioned among the Britifh nations which refifted the Romans under Julius Cæfar; which was probably owing to the diftance of their country from the fcene of action; and before the next invafion under Claudius, they had been fo much oppreffed by their ambitious neighbours the Cattivellauni, that they fubmitted with pleafure to the Romans, in order to be delivered from that oppreffion. Cogidunus, who was at that time (as his name imports) prince of the Dobuni, recommended himfelf fo effectually to the favour of the emperor Claudius, by his ready fubmiffion, and other means, that he was not only continued in the government of his own territories, but had fome other ftates put under his authority. (Tacit. Vit. Agric. c 14.) This prince lived fo long, and remained fo fteady a friend and ally to the Romans, that his fubjects being habituated to their obedience in his time, never revolted, nor ftood in need of any forts or forces to keep them in fubjection. This is certainly the reafon why we meet with fo few Roman towers and ftations in the country anciently inhabited by the Dobuni.

The Durocornovium of Antoninus, and the Corinium of Ptolemy, are fuppofed by antiquaries to have been the fame place, the capital of the Dobuni, and fituated at Cirencefter in Glouceftcrfhire, where are many marks of a Roman ftation. Clevum, or Glevum, in the 13th iter of Antoninus, ftood where the city of Glouceftcr now ftands; and Abone, in the 14th iter, was probably fituated at Avinton on the Severn. The country of the Dobuni was comprehended in the Roman province, Britannia Prima.

DOBYGUR, a fortrefs of Hindoftan, in the Carnatic; 14 miles S. of Velore. This fortrefs, and alfo that of Carnatic-gur, lie in the ridge of hills on the weft of Arnee; the latter bears about N. by W. at the diftance of about 3 miles from the former.

DO-CARMO, a town of South America, in the country of Brazil. S. lat. 20° 20′. W. long. 26° 35′.

DOCE, or *Fresh water river*, a river of Brazil, which runs into the Atlantic. S. lat. 19° 12′. W. long. 23° 20′.

DOCEA, in *Ancient Geography*, a town of Asia, in the Lesser Armenia.

DOCELA, a town of Asia, in the Greater Phrygia.

DOCETÆ, from δοκεῖν *to appear*, in *Ecclesiastical History*, the followers of Julius Cassianus, one of the Valentinian sect, towards the close of the second century, who revived a notion that had been adopted by a branch of the Gnostics, against whom St. John, Ignatius, and Polycarp, had asserted the truth of the incarnation. They believed and taught, as their name imports, that the actions and sufferings of Jesus Christ were not in reality, but only in appearance.

DOCETTES, in *Geography*, a town of France, in the department of the Vosges; 2½ leagues from Remiremont.

DOCHABAD, a district of Persia, forming the western boundary of the empire of Candahar, about 30 or 40 miles to the east of Tushiz.

DOCIMASIA, Δοκιμασία, from δοκιμάζω, *I try*, in *Antiquity*, a custom among the Athenians, by which every man, before he was admitted to a public employment, was obliged to give an account of himself and his past life, before certain judges in the forum; for if any man had lived a vicious and scandalous life, he was thought unworthy of the meanest office. Nor was this thought enough; for in the first ordinary assembly after their election, they were a second time brought to the test; when, if any thing scandalous was found against them, they were deprived of their honours. Potter. Archæol. Græc. lib. ii. cap. 11. tom. i. p. 72.

DOCIMASIA, or *Docimastic Art*, is that part of practical chemistry which relates to the analysis of minerals, and to all operations in metallurgy.

DOCIMASTICAL EXPERIMENTS. See ASSAYING.

DOCIMENUM MARMOR, a name given by the ancients to a species of marble, of a bright and clear white, much used in the large sumptuous buildings, as temples and the like. It had its name from Docimenos, a city of Phrygia, afterwards called Synaia, near which it was dug, and from whence it was sent to Rome. It was accounted little inferior to the Parian in colour, but not capable of so elegant a polish: whence it was less used by the statuaries, or in other smaller works. The emperor Adrian is said to have used this marble in building the temple of Jupiter, and many other of the great works of the Romans are of it.

DOCK, in *Agriculture*, the common name of a well-known plant, which is extremely troublesome as a weed in pasture and other lands, where the soil inclines to be deep, heavy, and rather moist. It is a plant which rises with a strong stem to some feet in height, sending forth large broad leaves of considerable length; and which strikes downwards with a strong perennial tap-root, in a somewhat similar manner to that of the carrot, by which means it becomes firmly established in the ground, without being liable to be destroyed, except by particular attention and trouble. It ripens its seed quickly in great abundance, but which drops about the foot of the plant, not having the means of being dispersed to any great distance. It has the singular property, that if the root be divided below the crown, the portion which is left in the earth sends forth shoots from almost any depth, provided it be not confined above, and have a suitable state of the soil. Besides, where the upper part is cut or torn off, the plant is capable of surviving, and of sending forth new shoots. Even when turned upside down, by the operation of the plough, it is found to recoil and force its way again quickly to the surface. It is therefore evident that the plough alone is not only incapable of perfectly eradicating this injurious plant, but that it often tends to render it more prevalent by breaking the root into different parts, which readily afford new shoots. It is consequently evident, that, in order to fully eradicate this noxious weed it is necessary to go over the whole of the land with the drawing iron, or spade, sometimes before the business of ploughing be attempted. By this means, and proper attention at the time of ploughing, to have the horses and other parts of the root, which may have previously escaped, completely removed, the weeds may be effectually cleared from the ground.

In meadow and pasture lands they may, however, be speedily removed by the careful use of the docking-iron, without having recourse to the plough.

It is scarcely necessary to observe, that the ripening and dissemination of the seeds of these plants should be effectually prevented, by their shoots being cut over in due time by the scythe, and in this way the multiplication of them will be materially prevented. And the sowing of the seed of this weed, with any part of crop, should likewise be cautiously avoided. See WEEDS.

DOCK is likewise a term applied to the trimming of the buttocks and other parts of sheep; and also to the cutting off the tails of horses.

DOCK, in *Botany*. See RUMEX.

DOCK, *Docking*, in *Law*, a name or expedient for cutting off an entire tail in lands, or tenements, by means of a common recovery; that the owner may be enabled to sell, give, or bequeath the same.

DOCK, in the *Manège*, is used for a large case of leather, as long as the dock of a horse's tail, which serves it for a cover. The French call the *dock*, *troussequeue*. It is made fast by straps to the crupper; and has leather thongs that pass between his thighs, and along the flanks to the saddle-straps, in order to keep the tail tight, and to prevent its whisking about.

DOCK, among *Sportsmen*, is used for the fleshy part of a boar's chine, between the middle and the buttock.

DOCKS, probably from δοχεῖον, *receptaculum*, of δέχομαι, *I receive*, are artificial basons, or excavations, under different denominations, formed for the convenience of receiving ships, in rivers and harbours, for the purpose of repairing, or for loading and unloading their cargoes, out of the influence of the tide. They are constructed of brick, stone, or timber; with locks or flood-gates, pointed to or from the tide, to keep the water in or out, as the object and nature of the docks require.

Wet Docks are for the reception of ships to lie afloat while loading or unloading, with gates pointed from the tide, to keep the water in at low water. Locks are attached thereto, with double gates, for the more easy admission and egress of shipping, without losing more water than necessary; and to aid the operation of opening and shutting these gates, sluices are made within the same, to regulate the water within the locks, until the same level is produced within as without, so that the gates may open with facility.

Dry Docks are of various kinds,

1. Basons, or docks open to the tide, are called dry docks, because the vessels frequenting them ground at low water, and lie dry on the ebb tide, and float again on the next rise of the tide. They are used at Liverpool as entrances to the wet docks, and are frequented by coasters, and small or light vessels, that do not injure by lying on the shore.

2. *Graving Docks*, for repairing of ships, are excavations with flood-gates pointed towards the tide, to keep the water out while ships are under repair. Vessels are admitted at high water, and the gates are shut at low water; and when the

the repairs are completed, the gates are again opened before the rise of the tide, and the veſſel is on the flood hauled out of dock. In ſome countries, where there is little or no tide, theſe docks are ſo conſtructed, as to have the water within forced out by pumps, or other mechanical operations, as in Ruſſia and other parts.

In ſome places, as at Portſmouth, floating gates are conſtructed, in the form of a veſſel, with each end like the bow of a ſhip, neatly fitted to the lock, and to work up or down a groove in the lock with the tide, by pumping water into, or out of the veſſel, ſufficient to float or ſink it, as occaſion might require. A veſſel of this kind was alſo uſed at the London docks, to keep the water out while they were making.

3. *Slips* for the building of ſhips, may be claſſed under this head. They alſo are excavations, ſloping and inclined towards the tide, well framed and floored with timber, &c. Ships, when built, are generally launched at ſpring tides, by driving away the ſhoars and props which ſupported them, when they are eaſily launched from off the ſlips.

Naval Docks.—Portſmouth, Plymouth, Chatham, Sheerneſs, Woolwich, and Deptford, are the principal naval arſenals of Great Britain; where ſhips of war of every deſcription from ſloops to ſhips of the line of 130 guns, are built and repaired, and when finiſhed are turned out of dock: other countries have ſimilar eſtabliſhments.

Commercial Docks.—The convenience and advantages of wet docks for the ſecurity of ſhipping and the diſpatch of buſineſs are become objects of great attention in many countries for commercial purpoſes. The adoption of them within this laſt century has been no where more general than in Great Britain. The docks now made and making, at London, Liverpool, Hull, Briſtol, Leith, &c. have contributed, and will greatly contribute (combined with our natural advantages) to the increaſe of our commerce, wealth, and population. They have formed our great leading ports into depots, and have given, aided by the extenſion of the bonding ſyſtem, great facilities to commerce by ſuſpending, in many caſes, the payment of duties until goods are taken out for home conſumption. Docks, while giving protection, convenience, and diſpatch to commerce, ſhipping, and revenue, happily link and unite, by means of rivers, roads, and canals, our foreign with our domeſtic commerce.

Liverpool Docks.—The port of Liverpool, from the badneſs of its harbour, the rapidity of the Merſey, and the ſhifting of its ſands, was obliged, at an early period, to reſort to docks: for this purpoſe an act was paſſed in 1708. What neceſſity firſt dictated, has ſince been one of the principal cauſes of the town becoming, through the enterprising ſpirit and induſtry of its inhabitants, the ſecond port in the kingdom, for commerce, ſize, and population. In the courſe of one century there have been eſtabliſhed within that port, five wet docks, three dry docks, and five graving docks, independent of the duke of Bridgewater's dock, for canal purpoſes; and a plan is now in execution for making two additional wet docks, and enlarging Queen's dock, which is propoſed to be connected with the Merſey by means of a new floating dock, and a dry harbour baſon. Almoſt all theſe docks are, more or leſs, encroachments on the banks of the river.

By the act paſſed in 1708, authority was obtained to make the firſt dock and baſon for the ſecurity of ſhipping and the loading and unloading of the ſame. The management of the undertaking was invested in the corporation for the term of 21 years, which gave for this purpoſe four acres of land, and they were impowered to borrow the ſum of 6000*l.* In 1717, the term was prolonged for 14 years, and they were authorized to borrow 4000*l.* more. In 1737, the term was further extended to 31 years, and powers given to make an additional dock, to build a pier in the open harbour, and to light the docks. The corporation on this occaſion gave ſeven acres of land, and they were impowered to borrow 6000*l.* In 1761, the commerce of Liverpool was ſo much increaſed, and its ſhipping had become ſo numerous, and ſo enlarged in ſize, that further accommodation was wanting. The term of the corporation's management was again extended for 21 years, with powers to make another dock, and to erect a light-houſe for the benefit of the port; for theſe purpoſes they were authoriſed to borrow the ſum of 25,000*l.*, and to raiſe the further ſum of 2000*l.* on the light-houſe duties. In 1784, the powers of all the former acts were enlarged, and the term extended to 41 years, with liberty to make two additional docks and piers, and to borrow for this purpoſe 70,000*l.* In 1799, an act was paſſed to alter and enlarge the powers of former acts, and to render the docks and the port more commodious and ſafe; by which a further extenſion of term was granted for 30 years. The corporation again gave ſome lands, and they were impowered to make two additional docks, and other docks; with liberty to raiſe the ſum of 120,000*l.*, and to double the former tolls.

Under the authority of theſe various acts of parliament the ſeveral docks have been conſtructed, and it has been found that each ſucceſſive improvement, by affording additional convenience to foreign trade, has been followed by its increaſe, and prepared the way for the further extenſion of this excellent ſyſtem of accommodation at future periods. The names and dimenſions of the docks are as follows, and a plan is annexed on a ſcale of double the ſize of the plan of the docks for London. See *Plate of Docks.*

Docks.	Long.	Broad.	Area.	Stat. Mea.	Dock Gates. Broad.	Dock Gates. Deep	Quay.
No.	Yards.	Yards.	Square Yds.	A. R. P.	Feet.	Feet.	Yards.
1 Old Dock - - -	200	70 to 90	17,070	3 2 4	34	23	652
2 Salthouſe - - -	irregular.		22,420	4 2 21	34	23	640
3 George's - - -	250	100	26,068	5 1 2	38	25	670
4 King's - - - -	290	90	25,650	5 1 8	42	25	715
5 Queen's - - - -	270	130	33,600	6 3 31	42	25	780
Baſons.			124,808	25 2 26			
6 To the Old Dock - - - - - -			19,298	3 3 34			
7 To George's Dock - - - - - -			12,090	2 3 0			
8 To King's and Queen's Docks - - - -			14,420	2 3 37			
			170,616	35 1 17			

These

These wet docks are all for ships from foreign voyages. The dry docks are for coasters, and other small and light vessels. There are five graving docks, which are from 390 to 490 feet long, and hold two or three vessels for repair, at a time. No. 9 The duke of Bridgewater has a dock at Liverpool, connected with his canal concerns, calculated to hold 42 canal flats, of 50 tons, such as No. 10 in *Plate of Docks*.

The docks are surrounded with convenient and spacious warehouses for the reception of goods; and a tobacco warehouse capable of containing 7000 hogsheads.

The several docks are connected with each other by means of tunnels or sluices under ground, for the purpose of scouring them when they want cleansing. This is effected by letting the water off from any one of them, and opening the sluices into it in different directions; while a number of men with shovels throw the mud into the currents, which is thus washed into the river, and in the course of about 12 or 14 days the dock is sufficiently cleared.

Accurate tide tables are kept, from which it appears that the rise of the tide in the river is about 30 feet at spring tides, at which times there are about 20 feet water at the Salt-house dock gates, and two feet more at the other dock gates.

The corporation make all necessary regulations relating to the docks; and the accounts of the receipt and expenditure are annually examined and published by commissioners unconnected with the corporation. Ships are here discharged by their own crews, but cooking on board is not permitted, and all lights must be put out at stated hours.

It cannot be doubted that the docks have greatly encouraged the increase which has taken place in the trade of Liverpool, and by their future enlargement, or the formation of additional ones, the port will readily accommodate the future increase of its commerce to any possible extent. In the year 1571, the inhabitants, addressing queen Elizabeth, styled the place the poor decayed town of Liverpool; and in fact, about that period it was only a little fishing town, having 12 barks, whose tonnage amounted to 223 tons, and which employed only 75 men. In the year 1805, the number of British built ships belonging to the port of Liverpool was 741, and their tonnage amounted to 111,227 tons: the tonnage of the ships which entered the docks in that year was 463,482 tons.

Statement of the amount of the dock duties at different periods: each year ending 24th. June.

Years.	Ships.	Duties.		
		£.	s.	d.
1755	——	2.417	13	11
1760	1245	2,330	6	7
1765	1930	3,455	8	4
1770	2073	4,142	17	2
1775	2291	5 384	4	9
1780	2261	3,528	7	9
1785	3429	8,411	5	3
1790	4223	10,037	6	2½
1795	3948	9,368	16	4
1800	4746	23,379	13	6½
1805	4618	33,364	15	1
1808	5225	40.688	0	0

The tonnage of the ships which entered the docks in the year ending 24th June 1808, amounted to 516,836 tons.

London.—When it is considered that the port of London commands about three-fifths of the commerce of the whole kingdom, that it has frequently riding within it from 1300 to 1400 sail of vessels at a time, and in the course of the year about 14,000; that from the year 1700 to 1792 its imports had increased from 4,785,538*l.* to 12,072,674*l.* and its exports from 5,387,787*l.* to 14,742,516*l.*, it appears surprizing that proper accommodations for its commerce should have been so long wanting. The legal quays, which were only 1464 feet long, having remained the same as at the time of the fire of London, in the year 1666, were, with the aid of the sufferance wharfs, totally inadequate to the increase of its commerce. The inconveniences arising from the crowded state of the Thames at all times, but particularly at those periods when ships arrive in large fleets, were long felt and complained of by all the principal merchants; and from reference to the reports of committees, and other publications on the improvement of the port of London, it appears that different plans had been frequently suggested to extend the convenience of the legal quays both above and below London bridge. It was not, however, till the year 1793, that a plan was first projected for making wet docks for the port of London, in Wapping, the isle of Dogs, and at Rotherhithe, and the preference intended to have been given, in the first instance, to Wapping, from its vicinity to the city, the seat of business, and to the custom house; one end of the spot fixed upon being within a quarter of a mile of the Tower of London, and the eastern extremity of it about one mile. The plan of docks meeting with approbation and encouragement, they were circulated generally to all the great leading interests in and out of parliament, and to all the principal persons connected with the commercial interest.

In 1794, a general meeting of merchants was convened, to consider the great inconveniences of the port of London, arising from the crowded state of the river, and the confined extent of the legal quays; when a committee was appointed to consider of the best mode of relief, who took into consideration all the plans which had been suggested, when they approved of the plan for making wet docks in Wapping with wharfs and warehouses on their borders, as the most effectual means of remedying the evils of the port. In consequence of this determination, Mr. Daniel Alexander, an ingenious architect and surveyor, who had been making great alterations at Rochester bridge, and who was conversant with operations connected with the tide, was directed to make a survey, and prepare plans and estimates for forming docks at Wapping, with the addition of a cut or canal leading to them, from that part of Blackwall where the present East India docks have been made, and along a line where the West India docks have been since formed. The plans and estimates were laid before a general meeting of merchants on 22d December, 1795, when they were unanimously approved, and a subscription of 800,000*l.* was filled in a few hours, for carrying the same into execution. A committee was appointed to make application to parliament, who presented a petition in January 1796, which was referred to a select committee of the house of commons, who were directed "to enquire into the best mode of providing sufficient accommodation for the increased trade and shipping of the port of London."

The application of the merchants experienced great opposition both from the corporation of the city of London and from private interests; and a great variety of plans and projects were brought forward for the extension of the legal quays above and below the bridge, and the improvement of the river, with or without docks. This caused much delay, but the necessity of providing some additional accommodation for the increasing multitude of ships which filled the river became every day more evident; and, upon a comparison of the various plans for making docks in different situations, it was generally admitted, that wet docks might be formed in various situations at a much less expence than on the spot fixed upon for the London docks at Wapping,

ping, but that the ſituation of the latter, from its vicinity to the ſeat of commerce, would much more than counterbalance the additional expence of their formation. Through the great exertions and perſeverance of William Vaughan, eſquire, aſſiſted by other highly reſpectable mercantile characters, the various obſtacles to the plan of the London docks were ſucceſſively overcome, and in Auguſt 1798, the ſubſcribers gave notice, that in the enſuing ſeſſion of parliament they meant to renew their application for forming docks at Wapping, and in December following they petitioned for leave to bring in a bill for this purpoſe. A few days after a petition was preſented by the corporation of London, with a view to ſimilar objects, and by making a navigable canal or paſſage acroſs the iſle of Dogs from Blackwall to Limehouſe, purchaſing the mooring-chains in the river, which were moſtly private property, and appointing harbour-maſters to regulate the navigating and mooring of veſſels in the port: they alſo propoſed to make wet docks in ſome part of the iſle of Dogs for the reception and diſcharge of Weſt India ſhipping. The latter part of the plan had however been taken up by a number of Weſt India merchants and planters, who had formed themſelves into a company diſtinct from the ſubſcribers to the London docks, for the purpoſe of forming docks for the reception of the Weſt India trade only, either alone, or in conjunction with the other improvements projected by the corporation. The general conviction of the neceſſity of ſome meaſure of this kind was not ſufficient to produce a union of intereſts in favour of either of the propoſed plans; at length the committee of the houſe of commons made a report, recommending the formation of wet docks as the only remedy for the evils of the port, and that they ſhould be made both at Wapping and the iſle of Dogs, but that the latter ſhould be adopted firſt.

The corporation of London and the Weſt India merchants forming a junction, the act for making the Weſt India docks paſſed in July 1799. In the next ſeſſion, on the 30th June 1800, an act was paſſed for forming the docks at Wapping, and another act has ſince been paſſed for making docks at Blackwall for the Eaſt India trade. Theſe ſeveral undertakings, all ariſing out of the original project of the London docks, have been ſince carried into execution, to the great convenience of the commerce of the port of London, and the permanent benefit of the ſubſcribers, by whom the large ſums neceſſary for accompliſhing them were advanced. For ſome particulars of the progreſs of their formation, ſee THAMES river, under the article CANALS.

Weſt India Docks.—The act for eſtabliſhing the Weſt India Dock Company, was paſſed 12th July 1799. Their original capital was 500,000*l.*, which they were impowered to increaſe to 600,000*l.* This capital was, however, found inſufficient for completing the undertaking, and in 1802 the company were authoriſed to add 200,000*l.* to it, making their capital 800,000*l.* which has been ſince increaſed to 1,200,000*l.* The dividends to be paid thereon to the ſubſcribers, are not to exceed 10 *per cent. per annum*, to which rate they have already attained.

The concerns of the company are under the management of twenty-one directors, eight of whom are choſen by the corporation of London, four of them being aldermen, and four common-council men.

The works were begun 2d February 1800, and the firſt ſhip entered the homeward-bound dock on 27th Auguſt 1802. The homeward-bound dock, ſee *Plate* N. *fig.* B. 1. which is 2600 feet long, and 500 feet broad, is eſtimated capable of holding 300 ſail of veſſels of 300 tons and upwards each. The outward-bound dock, B 2, is 2600 feet long, and 400 feet broad. They both communicate by means of locks at the end (next Blackwall) with a baſon of about ſix acres, with ſloping banks, which is connected with the river by the entrance lock; and at the end next Limehouſe, where there is another baſon of about two acres, built of brick, through which all veſſels go out, which have occaſion to go into the river to repair. The two docks are ſeparated and ſurrounded by ſtrong walls.

The uſe of theſe docks is limited to the Weſt India trade for 21 years. The company take the ſhips under their ſole direction, of unloading and management from the moment they enter the docks, diſcharging the ſame by their own ſervants; when the crews are diſmiſſed, and neither cooking nor reſidence allowed on board any of the veſſels while they remain in the homeward-bound docks, the gates of which aae ſhut every evening at ſtated hours. A military guard is ſtationed without the docks day and night. The diſtance from the ſtandard in Cornhill, to the neareſt dock gates, is rather more than three miles, and to the further extremity of the dock wall, about half a mile more; a conſiderable expence of cartage is unavoidably incurred, by the ſhips diſcharging at this diſtance, but there is an excellent road both to theſe docks, and to the Eaſt India docks.

Both the docks and warehouſes are handſome and ſpacious, the whole forming a noble and intereſting object, which muſt impreſs every one with an idea of the vaſt magnitude of the branch of commerce, to which they are appropriated. The warehouſes on the north and weſt ſides, are ten in number, with partition walls up to, but not through the roof, and are capable of containing 8000 hogſheads of ſugar each; on the ſouth ſide are extenſive warehouſes for rum. The docks were planned and executed by William Jeſſop, eſq. civil engineer, and the warehouſes by Mr. Gwylt, ſurveyor and architect.

Under the Weſt India dock act, the corporation of London were empowered to make a canal from Limehouſe to Blackwall, of about three quarters of a mile in length, to ſave the navigation round the Iſle of Dogs, which has been completed, and may probably at ſome future period be converted into a dock. See *Plate of Docks, fig.* D.

London Docks.—The act for eſtabliſhing this company was paſſed 20th June 1800. Their original capital ſtock was 1,200,000*l.*, and they were authoriſed to borrow, at intereſt, the further ſum of 300,000*l.*; but a larger capital being found neceſſary for completing the undertaking, they applied to parliament, in 1804, for leave to augment their capital ſtock by 500,000*l.*; and having ſince obtained another act for the liberty of raiſing a further ſum of 500,000*l.*, the total capital ſtock the company are now authoriſed to raiſe, if it ſhall be found neceſſary, is 2,200,000*l.* The dividends to be paid thereon to the ſubſcribers, are limited to 10 *per cent. per annum.* The management is veſted in 24 directors, elected annually, of whom the lord mayor is one.

The original plan of theſe docks (with the canal, which had been abandoned) was ſubmitted by the directors to the conſideration of four civil engineers of the firſt eminence and reſpectability, *viz.* Meſſrs. Robert Mylne, John Rennie, Joſeph Huddart, and William Chapman, and underwent ſome alterations by them. The dock and baſon, as altered by them, were then executed under the direction of Mr. Rennie, and the warehouſes and wall by Mr. Alexander.

The dock, baſon, and warehouſes, which are compleated, are of brick and ſtone, are well deſigned, in a chaſte and grand ſtyle, and happily executed, producing a noble effect. The length of the dock, as in *Plate of Docks, fig.* A. 1. is 1260 feet long, and 690 feet broad, containing 20 acres, and the baſon marked A. 2. as three acres, and the whole capable of containing about 230 ſhips of 300 tons burthen and upwards.

In the act a power was preſerved to make a ſecond dock and baſon to the eaſtward, with an entrance at Shadwell, containing an area of 14 acres, as denoted in the plan marked A 3 and 4. There are at preſent, on the north ſide of the dock, five ſtacks of warehouſes furniſhed with party and croſs ſub-diviſionary walls through the roofs, as a further protection againſt fire. On the ſouth ſide are other warehouſes, beſides vacant ſpaces left in different parts of the premiſes for additional warehouſes. On the eaſt ſide is the tobacco warehouſe, planned to contain 24,000 hogſheads of tobacco, and ſpacious arched vaults underneath for wine and tobacco. The latter are now wholly appropriated to wine, and hold many thouſand pipes. The whole building ſtands upon an area of near five acres, covering more ground, under one roof, than any public building or undertaking, except the pyramids of Egypt. Its roof is light, airy, and ſimple, and adds greatly to the beauty and boldneſs of the deſign, and ſtands unrivalled in architectural buildings of its kind.

The company was required to complete the docks within ſeven years, which was afterwards extended to twelve years. On the 24th January 1805, they gave notice, by advertiſement, that the baſon at Bell-dock, and the dock communicating therewith, and alſo part of the warehouſes, vaults, and quays, were ready for the reception of ſhips and landing their cargoes, in conſequence of which the dock was opened for public uſe in the following week.

All ſhips laden with wine, brandy, geneva, and other ſpirits, tobacco, and rice, muſt unload in theſe docks for the term of twenty-one years; with all other veſſels the uſe of the docks is optional, excepting thoſe from the Eaſt and Weſt Indies. The ſhips diſcharge their cargoes under the company's cranes, by their own crews. In theſe docks, cooking and reſidence on board are allowed, but no lights are permitted after certain hours. The whole is ſurrounded by a wall, the gates of which are ſhut at ſtated hours.

There is a neat ſwivel caſt-iron bridge over the entrance lock at Wapping, and an excellent double ſteam-engine erected, which was uſed while the docks were making, to carry off the water; it is not now worked.

The riſe of the tide at the entrance lock of the baſon, is four feet lower than the dock itſelf.

Eaſt India Docks.—The act for eſtabliſhing the company paſſed 27th July 1803. Their original capital was 200,000*l.* divided into ſhares of 100*l.* each; and they were authorized to increaſe the capital to 300,000*l.* if it ſhould be found neceſſary. In 1806 they were impowered to add 100,000*l.* more to their capital, making with the former ſum 400,000*l.*, nearly the whole of which has been raiſed. The dividends to be paid thereon to the ſubſcribers, are, as in the two preceding companies, limited to 10 *per cent. per annum.* The concern is under the management of 13 directors, who muſt be holders of at leaſt 20 ſhares of the company's ſtock, and four of them muſt be directors of the Eaſt India company.

The firſt ſtone of theſe docks was laid in March 1805, and the firſt ſhip entered them in Auguſt 1806. The dimenſions of the dock for unloading inwards are 1410 feet in length, and 560 feet in width, containing about 18½ acres: the dock for loading outwards, which was a part of Mr. Perry's dock, is 780 feet in length, and 520 feet in width, containing 9¼ acres. The extent of the entrance baſon, which connects them with the river, is 2¾ acres; the length of the entrance lock 210 feet, the width of the gates 48 feet in the clear, and the depth of water at ordinary ſpring-tides 24 feet. See *Plate* N. C. 1. 2.

Theſe docks are appropriated ſolely to the reception of Eaſt India ſhipping, and the company undertake to deliver the whole of the cargoes. No cooking, fire, or reſidence on board, are permitted in theſe docks, the gates of which are ſhut every afternoon at four o'clock. The diſtance from the Eaſt India warehouſes being about four miles, the goods are conveyed thither in caravans of a particular conſtruction, by an excellent road, towards the formation of which 10,000*l.* was contributed by the company.

Perry's Dock at Blackwall, and *Greenland Dock* on the oppoſite ſide of the river, were private property, having been formed by enterpriſing individuals, long before any public accommodation of this kind exiſted in the port of London. The firſt now forms one of the Eaſt India docks; and Greenland dock, hitherto appropriated to the purpoſes of the whale fiſhery, has likewiſe been purchaſed by a company.

The Surrey canal company have a dock at the entrance of their canal for ſmall veſſels, and have raiſed a conſiderable capital.

It affords a ſtriking proof of the wealth and proſperity of the city of London to find, that in the courſe of about ten years, there has been expended a capital of between four and five millions in theſe great undertakings for providing accommodation and ſecurity to its ſhipping and commerce.

Hull Dock, is ſituated on the Humber, and was formed under the authority of an act paſſed in 1774. It is about 480 yards long, and 88 yards wide, containing nearly 10 acres, and will accommodate about 130 veſſels at a time. The original capital of the company conſiſted of 120 ſhares, which have ſince been increaſed to 180 ſhares. It has been a moſt profitable concern to the ſubſcribers, as they have uſually made a large dividend; this, however, has varied very conſiderably: in the year 1806 they divided 72*l.* 15*s.* 10*d.* *per* ſhare; but in 1807, after having admitted 25 new ſhares, the dividend was only 49*l.* 9*s.* 1*d.* *per* ſhare. The formation of another dock, with other improvements, has been undertaken.

Briſtol.—Briſtol, with a large trade carried on in an inconvenient harbour from the great height of its tides, has, at length, undertaken an extenſive plan, according to which a very capacious wet dock is to be formed by damming up the river Avon for about two miles of its length, and turning the river into a new cut which has been formed to receive it.

Other ports, ſuch as Lancaſter, Grimſby, Dover, and Margate, &c. have their docks or piers for the ſafety and accommodation of the ſhipping frequenting them.

At *Leith*, in Scotland, a large range of docks are making on an extenſive ſcale, which are to be capable of receiving the men of war which may frequent that part of the coaſt, the old harbour having been found very inadequate: one of the docks is already completed, and a dry dock is nearly ſo. From Leith being within one mile of Edinburgh, and the ſpirit of improvement prevailing in Scotland, there is every probability of theſe docks and the intended incloſed harbour being executed on an extenſive and judicious plan, and becoming of much public utility.

On the continent, ſeveral ports, ſuch as Havre, Oſtend, &c. have wet docks on an extenſive ſcale, under various regulations.

Dock-*Yards*, are magazines of all ſorts of naval ſtore, and timber for ſhip building; the royal dock-yards in England, are thoſe at Chatham, Portſmouth, Plymouth, Woolwich, Deptford, and Sheerneſs. In time of peace, ſhips of war are laid up in theſe docks, thoſe of the firſt rates moſtly at Chatham, where, and at other yards, they receive, from time to time, ſuch repairs as are neceſſary.

Theſe

Thefe yards are generally fupplied from the northern crowns, with hemp, pitch, tar, rofin, canvas, oak-plank, and feveral other fpecies. But as for mafts, particularly thofe of the largeft fize, they have been ufually brought from New England.

The principal dock-yards are governed by a commiffioner, refident at the port, who fuperintends all the mufters of the officers, artificers and labourers, employed in the dock-yard and ordinary. He alfo controuls their payments; examines the accounts; contracts and draws bills on the navy-office to fupply the deficiency of ftores, and regulates whatever belongs to the yard, maintaining due order in the refpective offices.

DOCKEN, in *Agriculture*, a provincial term, fometimes applied to the dock.

DOCKER, in *Geography*, a river of England, in the county of Lancafter, which runs into the fea five miles N. of Lancafter

DOCKET fometimes denotes a little bill tied to wares or goods, and directed to the perfon and place they are to be fent to.

Docket, or *Dogget*, in *Law*, is a brief in writing, on a fmall piece of paper, or parchment containing the purport and effect of a larger writing. The rolls of judgment are docketted, when they are brought into the court of common pleas and entered on the docket of that term; fo that by fearching thefe dockets any judgment may be found, if the attorney's name is known (4 & 5 W. & M. c. 20.) Decrees in chancery, and commiffions of bankruptcy, are alfo docketted.

DOCKING Iron, in *Agriculture*, an implement of the fmall fpade kind, contrived with a narrow long blade, fo as to raife the root of the dock from the bottom.

DOCKUM, or Dokkum, a town of Holland, in the department of Friefland, fituated in a fertile country at the mouth of the Avers, at a diftance of fix miles from the North fea, with which it communicates by means of the Dockum Diep, a canal through which the largeft veffels pafs at high water. It is 12 miles N. E. of Leeuwarden, with which it communicates by a canal called the Ee, and 27 miles N. W. of Groningue. Lat. 53° 18'.

DOCLEA, in *Ancient Geography*, a town of Illyria, in Dalmatia; the fame with *Dioclea*.

DOCTOR, a perfon who has paffed all the degrees of a faculty, and is empowered to teach or practife the fame.

The title of doctor was firft created towards the middle of the twelfth century; to fucceed to that of mafter, which was become too common and familiar.

The eftablifhment of the doctorate, fuch as is now in ufe among us, is ordinarily attributed to Irnerius, who himfelf drew up the formulary. The firft ceremony of this kind was performed at Bologna, in the perfon of Bulgarus, who began to profefs the Roman law, and on that occafion was folemnly promoted to the doctorate, *i. e.* inftalled "juris utriufque doctor." But the cuftom was foon transferred from the faculty of law to that of theology; the firft inftance whereof was given in the univerfity of Paris, where Peter Lombard, and Gilbert de la Potree, the two chief divines of thofe days, were created doctors in theology, "facræ theologiæ doctores."

Spelman takes the title of doctor not to have commenced till after the publication of Lombard's Sentences, about the year 1140; and affirms, that fuch as explained that work to their fcholars, were the firft that had the appellation of doctors.

Others go much higher, and hold Bede to have been the firft doctor at Cambridge, and John de Beverley at Oxford, which latter died in the year 721. But Spelman will not allow doctor to have been the name of any title or degree in England till the reign of king John, about the year 1207.

The firft obfcure mention of academical degrees conferred by the univerfity of Paris, from which the other univerfities are fuppofed to have borrowed moft of their cuftoms and inftitutions, occurs in A. D. 1215. (Crevier Hift. de l'Univ. de Paris, tom. i.) And they were completely eftablifhed A.D. 1231. The high degree of eftimation in which they were held is evident from the following circumftance. Doctors in the different faculties contended with knights for precedence; and the difpute was terminated in many inftances by advancing the former to the dignity of knighthood. It was even afferted, that a doctor had a right to that title without creation.

To pafs doctor in divinity at Oxford, it is neceffary the candidate have been four years bachelor of divinity. For doctor of laws, he muft have been feven years in the univerfity, to commence bachelor of law; five years after which, he may be admitted doctor of laws. Otherwife, in three years after taking the degree of mafter of arts, he may take the degree of bachelor in law; and in four years more, that of L.L.D. which fame method and time are likewife required to pafs the degree of doctor in phyfic.

At Cambridge, to take the degree of doctor in divinity, it is required the candidate have been feven years bachelor of divinity. Though in feveral of the colleges the taking of the bachelor of divinity's degree is difpenfed with, and they may go out *per faltum*. To commence doctor in laws, the candidate muft have been five years bachelor of law, or feven years mafter of arts. To pafs doctor in phyfic, he muft have been bachelor in phyfic five years, or feven years mafter of arts.

A doctor of the civil law, may exercife eccleftiaftical jurifdiction, though a layman, ftat. 37 Hen. VIII. cap. 17. fect. 4.

Doctor, in *Mufic*. See *Academical* Degrees.

Doctor *of the Law*, was a title of honour or dignity among the Jews.

The Jews, it is certain, had doctors long before Jefus Chrift. The inveftiture, if we may fo fay, of this order, was performed by putting a key, and a table-book in their hands, which is what fome authors imagine our Saviour had in view, Luke xi. 52. where fpeaking of the doctors of the law, he fays, "Woe unto you, doctors of the law; for you have taken away the key of knowledge; you entered not in yourfelves, and them that were entering, you hindered."

The Greek text of St. Luke calls them νομικοι; and the Vulgate "legifperiti;" agreeably to which, our Englifh tranflators call them "lawyers." But the French verfion of "docteurs de la loi" feems the moft adequate. In effect, the word "lawyer," "legifperitus," is only found in St. Luke, and St. Paul, Titus, iii. 13. And νομικος, in St. Matthew, xxii. 35. is rendered by the Vulgate, "legis doctor;" though the Englifh verfion ftill retains the word "lawyer."

Thefe Jewifh doctors are the fame whom they otherwife call rabbins.

Doctor *of the Church*, a title given to certain of the fathers, whofe doctrines and opinions have been the moft generally followed and authorized.

We ufually reckon four doctors of the Greek church, and three of the Latin. The firft are, St. Athanafius, St. Bafil, St. Gregory Nazianzen, and St. Chryfoftom. The latter are, St. Jerom, St. Auguftine, and Gregory the Great.

In the Roman Breviary, there is a particular office for the doctors. It only differs from that of the confessors, by the anthem of the Magnificat, and the lessons.

Doctor is also an appellation adjoined to several specific epithets, expressing wherein the merit of such as the schools owned for their masters, consisted.

Thus Alexander Hales is called the "Irrefragable Doctor," and the "Fountain of Life," as mentioned in Possevinus. Thomas Aquinas is called the "Angelical Doctor;" St. Bonaventure, the "Seraphic Doctor;" John Duns Scotus, the "Subtile Doctor;" Raimond Lully, the "Illuminous Doctor;" Roger Bacon, the "Admirable Doctor;" &c.

Doctor, Διδασκαλος, in the Greek church, is a particular officer, appointed to interpret part of the scriptures.

He who interprets the gospel, is called, "Doctor of the Gospel;" he who interprets St. Paul's epistles, "Doctor of the Apostle;" he who interprets the psalms, "Doctor of the Psalter."

Doctors, *Christian*, in *Ecclesiastical History*, were divided, towards the close of the 12th century, into two classes, *viz.* those who were called by the various names of "biblici," *i. e.* bible doctors; "dogmatici," and "positivi," *i. e.* didactic divines; and also "veteres," or ancients; and the "scholastics," who were also distinguished by the titles of "sententiarii," after the "Master of the Sentences," and "novi," to express their recent origin. The *former* expounded, though in a wretched manner, the sacred writings in their public schools, illustrated the doctrines of Christianity, without deriving any succours from reason or philosophy, and confirmed their opinions by the united testimonies of scripture and tradition. (See Bible *Doctors*.) The *latter* expounded, instead of the Bible, the famous "Book of Sentences;" reduced under the province of their subtile philosophy, whatever the gospel proposed as an object of faith, or rule of practice; and perplexed and obscured its divine doctrines and precepts by a multitude of vain questions and idle speculations. The method of the "scholastics" exhibited a pompous aspect of learning; and those subtle doctors seemed to surpass their adversaries in sagacity and genius; hence they excited the admiration of the studious youth, who flocked in multitudes to their schools, while the "biblici," or "doctors of the sacred page," as they were also called, had the mortification to see their auditories unfrequented, and almost deserted. The scholastic theology continued in high repute in all the European colleges until the time of Luther. Mosh. E. H. vol. iii. p. 92, 8vo.

Doctor's *Commons*. See College *of Civilians*.

DOCTRINE, from *doceo*, I teach, denotes in general any thing that is taught, as a matter either of faith or practice; and the term has accordingly been applied to a variety of opinions, that have been adopted and inculcated in philosophy, religion, &c. There are certain doctrines respecting the political constitution of Great Britain, the asserting and publishing of which are made illegal by statute. Thus, if any person maliciously or advisedly affirm, that both, or either of the houses of parliament, have any legislative authority without the king, such person shall incur all the penalties of a præmunire. (13 Car. II. cap. 1.) Also, if a person affirm and maintain, by writing or printing, that the king and parliament have no right to direct the succession of the crown, he is guilty of high treason; during the life of the queen and after her decease, shall be guilty of a misdemeanor, and forfeit his goods and chattels (13 Eliz. cap. 1.); and if he maintains the same doctrine by teaching, or advised speaking, he incurs a præmunire. (6 Anne, cap. 7.) There are also other doctrines of a religious nature, which it is unlawful publicly to maintain and preach. See Blasphemy, Common *Prayer*, Heresy, Trinity, &c.

Doctrine, *Christian, Fathers of*. See Fathers.

DOCUMENT, in *Law*, some written monument produced in proof of any fact asserted, especially an ancient one.

DODANIM, in *Ancient Geography*, the children of Javan, mentioned in the book of Genesis, and supposed by some to be the name of the first inhabitants of Epirus, traces of which they observe in the name of Dodona, the most ancient of oracles; others suppose that they were an ancient people called "Pelasgi," who formed a wandering nation, and that the term Dodanim was formed of *dal*, or *dod*, which in the eastern dialect denoted *wandering*.

DODART, Denis, in *Biography*, Doctor Regent of the faculty of medicine at Paris, where he was born, in 1634, exhibited early such traits of genius and learning, that Guy Patin, not in general very lavish of praise, considered him as one of the most learned men of his time; and in a letter to a friend, he called him Monstrum sine Vitio. Having, in 1660, taken his degree of doctor, he soon attained to distinction in his profession, being the following year called to attend the princess-dowager of Conti, and the princes, her children, and some time after he was appointed physician to the king, Louis XIV. In 1673, he was made a member of the Academie des Sciences, and in compliance with their wishes, he wrote a preface to the "Memoires pour servir a l'Histoire de Plantes," published folio magno by the academy, in 1676.

He employed some labour in making chymical analyses of plants, with the view of acquiring a more intimate knowledge of their medical virtues, agreeably to the opinions that then prevailed, but which further experience has shewn not to be well founded. He pursued his statical experiments, to find the proportion that perspiration bears to the other excretions, for more than thirty years. The results first appeared in 1699, in the Memoirs of the Academy. They were afterwards published separately, under the title of "Medicina Statica Gallica." In the course of those experiments he found, that during the Lent in one year, he had lost in weight eight pounds five ounces: returning to his ordinary way of living, he recovered what he had lost in a very short time. He once purposed writing a history of music, but only finished a memoir on the voice, which is published among the Memoirs of the Academy. He was of a grave disposition, Fontenelle says, pious and abstemious; and his death, which happened Nov. 5th, 1707, was much regretted.

His son, Claude-John-Baptiste Dodart, following in the steps of his father, was made doctor in medicine in 1688. In 1718, he was appointed first physician to Louis XV. The only work in which he was concerned, was in editing "Pomet's History of Drugs," with some useful notes. He died at Paris in 1730. Haller Bib. Eloy Dict. Hist. General Biography.

DODARTIA, in *Botany*, (named by Tournefort in honour of Denis Dodart, M.D. a French botanist and academician of his time, author of a large thin volume of descriptions of plants, with uncoloured plates, executed in the very finest style of the age of Louis XIV,) Tourn. Cor. 47. t. 478. Linn. Gen. 322. Schreb. 422. Willd. Sp. Pl. v. 3. 355. Juss. 119. Gærtn. t. 53. Mart. Mill. v. 2. Class and order, *Didynamia Angiospermia*. Nat. Ord. *Personatæ*, Linn. *Scrophulariæ*, Juss.

Gen. Ch. *Cal.* Perianth of one leaf, bell-shaped, tubular, with

with ten angles and five teeth, nearly regular, permanent. *Cor.* of one petal, ringent; tube cylindrical, deflexed, much longer than the calyx; upper lip small, notched, ascending; lower spreading, three-cleft, broader and twice as long, obtuse, its middle segment narrowest. *Stam.* Filaments four, ascending towards the upper lip, but not so long; anthers small, roundish, of two lobes. *Pist.* Germen superior, roundish; style awl shaped, the length of the corolla; stigma compressed, oblong, obtuse, cloven into two cohering plates. *Peric.* Capsule globose, of two cells, with a parallel partition. *Seeds* numerous, minute. *Receptacle* convex, united with the partition.

Ess. Ch. Calyx with five teeth. Lower lip of the corolla twice as long as the upper. Capsule globose, of two cells, with many seeds.

1. D. *orientalis.* Linn. Sp. Pl. 883. Mill. Ic. t. 127. (D. orientalis, flore purpurascente; Tourn. Voy. v. 2. 144. cum ic. Coris juncea aphyllos; Amm. Ruth. 34. t. 5.) "Leaves linear, entire, smooth."—Discovered by Tournefort in his journey through Armenia towards Mount Ararat. He brought seeds to Paris, from whence the plant was distributed among the curious, and it is still sometimes met with in botanic gardens, though it has no charms to claim general cultivation. Gmelin found it in the deserts of Siberia very abundantly. The *root* creeps extensively. The *stem* is a foot or two in height, much branched, bushy, but has a naked appearance, from the smallness of the leaves. A few violet-coloured *flowers* an inch long, resembling some *Justiciæ*, are scattered here and there, on slender simple stalks.

2. D. *indica.* Linn. Sp. Pl. 883. "Leaves ovate, serrated, villose."—Native of the East Indies.—The whole plant is clothed with short shaggy pubescence. *Leaves* ovate, broad, bluntly serrated; the floral ones smaller, in the upper part of the branches. *Flowers* about the size of the former, yellow, with a hairy calyx.

DODBROOKE, in *Geography*, a parish and market town in the hundred of Coleridge, Devonshire, England, is chiefly entitled to notice from being the first place where *White Ale* was brewed, and for which the rector was entitled to a tithe share. A small sum is now paid by each innkeeper in lieu of it. Here is a charity school; and a market is kept every third Wednesday in the month: besides which there are four quarterly markets in every year. It has also one fair annually. The living is a rectory, and the town contains 84 houses, with 608 inhabitants.

DODD, William, in *Biography*, a preacher of considerable note, was born in the year 1729, at Bourne in Lincolnshire, of which place his father was vicar. He was initiated in the learned languages at a private school, but finished his studies at Clare-hall, Cambridge. In the year 1750, he took his degree of B. A., and in the following year he married, and soon found himself destitute of the means of support. It was not till 1753, that he was admitted into orders, when he quickly distinguished himself as one of the most popular preachers of the metropolis. By his pulpit exertions, and by the publication of sermons and other pieces of a practical religious tendency, he acquired a handsome income, which, however, was inadequate to the style and manner of living in which he had embarked, as well probably to gratify his own vanity, as the inclinations of his wife, who was said to be wholly destitute of those principles of economy which ought to characterize persons in their rank of life. To augment his income, which was never equal to his expences, he became the author or editor of several works, which were purchased with avidity, and which afforded Mr. Dodd large profits. In 1757, he took his degree of M. A., was chosen preacher to the Magdalen hospital, an institution that owed much of its early prosperity to his pulpit talents. In 1763, he obtained, through the patronage of Dr. Squire, bishop of St. David's, the prebendary of Brecon, and by the same interest he was appointed tutor to Philip Stanhope, esq. afterward earl of Chesterfield. In the following year he was chosen one of his majesty's chaplains, and soon after took his degree of LL. D. In 1772, he was active in the formation of a society for the relief of prisoners confined for small debts, and was in the same year presented to the rectory of Hockliffe in Buckinghamshire. Hitherto his character was estimable, and his exertions were always on the side of humanity; but he now found himself involved in debts which his regular income was unable to defray. The rectory of St. George's, Hanover square, fell vacant, and Dr. Dodd offered a bribe to the lord chancellor's lady, if she would obtain the presentation of that living for him. Indignant at the base and infamous attack upon her probity, she communicated the fact to her lord, who traced the business to the true author, and had his name struck out with ignominy from the list of the king's chaplains. Dr. Dodd, to avoid the disgrace which must attach to his conduct, went to Geneva, where he met with his pupil, who afterwards presented him with the living of Winge in Buckinghamshire. In 1777, he committed a forgery upon his friend and patron; by this he obtained a large sum of money, which he probably hoped to replace ere the deed was detected. But the offence was scarcely committed before the criminal was discovered, imprisoned, tried, convicted, and, notwithstanding every effort made in his behalf, executed at Tyburn. He died with all the marks of sincere and deep contrition for the vices and follies of which he had been guilty, uttering expressions of the most bitter regret for the scandal, which by his conduct he had brought upon his profession, and on the religion of which he was a minister. For a list of his works, which were very numerous, we refer to the Gentleman's Mazazine for 1777, or to the Gen. Biog.

DODDED, in *Rural Economy*, a term often applied to such sheep as are without horns.

DODDER, in *Agriculture*, the common name of a troublesome weed in arable and other lands. See Bindweed.

Dodder, in *Botany*. See Cuscuta.

DODDRIDGE, Philip, in *Biography*, an eminent nonconformist minister and tutor of the last century, was descended of an ancient and respectable family in Devonshire. His great grandfather was an eminent merchant at Barnstaple; and he had a brother, John Doddridge, born at this place in 1555, who passed through several eminent stages of the law, in the reign of king James I., and at length became one of the judges of the court of king's bench. This learned judge published a variety of works on the subject of antiquities and law, which did honour to his literary character and legal profession, and died in 1628. The grandfather of our author was educated at Oxford, and ejected from the rectory of Shepperton in Middlesex in 1662, by the act of uniformity. His father was an oilman in London, and as the eldest surviving branch of the family, was heir at law to a considerable estate, amounting to about 2000*l.* a-year, but the hazard and expence attending a suit for its recovery deterred him from undertaking it. His mother was the daughter of Mr. Bauman, a minister at Prague in Bohemia, who abandoned his friends and his country, where he had a considerable estate, about the year 1626, on account of his adherence to the protestant religion. Our author was the last and twentieth child of his father's marriage, and was born

born in London, June 26th, 1702. At his birth his life was despaired of, and he was regarded as dead; but by attention and care, the expiring flame of existence was cherished, and under the favour of Providence, his existence was prolonged for the benefit of the world. His constitution, however, was always feeble; and his life was wonderfully preserved for many years, considering the assiduity with which he prosecuted the studies and services to which he devoted it. To his pious parents he was indebted for early instruction in religion, and for those salutary impressions which were never erased from his mind. His classical education commenced in London and its vicinity. But being left an orphan in his 13th year, he was removed to a private school at St. Alban's, where he had the happiness of commencing an acquaintance with Mr. (afterwards Dr.) Samuel Clark, the dissenting minister of the place; to whose instruction and patronage he was afterwards singularly indebted. Having lost his whole patrimony after his father's death, the protection of such a friend was of the greatest importance to him; as he was thus enabled to pursue the course of his studies. In the year 1718, he left St. Alban's and retired to the house of his sister, who was married to Mr. John Nettleton, a dissenting minister at Oakar, in Essex. In this retirement, he deliberated on the course of life which he should pursue. During this period of hesitation and suspence, he received offers of encouragement and support from the duchess of Bedford, if he chose to be educated in one of the universities for the church of England; but as he could not conscientiously comply with the terms of conformity, he declined these offers with becoming respect and gratitude. Others to whom he applied for advice dissuaded him from pursuing the ministry among protestant dissenters, and advised him to devote himself to the profession of the law. The latter profession was recommended to him with flattering proposals; but at the moment of deliberation, and just before he had finally determined to accept these proposals, he received a letter from Mr. Clark with generous offers of assistance, if he chose the ministry upon Christian principles. These offers he thankfully accepted; and after continuing for some months at St. Alban's in the house of his benefactor, he was placed, in October 1719, under the tuition of the reverend John Jennings, who kept an academy for the education of non-conformist ministers at Kibworth in Leicestershire. The advantages he enjoyed in this seminary were very considerable, and he improved them with the most exemplary ardour and diligence. In this situation he paid particular attention to classical literature, and cultivated such an acquaintance with the Greek writers, and also with the best authors of his own country, as seemed to form an ease and elegance of style, which he otherwise could not have attained.

In 1722, having obtained an ample testimonial from a committee of ministers, by whom he was examined, he commenced the exercise of his ministerial office, as a preacher, and his first services were acceptable to those who heard him. His first settlement was at Kibworth, which he preferred, because it was an obscure village and the congregation was small, so that he could pursue his studies with little interruption. During his residence at this place, from June 1723 to October 1725, he paid particular attention to his compositions, and he thus acquired a habit of delivering his sentiments usually with judgment, and always with ease and freedom of language, when he was afterwards, by a multiplicity of engagements, reduced to the necessity of extempore speaking. It has been said, that our author excelled as a preacher during this period. In the year 1725, he removed to Market-Harborough, with a view to the benefit which he expected to derive from the conversation and advice of Mr. Some, the excellent pastor of the congregation in this place, but he still retained his relation to the people at Kibworth, and after the year 1727, when he was chosen assistant to Mr. Some, he preached alternately at Kibworth and Market-Harborough. During the interval that had elapsed since his entrance on the ministerial office, he received several invitations from congregations much more numerous than that with which he first settled: and he was particularly urged to undertake the pastoral charge of a large society of dissenters in the city of London. But he determined to adhere to the plan, which he had adopted, of pursuing his schemes of improvement in a more private residence. When he left the academy, his tutor, Mr. Jennings, not long before his death, which happened in 1723, advised him to keep in view the improvement of the course of lectures on which he had attended; and this advice he assiduously regarded during his retirement at Kibworth. Mr. Jennings foresaw, that, in case of his own death, Mr. Doddridge was the most likely of any of his pupils to pursue and complete the schemes which he had formed, and to undertake the conduct of a theological academy. Mr. Doddridge's qualifications for the office of tutor were generally known and approved, in consequence of a plan for conducting the preparatory studies of young persons intended for the ministry, which he had drawn up at the desire of a friend, whose death prevented his carrying it into effect. This plan was shewn to Dr. Watts, who had then no personal acquaintance with the author; but he was so much pleased with it, that he concurred with others in the opinion, that the person who had drawn it up was best qualified for executing it. Accordingly he was unanimously solicited to undertake the arduous office; and after some hesitation, and with a very great degree of diffidence, he consented to undertake it. Availing himself of all the information and assistance which he could obtain from conversation and correspondence with his numerous friends, he opened his academy at midsummer, in the year 1729, at Market Harborough. Having continued in this situation for a few months, he was invited to accept the pastoral office of a congregation at Northampton; and he removed thither in December 1729; and in March of the following year, he was ordained according to the mode usually practised among dissenters. It is needless to state the faithfulness and affection, the assiduity and zeal, with which he discharged, for more than twenty-one years, the duties of his pastoral relation, or the condescension and tenderness, with which he treated some narrow bigots and weak enthusiasts, who belonged to his church and who occasionally exercised his patience. It is sufficient to say, that he engaged, in a very high degree, the love and attachment of his congregation; and to adduce the testimoney which he bore to their character, when he observes, in his last will, "that he had spent the most delightful hours of his life in assisting the devotions of as serious, as grateful, and as deserving a people, as perhaps any minister had ever the happiness to serve."

In the year 1730, Mr. Doddridge entered into the matrimonial relation, with a lady, who possessed every qualification that could conduce to his happiness, and who, after a course of uninterrupted conjugal felicity, survived him many years. At the first removal of the academy to Northampton, the number of students was small; but it increased every year; so that, in 1734, it became necessary to have a stated assistant, to whom the care of some of the junior pupils was committed. Those who wish to acquaint themselves with the discipline of the family and the order of the lectures, will find ample satisfaction in the Biographia Britannica.

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We ſhall only obſerve, that the number of ſtudents was, one year with another, 34; and that during the 22 years in which this academy ſubſiſted under the tuition of our author, he had about 200 young men under his care, of whom 120 entered upon the miniſtry, others occupied reſpectable ſtations in civil life. The ſyſtem of education was liberal and comprehenſive; and many received inſtruction in this ſeminary, who were members of the eſtabliſhment, and who were allowed to attend the worſhip of the epiſcopalian church. On the abilities of the ſubject of this article, and on the high reputation which he acquired, both as a miniſter and a tutor, it is needleſs to enlarge. Of his talents as a writer, his numerous works will ſufficiently enable the public to judge. To enumerate them all would extend this article far beyond its proper limits; but we cannot forbear mentioning a few of the moſt conſiderable. The firſt diſtinct publication of our author was printed, without his name, in the year 1730, and entitled, "Free Thoughts on the moſt probable means of reviving the Diſſenting Intereſt, occaſioned by the late Enquiry into the cauſes of its Decay;" and it exhibits a pleaſing ſpecimen of candour and politeneſs in controverſial writing. In 1732 he publiſhed "Sermons on the Education of Children," principally deſigned for the uſe of his own congregation; and in 1735 "Sermons to young People," which were favourably received, and have paſſed through ſeveral editions. In 1736 there appeared "Ten Sermons on the Power and Grace of Chriſt," and "the Evidences of his glorious Goſpel." The three laſt were afterwards printed ſeparately, at the particular requeſt of one of the firſt dignitaries of the church of England. In the courſe of this year the two colleges of the univerſity of Aberdeen concurred in conferring upon our author the title of doctor in divinity; an honour which was never more fitly beſtowed. In 1739, Dr. Doddridge preſented to the public the firſt volume of his valuable work, "The Family Expoſitor, or, a Paraphraſe and Verſion of the New Teſtament, with critical Notes, and a practical Improvement of each Section." The ſecond volume of this work was publiſhed in 1740, and concluded the evangelical hiſtory; and in the following year, our author publiſhed a volume of "Practical Diſcourſes on Regeneration." In the years 1742 and 1743, Dr. Doddridge publiſhed "Three Letters" to the author of a treatiſe, entitled, "Chriſtianity not founded on Argument." Theſe letters, which are written with the utmoſt politeneſs and candour, met with very favourable reception, and procured for the author the thanks of ſeveral perſons of diſtinguiſhed rank and abilities. He alſo publiſhed, in 1743, "The Principles of the Chriſtian Religion, expreſſed in plain and eaſy Verſe, and divided into ſhort Leſſons, for the uſe of Children and Youth." In this ſmall tract, written with eaſe, plainneſs, and elegance, the author has too freely introduced doctrines of a diſputable nature, which has, in ſome degree, reſtrained its circulation and diminiſhed its uſefulneſs. The ſame objection has been urged by ſome perſons againſt another more popular tract, publiſhed in 1745, and entitled "The Riſe and Progreſs of Religion in the Soul," illuſtrated in a courſe of ſerious and practical addreſſes, ſuited to perſons of every character and circumſtance, with a devout meditation and prayer added to each chapter. This work was written at the requeſt of Dr. Watts, and obtained a very extenſive circulation, not only in this country, but in America, and on the continent of Europe, where it was tranſlated into the Dutch, German, Daniſh, and French languages.

In the year 1747, our author publiſhed "Some remarkable Paſſages in the Life of the Hon. Colonel James Gardiner," a work which was very generally and very highly commended, but in which, as ſome have thought, and particularly his friend and biographer Mr. Orton, "he too much indulged the emotions of private friendſhip and affection." In the year 1748, appeared the third volume of "The Family Expoſitor, containing the Acts of the Apoſtles, with additional Notes on the Harmony of the Evangeliſts;" and "Two Diſſertations," 1. On ſir Iſaac Newton's Syſtem of the Harmony; 2. On "The Inſpiration of the New Teſtament." In this ſame year Dr. Doddridge reviſed the "Expoſitory Works," and other remains of archbiſhop Leighton, and tranſlated his "Latin Prelections." The laſt work publiſhed by our author in his life time, was entitled "A plain and ſerious Addreſs to the Maſter of a Family, on the important ſubject of Family Religion," accompanied with two prayers. Of the author's grand work, "The Family Expoſitor," three volumes remained to be publiſhed after his death. It was a favourable circumſtance, however for the public, that the author himſelf had finiſhed the whole of the copy, in ſhort hand, a few ſlight notes towards the concluſion excepted, and that the larger part had been tranſcribed for the preſs. This was the caſe with the whole of the fourth volume, which was publiſhed in 1754, and contained St. Paul's epiſtle to the Romans, and his firſt and ſecond epiſtles to the Corinthians. The two remaining volumes, *viz.* the fifth and ſixth, were publiſhed by Mr. Orton in 1756. The greateſt part had been tranſcribed by the author himſelf; and the remainder was tranſcribed either by the editor himſelf, or by ſome of the doctor's pupils, and the tranſcript was compared ſeveral times with the ſhorthand copy. This is the moſt valuable and the moſt important of all Dr. Doddridge's publications; and on this his literary reputation chiefly depends. Many of his notes diſplay a ſagacious and judicious ſpirit of criticiſm; and the practical reflections are of general utility. The extent and permanence of its ſale evince the eſtimation in which it has been held, and in which it is ſtill held, as we may learn by the demand for a 7th edition. Rapid as he was as a writer, and ready as was his acceſs to the various ſources of information, this work muſt have employed a very conſiderable part of his time, ſo much occupied with numerous other engagements, as a miniſter, a tutor, and an author; more eſpecially, as he has every where interwoven the text with the paraphraſe, and carefully diſtinguiſhed the former from the latter by the italic character. This tranſlation has been extracted from the paraphraſe, and was publiſhed in 1765, in two volumes, 12mo., with ſome alterations and improvements by the editor, together with an introduction, and a number of very ſhort notes. The laſt work of Dr. Doddridge preſented to the public, in 1763, 4to. by the Rev. Samuel Clark of Birmingham, the ſon of the author's earlieſt benefactor, was "His Courſe of Lectures on the principal Subjects of Pneumatology, Ethics, and Divinity; with references to the moſt conſiderable Authors on each Subject." This is a work, formed originally on the plan of the courſe of lectures delivered by Mr. Jennings, the author's tutor, which, notwithſtanding the objections that may be urged againſt the mathematical form in which it appears, in the hands of a judicious lecturer, may be of great uſe; but it admits of continual improvement by the inſertion of new and appropriate references. A ſpecimen of this improvement appears in the new edition of 1794, in two volumes 8vo. We ſhould have mentioned a collection of Dr. Doddridge's hymns, publiſhed by Mr. Orton in 1755, the ſixth edition of which appeared in 1788. Although their poetical merit does not rank high, they are well calculated to anſwer the purpoſe for which they were intended, in their connection with particular texts of Scripture; and though

the numbers are not ſo flowing and harmonious as thoſe of Dr. Watts, they are leſs exceptionable to mixed aſſemblies than many of the hymns of the latter. But Dr. Doddridge, independently of his hymns, has given evidence of his poetical taſte and powers.

The excellent lines which he wrote on the motto to the arms of his family, "dum vivimus vivamus," are highly commended by Dr. Johnſon, and repreſented as containing one of the fineſt epigrams in the Engliſh language.

"Live, while you live," the Epicure would ſay,
"And ſeize the pleaſures of the preſent day."
"Live, while you live," the ſacred Preacher cries,
"And give to God each moment as it flies,"
Lord, in my views let both united be,
I live in pleaſure, when I live to thee.

His talent at ſatirical epigram appears in the following lines, written on one of his pupils, a weak young man, who thought that he had invented a method of flying to the moon.

"And will Volatio leave this world ſo ſoon,
To fly to his own native ſeat, the moon?
'Twill ſtand, however, in ſome little ſtead!
That he ſets out with ſuch an empty head."

From the brief view we have above given of Dr. Doddridge's life and labours, it will ſufficiently appear that his application muſt have been inceſſant, and that he could allow himſelf little time for exerciſe and recreation. His conſtitution was always feeble; and his friends deprecated the injurious effects of his uninterrmitting aſſiduity and exertion. By degrees, however, his delicate frame was ſo impaired, that it could not bear the attack of diſeaſe. In December 1750, he went to St. Alban's to preach the funeral ſermon of his venerable friend and father, Dr. Clark. The ſervice was trying, and in the courſe of his journey he caught a cold, which brought on a pulmonary complaint, that made rapid progreſs, and which reſiſted every remedy.

In the advance of the following ſpring it was thought to abate, and his friends flattered themſelves that his life would be ſpared. Notwithſtanding the advice and remonſtrances of thoſe who apprehended his death, and wiſhed to prolong his uſefulneſs, he would not decline or diminiſh the employments, in the academy and with his congregation, in which he took great delight. At length he was obliged to ſubmit; and to withdraw from all public ſervices to the houſe of his friend, Mr. Orton, at Shrewſbury. Notwithſtanding ſome relief which his receſs from buſineſs afforded him, his diſorder gained ground; and his medical friends adviſed him to make trial of the Briſtol waters. The phyſicians of this place afforded him little hope of laſting benefit; and he received their report of his caſe with Chriſtian fortitude and reſignation. As the laſt reſort in his caſe, he was adviſed to paſs the winter in a warmer climate; and at length he was prevailed upon to go to Liſbon, where he met with every attention, which friendſhip and medical ſkill could afford him. But his caſe was hopeleſs. Arriving at Liſbon on the 13th of October, the rainy ſeaſon came on, and prevented his deriving any benefit from air and exerciſe, and in a few days he was ſeized with a colliquative diarrhœa, which rapidly exhauſted his remaining ſtrength. He preſerved, however, to the laſt, the ſame calmneſs, vigour, and joy of mind, which he had felt and expreſſed through the whole of his diſeaſe. The only anxiety he ſeemed to feel was occaſioned by the ſituation in which Mrs. Doddridge would be left upon his removal. To his children, his congregation, and his friends in general, he deſired to be remembered in the moſt affectionate manner; nor did he forget a ſingle perſon, not even his ſervant, in the effuſions of his benevolence. Many devout ſentiments and aſpirations were uttered by him on the laſt day but one preceding that of his death. At length his releaſe took place on the 26th of October, O. S. about 5 o'clock in the morning; and though he died in a foreign land, and in a certain ſenſe among ſtrangers, his deceaſe was embalmed with many tears, nor was he moleſted, in his laſt moments, by the officious zeal of any of the prieſts of the church of Rome. His body was opened, and his lungs were found to be in a very ulcerated ſtate. His remains were depoſited in the moſt reſpectful manner in the burying ground belonging to the Britiſh factory at Liſbon. His congregation erected in his meeting-houſe a handſome monument to his memory, on which is an inſcription, drawn up by his much eſteemed and ingenious friend, Gilbert Weſt, eſq. Dr. Doddridge left four children, one ſon and three daughters, and his widow ſurvived him more than 40 years. His funeral ſermon was preached by Mr. Orton from 1 Cor. xv. 54; and it was extenſively circulated under the title of "The Chriſtian's triumph over death." His character is ſo well delineated by one of his biographers, that we ſhall give it in his words. "Dr. Doddridge poſſeſſed a quick conception, a lively fancy, and a remarkable ſtrength of memory, to which were united an invincible reſolution and perſeverance in the proſecution of his ſtudies. It is not ſurpriſing, therefore, that his mind was furniſhed with a rich ſtock of various learning. His acquaintance with books, ancient and modern, was very extenſive; and if, with regard to the learned languages he could not be called a profound linguiſt, he was ſufficiently converſant in them to read the moſt valuable pieces of antiquity with taſte and pleaſure, and to be able to illuſtrate the force and beauty of the ſacred writings in the ſpirit of true criticiſm. To hiſtory, eccleſiaſtical as well as civil, he had paid no ſmall degree of attention; and while from his diſpoſition he was led to cultivate a taſte for polite literature in general, more than for the abſtruſer parts of ſcience, he was far from being a ſtranger to mathematical and philoſophical ſtudies. But the favourite object of his purſuit, and that, in which his chief excellence lay, was divinity, taking that word in its largeſt ſenſe. As a preacher, Dr. Doddridge was much eſteemed, and very popular. Like thoſe of all other preachers, his diſcourſes poſſeſſed different merits and produced different impreſſions, according to the circumſtances in which he was placed, when he prepared, or when he delivered them. When he was enabled to beſtow on them proper pains, he was perſpicuous in his method, natural and orderly in the arrangement of his ſentiments, and correct and elegant, but ſimple in his language. And his manner of delivery was diſtinguiſhed by energy, a pleaſing variety of modulation, and an impreſſive pathos. Of Dr. Doddridge's moral and religious character, it is not eaſy to ſpeak in too high terms. His piety was ardent, unaffected, and cheerful, and particularly diſplayed in the reſignation and ſerenity with which he bore his affliction. His moral conduct was not only irreproachable, but in every reſpect exemplary. To his piety he joined the warmeſt benevolence towards his fellow-creatures, which was manifeſted in the moſt active exertions for their welfare within the compaſs of his abilities or influence. His private manners were polite, affable, and engaging; which rendered him the delight of thoſe who had the happineſs of his acquaintance. No man exerciſed more candour and moderation towards thoſe who differed from him in religious opinions. Of theſe qualities there are abundant proofs in the extenſive corre-

correſpondence which he maintained, not only with his diſſenting brethren, but with ſome of the brighteſt ornaments, both among the clergy and laity of the eſtabliſhed church. He was, indeed, ſo ſolicitous to be upon friendly terms, as far as poſſible, with all men, however varying in their ſentiments, that he has been accuſed by ſome of uſing a language of compliance and accommodation in his correſpondence and different connections, not eaſily reconcileable with ſincerity. But how much ſoever we may diſapprove of the ambiguity of ſome of the phraſes which he was accuſtomed to make uſe of, we can by no means admit that they warrant us in attaching to his character ſuch an injurious ſuſpicion. On a view of his whole life, we have no heſitation in ſubſcribing to the opinion of Dr. Kippis, that "Dr. Doddridge was not only a great man, but one of the moſt excellent and uſeful Chriſtians, and Chriſtian miniſters, that ever exiſted."

His reputation was ſuch, and the reſpect of perſons of all parties and denominations for his various excellent qualities was ſo great, that in the cloſe of his life, and in the ſcene of his laſt decline, all ſeemed to vie in teſtifying their ſolicitude for his recovery, and their wiſhes for his obtaining every accommodation, that would render his mind and his circumſtances eaſy. During his ſtay at Briſtol, previouſly to his voyage to Liſbon, he received very particular expreſſions of regard from a clergyman of the eſtabliſhed church. When Dr. Doddridge undeſignedly threw out a hint of the principal reaſon which cauſed him to demur about the voyage, and that was the expence of it, this gentleman was both generous and active in promoting a ſubſcription to defray the charges of his voyage. Nathaniel Neal, eſq. an eminent ſolicitor in London, was alſo very zealous in the management of this buſineſs, which he conducted with ſuch ſucceſs as to be able to inform the doctor, that inſtead of ſelling what our author had in the funds, he ſhould be able, through the benevolence of friends, to add ſomething to it, after the expence of the voyage was defrayed. As Mrs. Doddridge forfeited a conſiderable annuity, to which, as a widow, ſhe would have been intitled, by her huſband's dying abroad, a ſubſcription was opened for her chiefly in London, and, in a great meaſure, under the direction of Mr. Neal; by means of which a ſum was raiſed, which was more than equal to the annuity that had been forfeited. Many other expreſſions of unfeigned and affectionate reſpect for the worth, and memory, and family of Dr. Doddridge, might be mentioned. Orton's Memoirs of the Life, &c. of Dr. Doddridge. Biog. Brit. Gen. Biog.

DODECACHORDON, *Gr.* The title given by Glarianus to the book, in which he propoſes to augment the number of eccleſiaſtical tones or modes of the Romiſh church from eight to twelve. This publication bred ſchiſm among the writers on canto fermo. He pretended by theſe four additional modes, to eſtabliſh in their original purity the twelve modes of Ariſtoxenus, which, however, were thirteen; but this attempt was confuted by John Baptiſt Doni, in his treatiſe on the modes and genera.

The dodecachordon, however, is not only a ſcarce but a valuable book, from the great number of curious compoſitions it contains of the moſt eminent early contrapuntiſts; particularly of the admirable Juſquin Du Prey, and his maſter Okenheim.

DODECACTIS, in *Natural Hiſtory*, a name by which Linkius, and ſome other authors, have called a kind of aſtrophyte, or branched ſtar-fiſh, which has twelve rays, firſt parting from the body, and each of theſe finally divided into many others.

DODECADACTYLON, in *Anatomy*, a name given by ſome of the old authors to the gut called the duodenum, from its being anciently ſuppoſed to be about twelve fingers-breadth long.

DODECADIA, in *Botany*, (from δυωδεκα, *twelve*, in alluſion to the number of ſegments in the parts of the flower,) Loureir. Cochinch. 318. Claſs and order, *Polyandria Monogynia*. Nat. Ord. *Sapotæ*, Juſſ.?

Gen. Ch. *Cal.* Perianth inferior, ſpreading, in 12 ſegments, which are obtuſe, and very ſhort. *Cor.* of one petal, bell-ſhaped, with a ſhort thick tube; limb in 12 acute hairy ſegments, longer than the calyx. *Stam.* Filaments 30; thread-ſhaped, inſerted into the tube of the corolla, longer than the limb; anthers roundiſh. *Piſt.* Germen ovate, inferior; ſtyle awl-ſhaped, longer than the ſtamens; ſtigma ſimple. *Peric.* Berry ſmall, ovate, with ſeveral ſeeds.

Eſſ. Ch. Calyx inferior, in 12 ſegments. Corolla in 12 ſegments, bell-ſhaped. Berry.

D. *agreſtis*, a native of the woods of Cochinchina, where it is called Cây Cuong dûng.

Loureiro, from whom alone we have any account of this plant, deſcribes it as a large tree with ſpreading branches. *Leaves* alternate, ovato-lanceolate, entire, ſmooth. *Flowers* in axillary ſimple cluſters, ſmall, white. The author had ſeen only unripe berries, and therefore could not correctly deſcribe either the cells or ſeeds. It does not appear on what principle he refers this genus to the claſs *Icoſandria*, inſtead of *Polyandria*, to which it manifeſtly belongs.

DODECAGON, from δωδεκα, *twelve*, and γωνια, *angle*, a regular polygon or figure, with twelve equal ſides and angles.

If the radius of a circle O A D F (*Plate* VI. *Geometry*, *fig.* 83.) be ſo divided into two parts that the rectangle under the whole and the one part ſhall be equal to the ſquare of the other part; then this laſt part will be equal to the ſide C D of a regular decagon A B C D E F, &c. inſcribed in the circle; and that line whoſe ſquare is equal to the two ſquares of the whole, and of the ſame part, will be equal to the ſide A C of a regular *pentagon* inſcribed in the ſame circle. For, draw the radii O A, O C, O D, O F; alſo draw A D, cutting O C in G, and let A H be perpendicular to O G. The triangle O D G, having the angle C O D ($= \frac{1}{2}$ D O F $=$ O A D) $=$ O D A, is iſoſceles: the triangle A O G, having A G O ($=$ G D O $+$ D O G $=$ 2 D O C) $=$ A O C, is likewiſe iſoſceles; as is alſo the triangle C D G; becauſe, C G D being $=$ A G O, and C D G (C D A) $=$ F A D, the triangles A O G and C D G are equiangular; conſequently, C D, A O; C G, G O, being correſponding ſides, we have C G $\times$ A O (C G $\times$ C O) $=$ C D $\times$ G O $=$ G O^2, becauſe G O $=$ G D $=$ D C, the ſide of the decagon, &c. Moreover, becauſe A G $=$ A O, H G will be $=$ H O; and G C being the difference of the ſegments H O and H C, we have $AC^2 - AO^2 = CO \times GC = OG^2$; and conſequently AC^2 (*i. e.* the ſquare of the ſide of the pentagon) $= AO^2 + OG^2$.

Let C O $= a$, G O $= x$, then will C G $= a - x$; and by this propoſition, $\overline{a - x} \times a = x^2$, and $x^2 + ax = a^2$; and reſolving this quadratic equation, we ſhall have $x^2 + ax + \frac{1}{4}a^2 = a^2 + \frac{1}{4}a^2 = \frac{5}{4}a^2$; whence $x + \frac{1}{2}a = \sqrt{\frac{5}{4}a^2}$, and $x = \sqrt{\frac{5}{4}a^2} - \frac{1}{2}a$. Let the radius a be $= 1$, and G O, or the ſide of a regular decagon inſcribed in the circle is $= \sqrt{\frac{5}{4}} - \frac{1}{2}$. Hence it appears that the ſine of 18° (or half the ſide of a decagon inſcribed in the circle) is $= \frac{1}{2}\sqrt{\frac{5}{4}} - \frac{1}{4} = \frac{1}{2}\sqrt{1.25} - \frac{1}{4} = \frac{1.11803398}{2}$, &c. $- \frac{1}{4} = .55901699$, &c. $- .25 = .30901699$, &c.

If the ſide of a dodecagon be 1, its area will be equal to 3 times the tang. of $75° = 3 \times \overline{2 + \sqrt{3}} = 11.1961524$ nearly; and, the areas of plane figures, being as the ſquares of their ſides, 11.1961524 multiplied by the ſquare of the ſide of any dodecagon, will give its area. Hutton's Menſuration, p. 114.

To inſcribe a Dodecagon in a given Circle Carry the radius ſix times round the circumference, which will divide it into ſix equal parts, or form an hexagon (ſee HEXAGON); then biſect each of thoſe parts, which will divide the whole into 12 parts, for the dodecagon. For another method, ſee PENTAGON; and ſee alſo Hutton's Menſuration, p. 26, &c. See POLYGON.

Dials are ſometimes drawn on all the ſides of a dodecagon. In *Fortification*, a place ſurrounded with twelve baſtions is called a dodecagon; ſuch is Palma Nova in Friuli, &c.

DODECAGYNIA, in *Botany*, (from δωδεκα and γυνη, expreſſive of 12 piſtils or female organs in the flower,) an order of the Linnæan artificial ſyſtem, which occurs only in the 11th claſs, *Dodecandria*, and the character of which is to have not leſs than 12 piſtils, in ſome inſtances 15 or more, as in the genus *Sempervivum*. It is extremely rare for a flower to have more piſtils than ſtamens, and when that circumſtance does occur, the diſproportion is very great, as in *Myoſurus* and *Aliſma*, both of which have ſeveral ſcore piſtils to about five or ſix ſtamens. Hence the order in queſtion is not to be found in any claſs with leſs than 12 ſtamens.

DODECAHEDRON, from δωδεκα, *twelve*, and εδρα, *ſeat*, in *Geometry*, one of the regular bodies comprehended under twelve equal ſides, each of which is a pentagon. See BODY and REGULAR *Bodies*.

Or, a dodecahedron may be conceived to conſiſt of twelve quinquangular pyramids, whoſe vertices, or tops, meet in the centre of a ſphere conceived to circumſcribe the ſolid; conſequently they have their baſes and altitudes equal.

To find the Solidity of the Dodecahedron. Find that of one of the pyramids, and multiply it by the number of baſes, *viz.* 12; the product is the ſolidity of the whole body. Or its ſolidity is found by multiplying the baſe into $\frac{1}{3}$d of its diſtance from the centre, twelve times; and to find this diſtance, take the diſtance of two parallel faces; the half is the height.

The diameter of the ſphere being given, the ſide of the dodecahedron is found by this theorem; the ſquare of the diameter of the ſphere is equal to the rectangle under the aggregate of the ſides of a dodecahedron, and hexahedron inſcribed in the ſame, and triple the ſide of the dodecahedron. Thus, if the diameter of the ſphere be 1, the ſide of the dodecahedron inſcribed will be $(\sqrt{\frac{5}{3}} - \sqrt{\frac{1}{3}}) \div 2$; conſequently, that is to this as 2 to $(\sqrt{\frac{5}{3}} - \sqrt{\frac{1}{3}})$ and the ſquare of that, to the ſquare of this, as $6 : 3 - \sqrt{5}$. Therefore the diameter of the ſphere is incommenſurable to the ſide of an inſcribed dodecahedron, both in itſelf and its power.

If the ſide, or linear edge, of a dodecahedron be s, its ſurface will be $15\, s^2 \sqrt{1 + \frac{2}{5}\sqrt{5}} = 20.6457788\, s^2$: and its ſolidity $5\, s^3 \sqrt{\frac{47 + 21\sqrt{5}}{40}} = 7.663118 96\, s^3$.

If the radius of the ſphere that circumſcribes a dodecahedron be r, then is

$$\text{its ſide or linear edge} = \frac{\sqrt{15} - \sqrt{3}}{3}\, r,$$

$$\text{its ſuperficies} = 10\, r^2 \sqrt{2 - \tfrac{2}{5}\sqrt{5}}, \text{ and}$$

$$\text{its ſolidity} = \frac{20\, r^3}{3} \sqrt{\frac{3 + \sqrt{5}}{30}}.$$

The ſide of a dodecahedron inſcribed in a ſphere is equal to the greater part of the ſide of a cube inſcribed in the ſame ſphere, and cut according to extreme and mean proportion. If a line be ſo cut, and the leſſer ſegment be taken for the ſide of a dodecahedron, the greater ſegment will be the ſide of a cube inſcribed in the ſame ſphere. The ſide of the cube is equal to the right line which ſubtends the angle of a pentagon, of the dodecahedron inſcribed in the ſame ſphere. (See Hutton's Menſuration, p. 253.) See POLYHEDRON.

DODECANDRIA, in *Botany*, (from δωδεκα, *twelve*, and ανηρ, *a man*,) the 11th claſs of the ſexual or artificial ſyſtem of Linnæus, containing ſuch plants as have 12, or from that number to 15 or 19, ſeparate or diſtinct ſtamens, in the ſame flower with the piſtil or piſtils. It compriſes ſix orders, *Monogynia*, which is the moſt numerous and various of the whole; *Digynia*, *Trigynia*, *Tetragynia*, *Pentagynia*, and *Dodecagynia*, which ſee.

DODECAPOLIS, in *Ancient Geography*, a place of Aſia Minor, in Caria; called alſo *Sciritis*.

DODECAS, in *Botany*, (from δωδεκα, *twelve*, alluding to the number of ſtamens, which is rather an unuſual one,) Linn. Suppl. 36. Schreb. 316. Willd. Sp. Pl. v. 2. 841. Juſſ. 323. Mart. Mill. Dict. v. 2. Claſs and order, *Dodecandria Monogynia*. Nat. Ord. *Onagræ*, Juſſ. and not *Myrti*, as he has placed it.

Gen. Ch. *Cal.* Perianth ſuperior, of one leaf, turbinate, divided half way down into four ovate, ſpreading ſegments. *Cor.* Petals four, roundiſh, ſeſſile, inſerted into the calyx. *Stam.* Filaments 12, capillary, ſhorter than the calyx, inſerted into the receptacle, according to Linnæus; anthers oblong. *Piſt.* Germen half ſuperior; ſtyle thread-ſhaped, longer than the ſtamens; ſtigma obtuſe. *Peric.* Capſule nearly altogether inferior, ovate, of one cell, crowned with the ſpreading permanent calyx, within which the naked ſummit of the capſule opens by four valves. *Seeds* numerous, oblong, minute.

Eſſ. Ch. Calyx half four-cleft, ſuperior, bearing the corolla. Petals five. Capſule of one cell, crowned by the calyx.

1. D. *ſurinamenſis*. Sent by Dalberg from Surinam, in ſpirits, to Linnæus, who was in doubt whether to refer it to *Juſſiæa*, to which it ſeems very nearly allied. The *ſtem* is ſhrubby, with ſmooth angular branches. *Leaves* oppoſite, obovate-oblong, obtuſe, entire, ſmooth, tapering at the baſe, without ſtipulas. *Flowers* ſmall, on ſhort, axillary, ſimple, ſolitary ſtalks. *Bracteas* two under the *calyx*, which is obovate, with a quadrangular tube. Linnæus repeats that the ſtamens are inſerted, not into the calyx, but into the receptacle cloſe to the germen, which is contrary to all the apparent affinities of the plant.

DODECATEMORY, from δωδεκα, *twelve*, and μερος, *part*, the twelfth part of a circle.

The term is chiefly applied to the twelve houſes, or parts of the zodiac of the primum mobile; to diſtinguiſh them from the twelve ſigns.

DODECATEMORY is alſo a denomination ſome authors give to each of the twelve ſigns of the zodiac, becauſe they contain a twelfth part of the zodiac a-piece.

DODECATHEON, in *Botany*, (from δωδεκα, *twelve*, and θεος, *a divinity*, an old name for the cowſlip, ſuppoſed to allude

allude to the 12 Cæſars, who were commemorated in the circle of 12 flowers, or thereabouts, compoſing its umbel. The idea is rather far-fetched, and the Cæſars, for the moſt part, were unworthy of any ſuch elegant commemoration. However this may be, Linnæus retained the appellation for a new genus, akin to the cowſlip, which had been called *Meadia*, after Dr Mead, a name which Linnæus, on the repreſentation of the Engliſh botaniſts of the day, rejected as unworthy for generic, though he preſerved it in the ſpecific, one.) American Cowſlip, or Meadia. Linn. Gen. 81. Schreb. 107. Willd. Sp. Pl. v. 1. 808. Juſſ. 97. Gærtn. t. 50. Mart. Mill. Dict. v. 2. Claſs and order, *Pentandria Monogynia*. Nat. Ord. *Precia*, Linn. *Lyſimachiæ*, Juſſ.

Gen. Ch. *Cal.* Perianth of one leaf, half five-cleft, permanent; its ſegments reflexed, at length elongated, permanent. *Cor.* of one petal, deeply five-cleft; tube ſhorter than the calyx; limb reflexed, its ſegments very long, lanceolate. *Stam.* Filaments five, very ſhort, obtuſe, inſerted into the tube; anthers projecting, arrow-ſhaped, approaching each other in a conical form. *Piſt.* Germen conical; ſtyle thread-ſhaped, longer than the ſtamens; ſtigma obtuſe. *Peric.* Capſule elliptic-oblong, of one cell, ſplitting at the top into ſeveral horny recurved ſegments. *Seeds* numerous, ſmall, inſerted upon a central, elliptical, unconnected *receptacle*.

Eſſ. Ch. Corolla wheel-ſhaped, reflexed. Stamens inſerted into the tube. Capſule oblong, ſuperior, of one cell. Stigma obtuſe.

D. *Meadia*, *Curt. Mag. t.*, the only ſpecies, is a native of Virginia, from whence Bartram ſent its ſeeds to Peter Collinſon. They were raiſed in his garden at Mill Hill, and the leaves proved ſo like a lettuce, that he apprehended ſome miſtake, till the beautiful flowers came forth. Biſhop Compton, however, is recorded to have had this plant in his celebrated garden in 1709, but it probably had ſubſequently diſappeared. It is now not uncommon, being a hardy perennial, that bears our ſevereſt cold, and flowers in June. It will notwithſtanding bear forcing well, ſo as to bloſſom three months earlier, though ſome of its near allies, the *Primulæ*, will not endure the leaſt artificial heat.

DODO, in *Ornithology*. See Didus.

DODOENS. See Dodonæus.

DODON, in *Ancient Geography*, a fountain of Greece, in Epirus; ſituated in or near the temple of Jupiter Dodonæus, to whom it was conſecrated. Steph. Byz. is of opinion, that this fountain was the ſource of the river *Dodon*. Pliny and Mela alſo mention this fountain. Ancient naturaliſts aſſure us, that it had a property of rekindling torches, &c. when newly extinguiſhed; which it is ſuppoſed to have done by means of ſome ſulphureous fumes exhaling from it, as we ſtill find to be the caſe with a fountain in Dauphine, called the "burning fountain." It is alſo ſaid to have extinguiſhed torches, in which reſpect its powers were not very miraculous, ſince plunging them into a place where the ſulphur was denſe, or into the water, would produce that effect.

DODONA, a famous city of Epirus, placed by ſome writers in Theſprotia, and by others in Moloſſis; but Strabo reconciles theſe diſcordant opinions by informing us, that anciently it belonged to Theſprotia, and afterwards to Moloſſis, for it ſtood on the confines of theſe two provinces. This city is ſaid to have been built by Deucalion, who, in that univerſal deluge, retreated to this place, which, by reaſon of its height, ſecured him from the waters; and hither reſorted to him all thoſe who had eſcaped from the inundation. With theſe he peopled his new built city, calling it Dodona, according to ſome, from a ſea-nymph of that name; according to others, from Dodon, the ſon, or Dodona, the daughter, of Jupiter and Europa. At the ſame time, Deucalion is ſaid to have founded a temple, which he conſecrated to Jupiter, who is from thence ſtyled *Dodonæus*. Euſebius ſays, (in Chron.) that Dodanim, the ſon of Javan, and grandſon of Japhet, (ſee Dodanim) firſt ſettled in an iſland of Rhodes; and that ſome of his deſcendants, being ſtraitened there for want of room, paſſed over to the continent, and fixed their abode in Epirus, where they built a city, calling it Dodona, from their progenitor Dodanim. The temple of Jupiter Dodonæus was the firſt temple of Greece: for the Epirots were anciently reckoned among the Greeks. But the oracle of Dodona ſeems to have ſubſiſted for a conſiderable time before it, for Herodotus informs us, that it was the moſt ancient of all the oracles of Greece. As to the origin of this oracle, it is ſaid, that two pigeons, taking their flight from Thebes in Egypt, one of them came to Libya; and the other having flown as far as the foreſt of Dodona in Chaonia, a province of Epirus, alighted there; and gave the inhabitants of the country information that it was the will of Jupiter to have an oracle in that place. This prodigy aſtoniſhed thoſe who were witneſſes to it, and the oracle being founded, a great number of perſons reſorted hither to conſult it. Servius (in 3d Æneid, v. 466.) adds, that Jupiter had given to his daughter Thebé theſe two pigeons, and communicated to them the gift of ſpeech. Herodotus, (l. i.) who judged rightly that the fact, which gave riſe to the inſtitution of the oracle, was couched under this fable, has inveſtigated its hiſtorical foundation. Phœnician merchants, ſays this author, ſome time ago carried off two prieſteſſes of Thebes; ſhe who was ſold in Greece took up her reſidence in the foreſt of Dodona, where the Greeks came to gather acorns, their ancient food; there ſhe erected a ſmall chapel at the foot of an oak, in honour of Jupiter, whoſe prieſteſs ſhe had been at Thebes; and this was the foundation of that ancient oracle, ſo famous in preceding ages. The ſame author ſubjoins, that the woman was called the "pigeon," becauſe they did not underſtand her language, but ſoon becoming acquainted with it, they reported that the pigeon ſpoke.

In order to explain the ancient fables, it frequently happened that the Greeks, who were ignorant of the eaſtern languages, whence they were derived, invented new ones. The learned Bochart thought that he had diſcovered the origin of that under our preſent conſideration in two Phœnician, or Arabian words of a double meaning; one of them ſignifying a pigeon, the other a prieſteſs. The Greeks, always inclined to the marvellous, inſtead of ſaying that a prieſteſs of Jupiter had declared the will of that god, choſe to ſay it in a fabulous way, that it was pronounced by a pigeon. Whatever probability may be attached to the conjecture of this learned author, there appears to be more in what is offered by the abbé Salliar (Mem. Acad. Belles Lett. t. v. p. 35.) who takes this fable to have been founded upon the double meaning of the word πελειαι, which ſignified pigeons in Attica, and ſeveral other provinces of Greece, while in the dialect of Epirus it imported old women. Servius, (in 3 Æn. v. 466.) who fully comprehended the ſenſe of this fable, miſtook the proper application of it, by changing the appellative "Peleias" into a proper name. "There was," ſays he, "in the foreſt of Dodona, a fountain from which water iſſued with a ſoft murmuring noiſe, at the foot of an oak: an old woman, named *Pelias*, "interpreted this inarticulate ſound, and by means thereof gave predictions to thoſe who came to conſult her." In ancient

times, the oracle of Dodona seems to have given its responses by the murmuring of the fountain already mentioned (see Dodona); but afterwards they had recourse to other formalities; which we shall explain. In order to which we may previously observe, that near the temple was a sacred grove of oaks and beeches, which was supposed to be inhabited by the Dryades, Fauni, and Satyri, who, we are told, were often seen dancing under the shades of the trees. Before sowing was invented, when man lived upon acorns, those of this wood were in great request, as appears from the following verses of Virgil: (Georg. l. i. v. 7.)

"Liber, et Alma Ceres, vestro si munere tellus
Chaonium pingui glandem mutavit arista."

These oaks, or beeches, were said to be endued with a human voice, and prophetical spirit; for which reason they are called "speaking and prophesying oaks." What gave occasion to this fiction was, that the prophets, when they gave answers, placed themselves in one of these trees, so that the oracle was thought to be uttered by the oak, which was only pronounced out of its hollow stock, or from among its hollow branches. Some were of opinion, that the oracles were delivered from the branches of the trees, because the prophetical pigeons are reported, by Herodotus, to have perched upon a tree (l. ii. c. 52. 55. 57); and the scholiast upon Sophocles tells us, that above the oracle there were two pigeons. Others are inclined to believe, that the oracles were uttered from the hollow stock, because the prophetess could best be concealed there. It is said also, that brazen kettles were used for announcing the oracles, and they were no less famous than the speaking oaks. Accordingly, they suspended, as Suidas intimates, these kettles in the air, near a statue of the same metal, which was likewise suspended, with a lash in its hand. This figure, being agitated by the wind, struck against the kettle that was next to it, which communicating the motion to the rest, occasioned a kind of clattering, which continued for some time; and by means of this noise they formed predictions. (Vossii de Idololatria, l. i. c. 7.) As soon as the sound of the kettles ceased, the women named Dodonidæ, as Plutarch informs us, delivered their oracles, either in verse, as appears from the collection made of them; or by the lots, as Cicero intimates in his books of divination. Hence some have said, the forest of Dodona took its name; *dodo* in Hebrew signifying a kettle. From the speaking oaks of this forest was deduced another fable about the mast of the ship Argo, cut in this forest, which, according to Onomacritus, Apollonius of Rhodes, and Valerius Flaccus, gave oracles to the Argonauts. Van Dale, in his History of Oracles, after remarking that Suidas hath merely copied Eustathius, reports the opinion of Aristotle and several other authors; and takes particular notice how much the ancients vary in their accounts of this oracle; this variation being owing, without doubt, to the care that was taken, not to allow those who came to consult the oracle to approach too near it; so that they could only hear a confused sound, but could by no means judge whence it proceeded.

Dodona, in the period of its celebrity, was a populous city, and became the see of a bishop, suffragan of Nicopolis. But in process of time it was so completely destroyed, that it is not now possible to ascertain its precise situation.

DODONÆA, in *Botany*, (so named by Linnæus, after Rembertus Dodonæus, a celebrated botanist of the 16th century. Plumier had previously dedicated a genus to his honour, which Linnæus referred to *Ilex*.) Linn. Gen. ed. 1. 541. Hort. Cliff. 144. Syst. Veg. ed. 13. 299. Jacq. Amer. 109. Schreb. 257. Willd. Sp. Pl. v. 2. 343. Juss. 375. Gærtn. t. 111. (Ptelæa; Linn. Sp. Pl. ed. 1. 118. ed. 2. 173.) Class and order, *Octandria Monogynia*. Nat. Ord. *Terebintaceis affine*, Juss.

Gen. Ch. *Cal.* Perianth spreading, of four ovate, deciduous leaves. *Cor.* none. *Stam.* Filaments eight, very short; anthers oblong, curved, approaching each other, angular, obtuse, of two cells, bursting longitudinally at their outer edges, sometimes rough or bristly. *Pist.* in the same or a separate flower. Germen triangular, the length of the calyx; style cylindrical, with three furrows, erect; stigma three-cleft, sharpish. *Per.* Capsule triangular, inflated, of three cells; the angles large and membranous. *Seeds* two in each cell, roundish.

Ess. Ch. Calyx of four leaves. Corolla none. Capsule inflated, of three cells, with three wings. Seeds in pairs.

1. D. *viscosa*. Linn. Suppl. 218. Mart. Mill. Dict. v. 2. Willd. Sp. Pl. v. 2. 343. (Aceri vel Palmro affinis, &c. Sloane Jam. v. 2. t. 162. f. 3.) Leaves obovato-lanceolate, viscid. Calyx-leaves elliptical, obtuse, almost naked. Flowers diœcious? Native of the East and West Indies, in sandy ground. A tree ten or twelve feet high, according to Sloane, with fibrous deciduous bark. *Branches* round; when young unequally quadrangular. *Leaves* deciduous, alternate, nearly sessile, obovate with a taper base, nearly entire, bluntish with a little point, about two or three inches long, very glutinous, especially when young, destitute of all pubescence. *Stipulas* none. *Flowers* greenish, in little terminal, often branched, clusters. *Calyx-leaves* elliptical, concave, ascending, ribbed, very nearly if not quite smooth. *Anthers* not longer than the calyx, incurved, rather turgid, smooth and naked, tipped with a little hooked point. *Fruit* we suspect always on a different plant, consisting of inflated, membranous, winged, veiny capsules, about half an inch in diameter. 2. D. *spatulata*. Leaves linear obovate, viscid. Calyx-leaves ovate, acute, naked. Flowers diœcious. Brought by Mr. Archibald Menzies from the Sandwich Islands, where this shrub grows on high mountains as well as on the sea shore. It is smaller than the last, with smaller and differently-shaped *leaves*. The *calyx* is essentially different, its leaves being flat, horizontal, ovate and acute. The *anthers* are short and turgid. The *fruit* we have not seen. 3. D. *angustifolia*. Linn. Suppl. 218. Willd. Sp. Pl. v. 2. 344. Thunb. Prod. 77. (Triopteris; Brown Jam. 191. t. 18. f. 1.) Leaves linear-lanceolate, viscid. Calyx-leaves elliptical, obtuse, fringed.—Native of the Cape of Good Hope and of the West Indies. The *flowers* appear to be diœcious. The narrow *leaves* and fringed *calyx* distinguish it from the first species. The *fruit* is generally reddish. Our Cape specimens are less viscid, and have narrower leaves, than the Jamaica ones, to which last Brown's synonym certainly belongs, and not to the first species. Mutis's plant from Mexico, which he thought a new genus, and named *Palavia*, is the same as Browne's. 4. D. *triquetra*. Willd. Sp. Pl. v. 2. 343. Andr. Repos. t. 230. Leaves elliptic-lanceolate, smooth. Calyx-leaves naked. Anthers linear, elongated. Flowers diœcious.—Common in New South Wales, from whence the late Abbé Cavanilles obtained it and sent it to us. The elliptic-lanceolate, smooth (not viscid) *leaves*, and the yellow *anthers*, five times as long as the calyx, mark it essentially. *Fruit* on a separate plant. Mr. Andrews unjustly lays the blame on professor Martyn for confounding this with the first species; for the error is Forster's, whose D. *viscosa*. Prod. 27, seems to include our first and second species as well as the present, and who surely did not much

attend to the ſubject. 5. D. *cuneata*. Leaves wedge-ſhaped, obſcurely three-toothed. Calyx-leaves elliptical, obtuſe, fringed, reflexed. Flowers diœcious.—Native of New South Wales, from whence ſeveral ſpecimens have been ſent, but we have not met with it in the gardens. All the ſpecimens we have ſeen are male. The *branches* are ſlender and ſtraggling. *Leaves* about an inch long, vifcid, wedge-ſhaped and very obtuſe, with three teeth, more or leſs obvious, at the extremity. *Flower-ſtalks* capillary. *Calyx* reflexed, or rather revolute, expoſing the ſhort, turgid *anthers*. 6. D. *criocarpa*. Leaves elliptic-lanceolate, wavy, hairy as well as the fruit. Calyx-leaves elliptical, reflexed, briſtly.—Gathered by Mr. A. Menzies on the Alps of the Sandwich Iſlands. Its moſt remarkable character conſiſts in the hairy *leaves* and *fruit*. The young *branches* alſo are hairy. The *calyx* is reflexed, but ſcarcely revolute, its form like the laſt, but its edges are hairy or briſtly. We have ſeen no *anthers*, the flowers being probably diœcious. 7. D. *pinnata*. Leaves pinnate, hairy. Anthers briſtly at the ſummit.—Communicated by earl St. Vincent, who received it from New-South Wales. It differs from all the foregoing in its pinnate *leaves*, which are an inch or inch and half long, conſiſting of ſix or eight pair of little alternate, obovate, pointed, entire, revolute leaflets, hairy all over, with an odd one, their common ſtalk interruptedly winged. We have ſeen only male *flowers*, which are tawny, with ſpreading, ovate, hairy *calyx-leaves*, almoſt as long as the *anthers*. The latter are ſingularly briſtly at their ſummits.

We have been more particular than uſual on the ſpecies of this genus, becauſe they ſeem not to have been well diſcriminated by any botaniſt, and leaſt of all by thoſe who have gathered them wild. This, however, will certainly not be the caſe with Mr. R. Brown, who has probably found more than have come to our knowledge, and who cannot fail to illuſtrate the ſubject much further. To us the genus of *Dodonæa* ſeems almoſt, if not altogether, diœcious. All the ſpecies give out a ſtrong yellow ſtain on the application of ſpirits of wine after they are dried. Of their uſes or qualities we are ignorant. Such as have been introduced into the gardens are hardy green-houſe ſhrubs, but have little beauty to boaſt. S.

DODONÆUS, Dodonian, in *Antiquity*, an epithet given to Jupiter, as adored or worſhipped in the temple of Dodona, in a foreſt of the ſame name. See Dodona. It appears, both from Homer and Heſiod, that Jupiter Dodonæus was regarded as a Pelaſgian divinity. Strabo, citing a paſſage from a writer named Suidas, intimates, that the oracle of Jupiter had been tranſported from Theſſaly to Dodona, and that hence was derived the appellation of Jupiter Pelaſgian.

Dodonæus, or Dodoens, Rembertus, in *Biography*, a learned phyſician and botaniſt, of a Weſt Friſeland family of good repute, was born at Mechlin in 1517. His grand-father, long a magiſtrate of great credit and authority in Leuwarden, was named Rembertus Jœnckema. The ſon of this man was called Dodo, or Dodonæus, whence the grandſon obtained the name of Rembertus Dodonæus. He became phyſician to the emperors Maximilian II. and Rodolph II. Having been obliged during the civil wars of his time to quit the imperial court, in order to take care of his property at Mechlin and Antwerp, he reſided a while at Cologne, from whence he was perſuaded to return to Antwerp, but ſoon afterwards he became profeſſor of phyſic in the newly founded univerſity of Leyden with an ample ſtipend. This took place in 1582, and he ſuſtained the credit of his appointment by his lectures and various writings till death put a period to his labours in March 1585, in the 68th year of his age. It appears, by his epitaph at Leyden, that he left a ſon of his own name behind him.

Dodonæus is recorded to have excelled in a knowledge of the hiſtory of his own country, and eſpecially in genealogical inquiries, as well as in medicine. His chief fame at preſent reſts on his botanical publications, particularly his *Pemptades*, or thirty books of the hiſtory of plants, in one volume folio, publiſhed at Antwerp in 1583, and again in 1612 and 1616. This is ſtill a book of general reference on account of the wooden cuts, which are numerous and expreſſive. Haller reckons it "a good and uſeful work, though not of the firſt rate." The author had previouſly publiſhed ſome leſſer works in 8vo. as *Frugum Hiſtoria*, printed at Antwerp in 1552, including the various kinds of corn and pulſe, with their virtues and qualities, often copied, as Haller remarks, literally from ancient authors, who perhaps do not always ſpeak of the ſame plants. This work likewiſe is illuſtrated by wooden cuts.

His *Herbarium Belgicum* firſt appeared in the German language, in 1553, and again in 1557; which laſt Cluſius tranſlated into French. From the French edition "Henry Lyte eſquyer" compoſed his Herbal, which is pretty nearly a tranſlation of the whole. It was publiſhed in 1578, and went through ſeveral ſubſequent editions. This work, in its various languages and editions, is accompanied by wooden cuts, very inferior, for the moſt part, to thoſe in the above-mentioned *Pemptades*. Haller records an epitome of Dodonæus by William Kam, printed at London, in 4to. in 1606, under the title of Little Dodoen. This we have never ſeen.

Dodonæus publiſhed two 8vo. volumes of *Imagines* or wooden cuts of plants, with a few remarks, which went through ſeveral impreſſions, but are now ſeldom uſed, being ſuperſeded by his *Pemptades*. Some of the beſt of theſe cuts were employed in his *Florum et Coronariarum Odoratarumque nonnullarum Herbarum Hiſtoria*, 8vo. publiſhed at Antwerp, in 1569, an elegant little volume, reſembling the 8vo. editions of Cluſius; but all theſe figures are reprinted in the *Pemptades*.

Haller ſpeaks with praiſe of the figures in his work on Purging and Poiſonous herbs, barks and roots, Antwerp, 1574, 8vo. and mentions a little book on the Vine, &c. without cuts, neither of which has come under our inſpection. Melch. Adami, Vitæ Germ. Med. Haller. Bibl. Bot.

DODONIA, in *Ancient Geography*, one of the names formerly given to Epirus.

DOORA, in *Roman Antiquity*, a drink prepared from nine different ingredients; which are enumerated by the epigrammatiſt in the following line.

"Jus, aqua, mel, vinum, panis, piper, herba, oleum, ſal."

Vide Auſon, Epigram 86.

DODRANS, in *Antiquity*, a diviſion of the as; being $\frac{3}{4}$ thereof, or nine unciæ.

DODRED Wheat, in *Agriculture*, a name often provincially applied to ſuch ſorts of this grain as are without beards.

DODSLEY, Robert, in *Biography*, was born in very humble life at Mansfield in Nottinghamſhire, and without the advantages of education was enabled to make a conſiderable figure in the literary world. While young, he had acquired the neceſſary elements of reading and writing, and when in the ſtation of livery ſervant to a lady of faſhion, he publiſhed by ſubſcription a volume of poems, entitled, "The Muſe in Livery." It was received with much approbation, and from the encouragement of this firſt eſſay, he proceeded to drama, and produced the "Toy-ſhop," intended as a

ſatire

ſatire upon the prevailing follies of the times. By the influence of Mr. Pope it was brought upon the ſtage, and became very popular. By the profits ariſing from this, and from his poems, he opened a bookſeller's ſhop in Pall-Mall, where, by perſevering induſtry and great good conduct, he arrived at conſiderable diſtinction. His next productions as an author were, "The King and the Miller of Mansfield," a farce founded on the old ballad ſtory of that name; and a ſequel, entitled, "Sir John Cockle at Court." Theſe, though not ſo much diſtinguiſhed by humour as by their moral and ſentimental tendency, were well received by the public, who conſidered Dodſley as under their peculiar patronage. A work which he publiſhed ſoon after, obtained for the author a larger ſhare of celebrity; this was the "Economy of Human Life," which at the time was ſuppoſed to have been written by the earl of Cheſterfield. Few books in the Engliſh language have paſſed through more editions than this, and it is ſtill regarded as one admirably adapted to the peruſal of young perſons. In 1758, he offered Mr. Garrick a tragedy, entitled "Cleone," which was refuſed; but at the other theatre it was admitted, and amply repaid the managers, as it long drew together very large audiences. Two years afterwards Mr. Dodſley publiſhed his "Select Fables," in three volumes, many of which are original; and to the whole was prefixed an "Eſſay on Fable." Mr. Dodſley is well known as the editor of the "Preceptor," a work of much merit; of "A collection of Plays," in twelve volumes, which has been re-publiſhed by Mr. Reid; and of "A collection of Poems, by different Hands," in ſix volumes. This is reckoned one of the moſt valuable publications of the kind. The exertions of Mr. Dodſley as an author, an editor, and bookſeller, were crowned with ſucceſs; he acquired a handſome fortune, and retired from buſineſs. In retirement, as in active life, he was reſpected and beloved: modeſt in proſperity, grateful to his early friends and patrons, and diſpoſed to beſtow on others the ſame aſſiſtance which he had himſelf experienced. He died of the gout in the year 1764. His works have been ſince publiſhed, in two volumes, 8vo. Biog. Brit.

DODSON, Michael, a learned Engliſh barriſter, and biblical ſcholar, was born at Marlborough, in September, 1732. He was educated partly under his father, who was a diſſenting miniſter, and partly at the grammar ſchool of his native town. Under the direction of his maternal uncle, ſir Michael Foſter, one of the juſtices of the court of king's bench, Mr. Dodſon was brought up to the profeſſion of the law. He was admitted of the Middle Temple in 1754, and practiſed many years as a ſpecial pleader with much reputation: in 1770, he was appointed one of the commiſſioners of bankrupts, an office in which he continued till his death. In 1783, he was called to the bar, having declined that honour till then, which was intended to diminiſh rather than increaſe his buſineſs, his habits never leading him to deſire practice at the bar.

As an author and editor, Mr. Dodſon was well known and highly diſtinguiſhed. In 1776 and 1792, he publiſhed, with additions, new editions of Mr. juſtice Foſter's work, entitled "A report of ſome proceedings on the Commiſſion for the trial of the Rebels in the Year 1746, &c. &c." And in 1795, he drew up a life of his uncle ſir Michael, which was printed in the ſixth volume of the Biographia Britannica. As a biblical writer he publiſhed many papers in a work entitled "Commentaries and Eſſays," and in 1790 he laid before the public, as the reſult of many years ſtudy and deep inveſtigation, "A new tranſlation of Iſaiah, with notes ſupplementary to thoſe of Dr. Lowth, late biſhop of London, and containing remarks on many parts of his tranſlation and notes by a Layman." Mr. Dodſon enjoyed a life of uninterrupted good health, till a few months before his death. He died in October 1799, aged 67 years. Mr. Dodſon's legal knowledge and diſcrimination were highly eſtimated by thoſe to whom he was known, and who had occaſion to confer with him upon queſtions of law. He was deliberate in forming his opinion, and very diffident in delivering it, but always clear in the principles and reaſons on which it was founded. His general knowledge of the laws, and his veneration for the conſtitution of his country, evinced his extenſive acquaintance with the genuine principles of juriſprudence, and his regard for the permanence of the liberties of Britain. His counſel, on any and every occaſion, was founded in judgment, and communicated with diſcretion, ſincerity, and kindneſs. He was mild in his manners, even in his temper, warm in his affections, and ſteady in his attachments. In matters of religion, he contended for the rights of private judgment in their moſt extenſive ſenſe. He was himſelf a firm believer in the Chriſtian religion; holding the unity of God as the fundamental principle of rational worſhip, and regarding Jeſus Chriſt as a man, the delegated and ſpecial meſſenger of the Almighty to declare his will to the world.

DODWELL, Henry, was born at Dublin in the year 1641. His father loſing his property in the great Iriſh rebellion, came to England in the year 1648, in order to obtain ſome effectual aſſiſtance from his relations in London. He ſoon left the metropolis for York, where his ſon Henry was educated. At an early age this youth was left an orphan, his father being carried off by the plague in Ireland, whither he went to look after his eſtate, and his mother falling a victim to conſumption. He was now deſtitute of almoſt all the common neceſſaries of life; attached to books and ſtudy, but without pens and ink to prepare his exercife, and frequently ſubject to much ill treatment from the perſon who had undertaken to provide for him, on account of the uncertainty of his ever being repaid his diſburſements. Some of his more preſſing wants were ſupplied by ſir Henry Slingſby, his maternal uncle, whoſe ſituation did not allow him to do much for his nephew. At the age of 13 he was taken under the protection of another uncle, Mr. Henry Dodwell, rector of Newbourn and Hemley in Suffolk, who aſſiſted the youth in his ſtudies. He was afterwards admitted of Trinity college, Dublin, where he was very conſpicuous for the diligence of his application and for his exemplary piety, and was in due time elected fellow. In 1666, he quitted his fellowſhip, becauſe he could no longer hold it without entering into orders, to which he objected, thinking he might be more uſeful to the intereſts of religion as a layman, than if he aſſumed the clerical profeſſion. He now came to England, and reſided ſome time at Oxford, for the ſake of the advantages of a public library: he then returned to Ireland and commenced his courſe of authorſhip. Of his numerous publications we can notice but few: his firſt piece was a preface to a poſthumous piece of Dr. Stearn, his late tutor; it was entitled "Prolegomena apologetica, de uſu dogmatum Philoſophicorum." He then publiſhed two letters of advice on theological ſubjects, to a ſecond edition of which he annexed "A Diſcourſe concerning the Phœnician Hiſtory of Sanchoniathon," which he attempts to prove a forgery by Philo Biblius.

In 1674, he came again to England, ſettled in London, and became intimately acquainted with the moſt learned and diſtinguiſhed divines of the time; particularly with Dr. Lloyd, afterwards biſhop of Worceſter; whom he accompanied to Holland, when he was appointed chaplain to the princeſs of Orange. As a writer he about this period attacked the Roman

man catholics, and foon after the proteftant diffenters. The laft gave rife to a controverfy between Mr. Dodwell and the celebrated Richard Baxter. In the year 1688, without any application on his part, and as an honourable reward of literary exertions, he was elected Camden profeffor of hiftory by the univerfity of Oxford. This honour he enjoyed but a fhort time, as his notions of government would not permit him to take the oaths of allegiance required by the leaders of the revolution. Quitting his profeffor'fhip, he wrote a defence of his nonjuring principles, and other treatifes on topics connected with it. In 1692, he publifhed his Camdenian lectures, of which the fubjects are the authors who wrote the hiftory of the Roman emperors from the time of Trajan to that of Diocletian. Soon after he loft the profeffor'fhip he retired to Cookham, a village in Berkfhire, and there, or in the neighbouring village of Shottefbrooke, he chiefly fpent the remainder of his days. Here he married, and became the father of 10 children.

In 1696, Mr. Dodwell drew up annals of Thucydides and Xenophon, to accompany editions of thofe authors by Dr. Hudfon and Mr. Wells, which were afterwards feparately reprinted at Oxford. In the year 1701, he publifhed, in quarto, an account of the Greek and Roman cycles, which was highly efteemed by Dr. Halley, and is the moft elaborate of all Mr. Dodwell's works, and was probably the refult of his enquiries on the fubjects difcuffed during the greateft part of his life. Paffing over many other pieces of this author we obferve that, in 1706, he publifhed a work which expofed him to much cenfure, and difgufted many who had heretofore been his zealous admirers. This was entitled an Epiftolary Difcourfe, proving, from the fcriptures and the firft fathers, that the foul is a principle naturally mortal, but immortalized actually by the pleafure of God, to punifhment or reward, by its union with the divine baptifmal fpirit; where it is proved that none have the power of giving this divine immortalizing fpirit fince the apoftles, but only the bifhops. At the end of the preface is a differtation to prove, that "facerdotal abfolution is neceffary for the remiffion of fins, even of thofe who are truly penitent." This work met with powerful opponents, who expofed its philofophy and theology. The principal writers againft Mr. Dodwell, on the occafion, were Mr. Chifhull, Mr. Mills, afterwards bifhop of Waterford, Mr. Norris, and the celebrated Dr. Clarke. The author endeavoured to vindicate himfelf in feparate treatifes, but by every candid, judicious, and liberal mind, it was feen that his caufe was wholly indefenfible. Mr. Dodwell died in 1711, in the feventieth year of his age. Contemporaries knew his merit, and how to eftimate his various talents: he was a man of much application, extenfive reading, and poffeffed great learning. His judgment and tafte have met with few admirers: he was fond of ftrange and paradoxical notions; his religious fentiments were extremely narrow; and he entertained a fort of fuperftitious reverence for the prieftly character. His piety was, however, undiffembled; his integrity unimpeached, and his whole deportment unaffectedly humble and modeft. His moral conduct was eminently virtuous, and his benevolence highly exemplary: he carried the principle of abftemioufnefs to excefs, religiouffy abftaining from almoft all food three days in a week. Of Mr. Dodwell's children two require a fhort notice, *viz.* Henry, the eldeft fon, who was bred to the profeffion of the law, and took an active part in the Society for the Encouragement of Arts, Manufactures, &c. As a writer he enlifted in the caufe of infidelity, and attacked revelation in the difguife of a friend, and publifhed a treatife, entitled "Chriftianity not founded upon Argument," which was ably anfwered by Drs. Benfon, Randolf, Doddridge, and Leland. The other fon, William, educated at Trinity College, Oxford, rofe to fome confiderable preferment in the church, and publifhed many works, among which was, "A Free Anfwer to Dr. Middleton's Free Enquiry," for which he was prefented by the univerfity with a diploma, in full convocation:—"A Differtation on Jephtha's Vow," and two volumes of fermons, one of which was written in oppofition to his brother's pamphlet. Biog. Britan.

DOE, the female of the buck. See CERVUS and DEER.

Doé, in *Geography*. See DOUÉ.

DOEBELN, formerly DOBELIN, or *Dobeln*, a fmall town of Saxony, in the circle of Leipzic, fituated in an ifland formed by the river Mulda, 30 miles W. of Drefden, and 35 S. E. of Leipzic, with a population of 3500 individuals, and remarkable for its manufactures of woollen and linen cloth, flannel, hats, and ftockings. In its neighbourhood are flate quarries, and a very good fuller's earth.

DOEHLEN, a fmall town of Saxony, in the circle of Mifnia, which holds part of the royal ftud, known by the name of the Torgau ftud.

DOEL, a town of Flanders, on the Scheldt, oppofite to Lillo.

DOEN, a town of European Turkey, in the province of Bulgaria, on the Danube; 56 miles N. N. E. of Siliftria.

DOEMITZ. See DOMITZ.

DOES, JACOB VANDER, the *Old*, in *Biography*, a painter and engraver, was born at Amfterdam in 1623, and after having been a difciple of N. Moyart, travelled to Rome and formed himfelf on the manner of Bamboccio. He excelled in landfcapes and animals. His temper was melancholy and auftere, fo that he incurred the difpleafure of all his acquaintance, and was deferted by them. He died at Amfterdam in 1673. "His tone is dark, but his compofition has dignity, his figures are well defigned, and touched with fpirit, and his animals, efpecially the fheep, are painted with equal truth and delicacy." The etchings of this mafter from compofitions of his own, ornamented with animals, are executed in a flight, free, mafterly ftyle. Pilkington by Fufeli and Strutt.

DOES, JACOB VANDER, the *Young*, was the fon of the former, and born at Amfterdam in 1654. He was fucceffively a difciple of Karel du Jardin, Netfcher, and Gerard Laireffe. He was a very ready designer, and poffeffed a lively imagination and good invention; but the impetuofity of his temper was fuch, that he deftroyed his compofitions, if his pictures did not pleafe him in the progrefs of their execution; nor could the interpofition and remonftrances of his beft friends avail for their prefervation. His death, A. D. 1693, at the age of 39 years, prevented his acquiring that fortune and high reputation, which the fame of his abilities and performances gave him reafon to expect. Pilkington.

DOES, SIMON VANDER, the fon of the firft of the artifts above-mentioned, was born at Amfterdam in 1653. Having learned the art of painting from his father, and purfuing the fame ftyle and manner in the choice of the fame fubjects, he travelled to Friefland and to England, and afterwards fettled at the Hague. Notwithftanding the difficulties in which the extravagance of a diffolute wife involved him, and the depreffion of circumftances and fpirits which they occafioned, he perfevered in the exercife of his profeffion. On fome occafions he painted portraits, refembling in their touch and colouring thofe of the old Netfcher; but though his works were much admired and fought after, he fell into great poverty, and died in 1717 at the age of 64 years. The works of this artift are peculiarly pleafing; and though his

his figures want elegance, and his colouring inclines to the yellow and light brown, yet his cattle are so correct, his touch so free and easy, his distances and the forms of his trees so agreeable, his colouring so transparent and delicate, and his pastoral subjects distinguished by so much nature and simplicity of rural life, that his works have been very highly esteemed, and have been sold for very large prices. This artist has etched some few small landscapes, with animals, from his own compositions. Pilkington. Strutt.

DOESBOURG, or Dofsburg, in *Geography*, a small but well fortified town of Holland, in the department of Gueldre, situated at the confluence of the Old and New Yssel, 12 miles S. of Zutphen, lat. 51° 59′ 30″ The New Yssel is also called Drusus' canal. It is a cut made from the Rhine near Arnhem to the Old Yssel, by Drusus, son-in-law to Augustus. (Busching. 4to. vol. vi. p. 473.)

DOEVEREN, Walter, Van, in *Biography*, a skilful anatomist and accoucheur, and professor of medicine, in the university at Leyden, published, in 1753, "Dissertatio de vermibus in intestinis hominum genitis," which was translated into French in 1764. It contains a very accurate description of the different species of worms, and the most approved method of treating the diseases occasioned by them "Sermo academicus de erroribus medicorum utilitate non carentibus," 1762, 4to. This has been much commended, as containing a specimen of ingenious and acute argumentation. But the most valuable of his productions, is his "Observationum academicarum ad monstrorum historiam, anatomiam, pathologiam, et artem obstetricam præcipue spectantium." Groning. 1765, 4to. It contains observations on the rupture of the bladder in a pregnant woman, and of the uterus in the course of a difficult labour, of a polypus of the uterus, successfully removed by ligature; a description of a lamb, with two heads, and of a child born without a head. Haller. Bib. Chir.

DOFAR, in *Geography*. See Dafar.

DOFFIR, a town of Arabia, in the country of Yemen; 12 miles S. of Chamir.

DOFRE, a town of Norway; 36 miles E. of Romsdael.

DOG, in *Astronomy*, a name common to two constellations, called the Great and Little Dog; but among astronomers, more usually, Canis major, and minor. See Canis *major & minor*.

Dog, in *Zoology*, the first species of the Canis tribe, the C. familiaris of the Linnæan school. Linnæus was led to believe that the dog might be distinguished by the form and situation of the tail, which he observes is recurved and turned to the left: this character, it must, however, be allowed, is only partially distinctive; it preponderates in many varieties of the dog tribe, but is not always constant.

It has been well observed by Buffon, that the services of this truly valuable creature have been so eminently useful to the domestic interests of man in all ages, that to give the history of the dog, would be little less than to trace mankind back to their original state of simplicity and freedom, to mark the progress of civilization through the various changes of the world, and to follow, attentively, the gradual advancement of that order, which placed man at the head of the animal world, and gave him a manifest superiority over every part of the brute creation. The dog, independent of the beauty of his form, his vivacity, force, and swiftness, is possessed of all those internal qualifications that can conciliate the affections of man, and make the tyrant a protector. A natural share of courage, an angry and ferocious disposition, render the dog in his savage state a formidable enemy to all other animals; but these readily give way to very different qualities in the domestic dog, whose only ambition seems the desire to please. He is seen to come crouching along, to lay his force, his courage, and all his useful talents at the feet of his master. He waits his orders, to which he pays implicit obedience: consults his looks, and a single glance is sufficient to put him in motion; he is more faithful even than the most boast-d among men: he is constant in his affections, friendly without interest, and grateful for the slightest favours: much more mindful of benefits received than of injuries offered: he is not driven off by unkindness; he still continues humble, submissive, and imploring, his only hope is to be serviceable, his only terror to displease: he licks the hand just lifted to strike him, and at last disarms resentment by submissive perseverance; more tractable than man, and more pliant than any other animal, the dog is not only soon instructed, but even conforms himself to the manners, movements, and habits of those who govern him. He assumes the very tone of the family in which he lives. Like other servants he is haughty with the great, and rustic with the peasant. Always eager to obey and to please his master, or his friends, he pays no attention to strangers, and furiously repels beggars, whom he distinguishes by their dress, their voice, and their gestures. When the charge of a house or garden is committed to him during the night, his boldness increases, and he sometimes becomes perfectly ferocious. He watches, goes the rounds, smells strangers at a distance, and if they stop or attempt to leap any barrier, he instantly darts upon them, and by barking, and other marks of passion, alarms the neighbourhood.

To conceive the importance of this species in the order of nature, let us suppose that it never existed. Without the assistance of the dog, how could men have conquered, tamed, and reduced other animals into slavery? How could he still discover, hunt down, and destroy noxious and savage beasts? For his own safety, and to render him master of the world, it was necessary to form a party among the animals themselves, to conciliate by caresses those which were capable of attachment, and obedience, in order to oppose them to the other species. Hence the training of the dog seems to have been the first art invented by man; and the result of this art was the conquest and peaceable possession of the earth.

The dog is one of those animals which have been so long retained under the protection of mankind, that the real origin of the species remains in a state of uncertainty. Wild dogs appear to be found in large troops in Congo, Lower Ethiopia, and towards the Cape of Good Hope. They are said to be red haired, with slender bodies, and tails turned up like grey-hounds. Others resembling hounds are of various colours, have erect ears, and are the size of a large fox hound; they destroy cattle and hunt down antelopes, and other such animals, as our dogs do the stag. They run swiftly, have no fixed residence, and are very seldom killed, being so crafty as to shun all traps, and of so sagacious a nose as to avoid every thing that has been touched by man. They go in large packs and attack lions, tigers, and elephants; and among the sheep of the Hottentots they commit terrific ravages. Their whelps are sometimes taken, but as they grow old become so ferocious, that they cannot be domesticated.

Modern naturalists are not inclined to allow that these wild dogs constitute the true or real species in a state of nature, but that they are rather the descendants of dogs once domesticated, and which have relapsed into a state resembling that of primitive wildness. Some consider the wolf as the parent source from whence our numerous race of dogs originally sprang. On this point it is remarked by Buffon, that "the wolf and the dog have never been regarded as the same

ſame ſpecies except by the nomenclators of natural hiſtory, who being acquainted with the ſurface of nature only, never extend their views beyond their own methods, which are always deceitful, and often erroneous, even in the moſt obvious facts. The wolf and dog, (he affirms,) cannot breed together, and produce an intermediate race: their diſpoſitions are oppoſite, and their conſtitutions different: the wolf alſo lives longer than the dog; the former breeds but once a year, but the dog twice or thrice. Theſe diſtinctions are more than ſufficient to demonſtrate the two animals to be of very different kinds. Beſides, on a cloſer inſpection, we eaſily perceive that even externally the wolf differs from the dog in eſſential and uniform characters. The appearance of the head and form of the bones are by no means the ſame. The cavity of the eye in the wolf is placed obliquely; the orbits are inclined; the eyes ſparkle and ſhine in the dark: inſtead of barking the wolf howls; his movements, though quick and precipitate, are more uniform and equal: his body is ſtronger, but not ſo flexible: his limbs are firmer, his jaws and teeth larger, and his hair coarſer and thicker." This, however, was the argument of Buffon, previous to the celebrated experiments made to produce a breed between the dog and wolf, and which being attended with the moſt complete ſucceſs clearly proved the fallacy of his reaſoning. It was found that not only a breed could be obtained by coupling theſe animals, but that the hybrids thus produced were alſo capable of producing offſpring, an account of which is amply detailed in the ſupplemental volumes of Buffon's work. This does not, nevertheleſs, afford ſufficient evidence that theſe two animals derive their origin from the ſame ſource; the like circumſtance being known to take place between the horſe and the aſs, the mules of which have ſometimes proved fertile, a fact very fully atteſted of ſome mules produced in New Holland. We are not, therefore, juſtified in ſuppoſing the ſpecies to be the ſame from the circumſtance of their coupling, and can only conclude from ſuch experiments that animals nearly allied to each other, though really different, may ſometimes intermix. It is even more probable that the origin of the dog may be traced to the jackal than the wolf, but it muſt be alſo at the ſame time allowed that nothing can be advanced with certainty on this ſubject. That kind of domeſticated dog which is generally ſuppoſed to approach neareſt to the primitive race is the ſhepherd's dog. Buffon propoſes a genealogical table of the different kinds of dog in which this variety is placed as the apparent ſtock.

Principal Varieties of Dogs.

Shepherd's Dog, Canis domeſticus of Linnæus, & le Chien de Berger of Buffon, is diſtinguiſhed by its upright ears and remarkable villoſity of the tail beneath; and ſtands at the head of the firſt claſs of farm dogs. This breed of dogs is ſaid to be preſerved in the greateſt purity in the northern parts of Scotland, where its aid is highly neceſſary in managing the numerous herds of ſheep bred in thoſe extenſive wilds. The ſame variety is diffuſed over moſt parts of Europe, and is obſerved in ſome countries to be larger and more robuſt than in England. Mr. Bewick remarks, that in thoſe extenſive tracts of land, which in many parts of our own iſland are ſolely appropriated to the feeding of ſheep and other cattle, this ſagacious animal is of the utmoſt importance. Immenſe flocks may be ſeen continually ranging over thoſe wilds, as far as the eye can reach, ſeemingly without controul: their only guide is the ſhepherd, attended by his dog, the conſtant companion of his toils: it receives his commands, and is always prompt to execute them; it is the watchful guardian of the flock, prevents them from ſtraggling, keeps them together, and conducts them from one part of their paſture to another: it will not ſuffer any ſtrangers to mix with them, but carefully keeps off every intruder. In driving a number of ſheep to any diſtant part, a well-trained dog never fails to confine them to the road; he watches every avenue that leads from it, where he takes his ſtand, threatening every delinquent, and purſues the ſtragglers, if any one ſhould eſcape, and forces them into order without doing them the leaſt injury. If the herdſman be at any time abſent from the flock, he depends upon his dog to keep them together; and as ſoon as he gives the well-known ſignal, this faithful creature conducts them to his maſter, though at a conſiderable diſtance. The ſame writer mentions, as a remarkable ſingularity in the feet of the ſhepherd's dog, that they have one and ſometimes two extra toes on the poſterior feet: theſe toes appear to be deſtitute of muſcles, and hang dangling at the hind part of the leg, more like an unnatural excreſcence than a neceſſary appendage. The ſame circumſtance is alſo obſerved in the feet of the cur and the ſpaniel, ſo that it is not peculiar to the firſt-mentioned variety of the dog kind. Neither Linnæus nor Buffon ſpeak of theſe excreſcences.

Wolf Dog, or *Pomeranian Dog*, Canis Pomeranius of Linnæus, is known by having the hair on the head long, the ears erect, and the tail very much curved on the rump. Buffon calls it Chien-loup. It bears much reſemblance to the ſhepherd's dog, but is larger.

Siberian, or *Greenland Dog*, le Chien de Sibirie of Buffon, Canis Sibiricus of Linnæus. This kind is nearly allied to the preceding, and comprehends ſeveral caſual varieties differing in ſtrength and ſize. Moſt of the Greenland dogs are white, but ſome are ſpotted, and ſome black, and are ſaid rather to howl than bark. The Greenlanders ſometimes eat their fleſh, and make garments of their ſkins. But they are principally uſed, both in this country and alſo in Kamtſchatka, for drawing ſledges over the frozen ſnow in winter. Four, five, or ſometimes ſix, as circumſtances require, are commonly yoked to the ſame ſledge, and will readily carry three perſons with their baggage, and thus perform a journey of fifty Engliſh miles in a day. The dogs of Kamtſchatka, which, according to Steller, are called *Koſha*, are uſually black or white: they are ſtrong, nimble, and active, and it is in ſledges, drawn by theſe animals only, that travelling is practicable, in that dreary country, during the winter. A remarkable inſtance of the expedition with which this mode of travelling is performed, is mentioned by captain King, who relates, that during his ſtay in Kamtſchatka, a courier with diſpatches accompliſhed a journey of 270 miles in leſs than four days.

Moſt commonly theſe ſledges are drawn by five dogs, four of which are harneſſed two abreaſt, and the fifth placed as a leader. The reins being faſtened to a collar round the leading dog's neck, are of little uſe in directing the pack, the driver depending chiefly upon their obedience to his voice, with which he animates them to proceed. Great care and attention are beſtowed in training up theſe leaders, and which are of courſe eſteemed more valuable according to their ſteadineſs and docility, and fetch from forty to fifty roubles (about ten pounds ſterling) each. The rider has a crooked ſtick, anſwering the purpoſe of both whip and reins, with which, by ſtriking on the ſnow, he regulates the ſpeed of the dogs, or ſtops them at pleaſure. When they are inattentive to their duty, he often chaſtiſes them by throwing it at them. He diſcovers great dexterity in regaining his ſtick, which is the greateſt difficulty attending his ſituation, for if he ſhould happen to loſe it, the dogs immediately diſcover the circumſtance, and never fail to ſet off at full ſpeed, and

and continue to run till their ſtrength is exhauſted, or till the carriage is overturned and daſhed to pieces, or hurried down a precipice. Notwithſtanding the uſefulneſs of theſe dogs, they are neither of a very tractable diſpoſition, nor remarkable for their fidelity, and their treatment in Kamtſchatka, in particular, is ill calculated for ſecuring their attachment. In the winter they are fed ſparingly with putrid fiſh, and in ſummer are turned looſe to ſhift for themſelves, till the return of the ſevere ſeaſon makes it neceſſary for their maſters to take them again into cuſtody. When yoking to the ſledge they ſet up a diſmal yell, which ceaſes on beginning the journey, and then gives place to ſilent ſubtlety, and a perpetual endeavour to weary out the patience of the driver by their ſtratagems, and againſt which it is always neceſſary for him to be on the guard. But with all their faults they are conſidered as conſtituting one of the great conveniencies of life, by the inhabitants of the frozen regions of Kamtſchatka. The Siberian, or Greenland dog, has the ears ſhort and erect, and the whole of the body covered with long hair. They are uſually white with a black face; they ſeldom bark, but make a ſort of hideous howl. They ſleep abroad, forming a lodge in the ſnow, and lying with only their noſes above it. The Greenlanders are not kinder maſters to their dogs than the Kamtſchatkans; they leave them to feed on muſcles or berries, unleſs they have made a great capture of ſeals, when they treat them with blood and garbage. They ſometimes eat their dog, uſe their ſkins for coverlets, for clothing, or for bordering and ſeaming their habits; and from their guts they make their beſt thread. They faſten to their ſledges from four to ten dogs, and they travel over the ice, with a carriage, loaden with their maſter and five or ſix ſeals, 15 German, or 60 Engliſh miles a day. Theſe dogs are excellent ſwimmers, and will hunt in packs the arctic fox, ſeals on the ice, and the polar bear, in which latter chace they are ſometimes uſed by the natives.

Iceland Dog, Canis Iſlandicus of Linnæus, and called by the Icelanders, according to Olafſen, *Fiaar-hund*. It is covered with long hair, except on the ſnout, and the ears, which are erect, and pendulous at the tip.

Newfoundland Dog, a variety of large ſize, and which, from its ſuperior ſtrength, ſagacity, and docile diſpoſition, is one of thoſe beſt calculated for the ſecurity of a houſe. The feet of this kind of dog are more palmated than uſual, and the animal is remarkably partial to the water. The breed of Newfoundland dogs was originally brought from the country of which they bear the name, where they are extremely uſeful to the ſettlers on thoſe coaſts, who employ them as animals of burthen, to bring wood from the interior of the country to the ſea ſide: three or four of them yoked to a ſledge will draw two or three hundred weight of wood piled upon it for ſeveral miles with great eaſe. In this ſervice, it is affirmed they are ſo ſagacious and willing, that they never require a driver or perſon to guide them, but after delivering their loading, they return without delay to the woods, and receive food in reward for their induſtry. In theſe parts they are accuſtomed to feed principally on fiſh, which, either in a freſh or dried ſtate, theſe animals are remarkably fond of. From the ſtructure of the feet, the Newfoundland dog is enabled to ſwim extremely faſt, dive with eaſe, and bring up any thing from the bottom of the water.

Large rough water Dog, Canis aviarius aquaticus, Linn. Canis ſagax ad aquas, Aldrovandus, Grand barbet of Buffon, Budel of Ridinger: a variety diſtinguiſhed by its curly hair, which much reſembles wool. The webs between the toes are larger than in moſt other dogs, which ſufficiently accounts for the eaſe with which it ſwims, and renders it uſeful in hunting ducks and other water fowl. Dogs of this breed are alſo frequently kept on board ſhips, for the purpoſe of ſending into the water after any ſmall article that may chance to fall overboard.

Great Water Spaniel, is alſo known by its curled hair, and propenſity to the water. In point of form it is far more elegant than the rough water dog, and its aſpect more ſagacious and mild: the ears are long and pendulous, and the hair beautifully criſped and curled. It is chiefly uſed in diſcovering the haunts of water-fowl, and in finding birds that have been ſhot in marſhy places.

Small Water ſpaniel, called by Buffon *le petit Barbet*, is a variety cloſely allied to the former, but of a ſmaller ſize, and poſſeſſes the ſame habits and diſpoſition.

King Charles's Dog, a variety of the moſt elegant kind, and which is ſufficiently known in this country, under the appellation abovementioned. It is the canis brevipilis of Gmelin, and the ſame apparently which Buffon calls Gredin. The head is ſmall and rounded, with the ſnout ſhort, and the tail curved back; its ears are long, hair curled, and feet webbed. The celebrity attached to this breed ſeems to ariſe chiefly from its having been the favourite companion of Charles II., who, it is recorded, ſcarcely ever walked out without being attended by ſeveral of them. The *Springer*, or *Cocker*, is a variety cloſely allied to this kind. The dog called *Pyrame*, by Buffon, is alſo a variety of the ſame, and is diſtinguiſhed by a patch of red on the legs, and another over each eye.

Maltefe Dog, Canis melitæus, Gmelin; Canis melitenſis hirſutus, Aldrovandus, and Bichon of Buffon, a variety with long ſoft and ſilky hair appertaining to the ſpaniel kind, very ſmall, and of a white colour in general. This is one of the moſt elegant of the lap-dog kind, and in ſome varieties, as in the ſhock, is almoſt concealed in the hair which covers it from head to foot.

Lion Dog, the Gmelinian Canis leoninus, an animal of ſmall ſize, having the head and fore-part of the body covered with ſhaggy hair, while the hind-part is quite ſmooth, except a tuft at the end of the tail. The *Comforter* is another ſmall dog allied to this, and is a general attendant on the ladies at the toilette, or in the drawing-room, but is of a ſnappiſh, ill-natured diſpoſition, and very noiſy.

Pug dog, Canis fricator of Gmelin, and donquin of Buffon, has the noſe turned upwards, the ears pendulous, and body ſquare. In its outward appearance this animal reſembles the bull dog in miniature: it was formerly very common in England, but has of late years become ſcarce. They are the principal breed of lap-dogs kept by the ladies at Padua, and ſome other parts of Italy. The baſtard pug-dog, as its appellation implies, is a croſs breed between the common pug-dog and ſome other. This latter is the roquet of the French, Canis hybridus of Gmelin; and there are likewiſe ſeveral other hybrid varieties of this kind of dog.

Maſtiff, Canis moloſſus of Linnæus. Canis ſagax ſanguinarius of Geſner, Baerenbeiſſer of Ridinger. This is the ſize of a wolf, very robuſt in its form, and having the ſides of the lips pendulous. Its aſpect is ſullen, and its bark loud and terrible, and he appears every way formed for the important truſt of guarding property committed to his care, and as a houſe or yard dog may be perhaps more valuable than the Newfoundland breed, which is more commonly kept for this purpoſe. Dr. Caius, who lived in the reign of queen Elizabeth, and who has left us a curious treatiſe on Britiſh dogs, informs us, that three of theſe animals were reckoned a match for a bear, and four for a lion. From an experiment however, made in the preſence of James I., as related by Stow, the lion was found an unequal match for

only three of them. Two of the dogs were disabled by the combat, but the third forced the lion to seek for safety by flight. The two dogs were so much beaten and torn in the conflict, that they soon died of their wounds; the last survived and was taken great care of by the king's son, who said "he that had fought with the king of beasts should never after fight with any inferior creature."

The mastiff, in its pure state, is seldom met with. The generality of dogs, distinguished by that name, are crossed breeds between the mastiff and bull-dog, or the ban dog.

Bull-dog, is of the mastiff kind, and very nearly allied to the former, but is smaller, with a somewhat flatter snout, and still more ferocious aspect; the lip, as in the former, pendulous. This is reputed the fiercest of all the dog kind; it is low in stature, but very strong and muscular: the nose short, and the under jaw projecting considerably beyond the lower one. Its courage in attacking the bull is well known: its fury in seizing, and its invincible obstinacy in maintaining its hold, are truly astonishing: it always aims at the front, and generally fastens upon the lip, or other part of the face, where it hangs in spite of every effort of the bull to disengage himself.

This is the kind of dog employed in the diversion of bull-baiting, an inhuman and disgraceful custom long practised in this country; but which of late years has been gradually on the decline, and in many parts has been entirely laid aside. As an instance of the remarkable ardour of this breed of dogs in attacking the bull, it is related by Dr. Goldsmith, that some years ago, at a bull bait in the north of England, when that barbarous custom was very common, a young man, confident of the courage of his dog, laid some trifling wager that he would, at separate times, cut off all the four feet of his dog; and that after every amputation it would attack the bull. The cruel experiment was tried, and the dog continued to seize the bull as eagerly as if he had been perfectly whole. The aspect of the bull-dog is altogether ferociously brutal, and as he always makes his attack without barking, it is dangerous to approach him alone without the greatest precaution.

The bull dogs of Great Britain were celebrated for their strength and invincible courage in the early history of the country: even under the Roman emperors, while their forces colonized this island, an officer was appointed, whose sole business it was to breed and transport from hence such as would prove equal to the combats of the amphitheatre. There may not, however, remain sufficient evidence on record to decide, whether the mastiff or the bull dog was the breed in such high request: some writers affirm it to be the mastiff, others the bull dog. Linnæus seems to consider the mastiff as the dog in question, and gives it the trivial name of *anglicus* for that reason. Aldrovandus calls it *Canis bellicosus anglicus*, and Ridinger *Englische Docke*. The true bull dog, the Linnæan canis molossus, nevertheless, appears to be an indigenous breed in this island, and from their acknowledged superiority in courage, though inferior in point of size, may perhaps be regarded more truly as the genuine British race so highly celebrated by the Latin historians.

Ban-dog, a variety of this fierce tribe not often met with. It is lighter, smaller, more active and vigilant than the mastiff, but not so powerful. Its nose is smaller, its hair more rugged, and the colour generally of a yellowish grey streaked with shades of black or brown. It attacks with eagerness, but more commonly seizes cattle by the flank than in front.

Dalmatian or *Coach Dog*, is an animal of great beauty, being of a white colour, elegantly marked on all parts with numerous round black spots. The native country of this breed is uncertain; it is commonly termed the Danish dog. Buffon calls it Brague de Bengal, but Pennant affirms that it is a native of Dalmatia, a district of European Turkey. It is said to have been known and domesticated in Italy for the last two centuries, and to be the common harrier of that country.

This kind is usually kept in genteel houses as an attendant on the carriage: its scent is indifferent.

Irish Greyhound, Canis Graius Hibernicus of Ray, and Le Matin of Buffon. This is the largest of the dog kind, and in its appearance the most beautiful and majestic. The breed is peculiar to Ireland, where it was formerly of great use in destroying the wolves, with which that country was much infested, but is now become extremely rare. In the third volume of the Linnæan Transactions, is an account of a dog of this kind communicated by Aylmer Bourke Lambert, esq. who assures us that the breed is now become nearly extinct in Ireland; those in the possession of the earl of Altamont (eight in number) being the only ones in the country. The specimen described by Mr. Lambert measured sixty-one inches from the nose to the tip of the tail; but formerly they appear to have been of a much superior size, and in shape more resembling a greyhound. Dr. Goldsmith assures us he has seen a dozen of these dogs, and informs us that the largest was about four feet high, or as tall as a calf of a year old. These dogs are generally of a white or cinnamon colour, and more robust than the greyhound, their aspect mild, and their disposition gentle and peaceable. It is said that their strength is so great that in combat the mastiff or bull dog is far from equal to them. They commonly seize their antagonists by the back and shake them to death. These dogs were never serviceable for hunting either the stag, the fox, or the hare: their chief utility was in hunting wolves, and to this breed may be in a great measure attributed the final extirpation of those ferocious animals in the woody districts of Wales and England in early times.

Scottish Highland Greyhound, or *Wolf Dog*, is a large, powerful, and fierce looking dog, with pendulous ears, and its eyes half concealed among the hair; its body was strong and muscular, and covered with harsh wiry hair of a reddish colour mixed with white. This is the animal formerly used by the chieftains of Scotland in their grand hunting parties.

Gazehound, an animal similar to the greyhound; and, like that kind of dog, directed in its pursuit only by the eye. This was formerly in great repute, but appears at this time to be very imperfectly known. It was used chiefly in stag and fox hunting.

Greyhound, Le Levrier of Buffon, Canis grajus of Gmelin. The greyhound is remarkable for the slenderness of its form, its elongated snout, and extreme swiftness of its course. It is indeed esteemed the fleetest of all the hunting dogs, but as it wants the faculty of scent, follows by the eye. Formerly, the greyhound was held in such esteem, that by the laws of king Canute, it was enacted that no one under the degree of a gentleman should presume to keep one. Buffon supposes this to be the Irish greyhound rendered thinner and more delicate by the influence of climate.

Italian Greyhound, called by Ridinger Windspiel, and Levron by Buffon. This, like the former, has the body arched and the snout tapering, but its size is only half that of the common greyhound; it is a beautiful and delicate animal, and is not common in this country, the climate being too rigorous for its constitution.

Lurcher, the usual attendant on the poacher in his illicit practices, is a dog of smaller size than the greyhound, and stouter in proportion; its hair rough and commonly of a pale yellowish colour, and the aspect of its visage remarkable

for its fullenneſs. As this dog poſſeſſes the advantage of a fine ſcent, it is moſt commonly employed in killing hares and rabbits during the night-time. When turned into the warren it lurks about with the utmoſt precaution, and darts upon the rabbits, while feeding, without barking or making the leaſt noiſe; and then conveys his booty in ſilence to his maſter, who remains in waiting in ſome convenient place to receive it. The lurcher is ſo deſtructive to game as to be generally proſcribed, and the breed in conſequence may therefore at no very remote period become extinct.

Naked Dog, a ſingular variety, naturally deſtitute of hair, which is imagined to have originated in ſome very warm countries. Many have ſuppoſed it to be of the Engliſh bull dog kind reduced and degenerated by the heat of the eaſtern climate. Buffon calls it *Le chien Turc*, and later writers depending on his authority have hence deſcribed it as a native of Turkey, but erroneouſly, for in that part of the world it appears to be altogether unknown. Sonnini, in the courſe of his travels through the Ottoman empire, had an ample opportunity of aſcertaining this fact, and ſpeaks decidedly to that effect. On the ſubject of dogs (obſerves this writer) which are in very great numbers in the towns of Turkey, I ſhall remark, that we might ſeek there in vain that ſpecies, rather uncommon and without hair, which we call *the Turkiſh dog*, and ſometimes the naked dog. It is not in the temperate climate of Turkey that dogs loſe their hair; it is not even under the burning ſky of Egypt, for thoſe ſeen in the moſt northern part, which is diſtinguiſhed by the name of Lower Egypt, are of the race of large greyhounds, deformed by want, which are found in the other towns of Turkey; and thoſe of Upper Egypt have long hair, and ſomewhat reſemble our ſhepherd's dog. M. Sonnini does not pretend to ſay from what country the Turkiſh dog originally came, but aſſures us he never met with a ſingle one in Turkey, nor could he learn after much enquiry that it is at all known in that country. I have even ſome reaſon to ſuſpect (ſays this writer) that this is a diſtinct and ſeparate ſpecies, and the ſcarcity of theſe dogs in Europe might lead us to preſume that they are a ſimple accidental variety in a ſpecies of animals the race of which are inceſſantly croſſed and mingled; a variety which may have been called Turkiſh dog, becauſe having ſcarcely any hair they have ſome reſemblance to the Turks, with whoſe ſcrupulous attention to eradicate their hair every one is well acquainted. The author of the ſportſman's cabinet tells us, the bull dog, the naked or Turkiſh dog, and the Iceland dogs are ſaid to conſtitute but one race, which being removed from cold countries where the fur, hair, or wool is always ſtrong, into the warmer climates of Africa and India, have loſt their hair. The Turkiſh dog, it is remarked likewiſe, is nothing but the ſmall Daniſh dog, which having been tranſported to a much warmer climate loſt its hair, and was afterwards returned to Turkey, and propagated more carefully on account of his ſingularity. This opinion is, however, diſcountenanced by the foregoing obſervations.

Terrier, a ſmall thickſet dog, of which there are two kinds, one with the legs ſhort, the back long, and moſt commonly of a black or yelloviſh colour mixed with white; the other of more ſprightly appearance, with the body ſhorter, and the colour reddiſh brown or black. In both the diſpoſition is nearly the ſame; it has an acute ſmell, is generally an attendant on every pack of hounds, and is very expert in forcing foxes and other game out of their coverts. Its determined hoſtility againſt rats, mice, and other animals of the like deſcription, renders it really ſerviceable. The terrier is well known to encounter the badger, which is a formidable animal, with great courage, and not often without ſucceſs, though it ſeldom fails to meet with ſevere treatment in thoſe engagements. To the fox as well as badger it is an implacable enemy, and purſues every kind of game ſecreted in ſubterraneous retreats with more alacrity than any other of the dog race. The huntſmen are exceedingly choice in their ſelection of terriers for a fox hunting eſtabliſhment; their ſize is not ſo much regarded as ſtrength, but they muſt poſſeſs, as an indiſpenſable qualification, the moſt invincible fortitude. The black, and black tanned, or rough wire-haired pied are preferred, for it is obſerved that theſe inclining to a reddiſh colour are ſometimes in the clamour of the chaſe.

Turnſpit, a ſprited, active, and induſtrious kind of dog, conſidered once as an indiſpenſable attendant on the ſpit, which, by a peculiar contrivance, and the aid of its own exertions, it was enabled to turn at an even pace. This office of the canine turnſpit has, however, been gradually ſuperſeded by the introduction of the "*jack*" in this country, except in ſome particular places. It is ſtill practiſed in France and Germany. The turnſpit is diſtinguiſhed by having the body long, the legs very ſhort, and the tail curled on the back; its uſual colour is greyiſh with black ſpots. Gmelin has three varieties of this family of dogs, one of which has the feet ſtraight, another the feet curved, and the third having the body covered with long curly hair. The terrier is the Gmelinian *canis vertagus*.

Beagle. The ſmalleſt of thoſe dogs which are kept for the pleaſure of the chace in this country, and which is employed chiefly in hunting the hare. The huntſman diſtinguiſhes two or more diſtinct varieties, as the "rough beagle" and "ſmooth beagle," &c. and each kind has its particular admirers. The beagle is remarkable for the exquiſiteneſs of its ſcent, and the ſoft and muſical melody of its tone.

Harrier, another of the hunting dogs, cloſely allied to the beagle, and like that kind comprehending ſeveral varieties. This is larger than the beagle, more nimble, and vigorous, and better adapted to endure the labour of the chace. In the purſuit of the hare, it evinces the warmeſt ardour, and frequently outſtrips the ſpeed of the fleeteſt ſportſman. A hybrid breed between this and the terrier, is ſometimes kept for hunting the otter, the dog produced being a hound of great ſtrength and activity.

Fox-hound. The breeding and training of this kind of dog is attended to with ſo much care in this country, that it can admit of no ſurpriſe to find them ſuperior in ſtrength, agility, and ſwiftneſs, to thoſe of every other part of the world; the unrivalled excellence of the Britiſh fox-hound is univerſally acknowledged. In choſing thoſe animals, ſuch as ſtand high and appear light in their make are deemed preferable. The fox-hound is not limited to the purſuit of the fox only, but is inſtructed alſo to hunt the ſtag and other deer, and are found equal to the moſt arduous conteſts of the chace. It is affirmed, that the fox-hounds reared in this country loſe much of their native vigour, on being tranſported into any other climate.

One of the moſt remarkable inſtances of the ſpeed and determined perſeverance of this kind of hounds, occurred many years ago in the north of England. A ſtag was hunted from Whinfield park, in the county of Weſtmoreland, till, by fatigue or accident the whole pack was thrown out, except two fox-hounds bred by lord Thanet, who continued the chace during the greateſt part of the day. The ſtag returned to the park from whence he had been driven, and as his laſt effort leaped over the wall, and died as ſoon as he had accompliſhed it. One of the hounds ran to the wall, but being unable to get over it, laid down and almoſt immediately expired: the other hound was found dead

about half a mile from the park. The length of this chace is uncertain, but as they were feen at Red-kirks, near Annan, in Scotland, diftant on the poft road about forty-fix miles, it is conjectured, the circuitous courfe they took, could not make the diftance ran lefs than one hundred and twenty miles. A chace of fix or eight hours has been fuftained by thefe hounds on many occafions, but their fwiftnefs cannot perhaps be more forcibly inftanced, than by fome experiments that have been lately determined in the fporting world. One efpecially fhould be noticed: about the year 1795, Merkin, a celebrated fox-hound bitch, was challenged to run any hound of her years, five miles over Newmarket, giving 220 yards, for 10,000 guineas, and as a run for trial, performed a race of four miles in feven minutes and a half.

Old Englifh hound is diftinguifhed by its great fize and ftrength: the body is long, with a deep cheft, its ears long and fweeping, and the tone of its voice peculiarly deep and mellow. It poffeffes the moft exquifite fenfe of fmelling, and can often difcover the fcent an hour after the beagles have given it up. Dogs of this kind were once common in Britain, and are faid to be formerly much larger than at prefent.

The *Kibble hound* is a crofs breed between this and the beagle.

Blood hound, a dog of larger fize than the old Englifh hound, more beautiful in its formation, and poffeffing fuperior activity and fagacity. The prevailing colour is reddifh brown. This fort of hound was held in high requeft among our anceftors, and as it was remarkable for the moft exquifite fenfe of fmelling, was frequently employed in recovering game that had efcaped from the hunter. It could follow, with great certainty, the footfteps of a man to a confiderable diftance, and was therefore of the utmoft utility in thofe barbarous and uncivilized times, in tracing murderers and other felons through the moft fecret coverts. In many diftricts, infefted with robbers, a certain number of thefe hounds were maintained at the public charge, and in general proved the means of difcovering the perpetrators of crimes when every other endeavour failed of fuccefs. Upon the Scottifh borders, where it was known by the name of *Sleuth-hound*, it was efpecially ferviceable.

The breed of this kind of dog is not very generally cultivated at this time. Some few are kept for the purfuit of deer which have been previoufly wounded by a fhot to draw blood, the fcent of which enables the dog to purfue with the greateft certainty. During the American war numbers of thefe dogs were fent to that country, and employed in difcovering fugitives concealed in the woods and other fecret places: they were in ufe alfo, for a fimilar purpofe, during the late revolts in the Weft Indian iflands, and likewife in Ireland at the time of the laft rebellion. They are fometimes employed in difcovering deer-ftealers, whom they infallibly trace by the blood that iffues from the wounds of their victims. They are alfo faid to be kept in convents fituated in the lonely mountainous countries of Switzerland, both as a guard to the facred manfions as well as to find out the bodies of men who have been unfortunately loft in croffing thofe wild and dreary tracts. As an inftance of the certainty with which the blood-hound purfues the object it is required to feek, it is related by Mr. Boyle, that a perfon of quality, in order to try whether a young blood-hound was well inftructed, caufed one of his fervants to walk to a town four miles off, and then to a market town three miles from thence. The dog, without feeing the man he was to purfue, followed him by the fcent to the above-mentioned places, notwithftanding the multitude of market people that went the fame way, and travellers that had occafion to crofs it: and when the blood-hound came to the chief market-town, he paffed through the ftreets without taking notice of any of the people there, and did not quit the place till he had gone to the houfe where the man was refting himfelf, and whom he found fitting in one of the upper apartments.

Spanifh Pointer, originally, as its name implies, a native of Spain, but long fince naturalized in this country. This dog is remarkable for the aptnefs with which it receives inftruction, and is much more readily broke and trained to the fport than the Englifh pointer, but is lefs capable of enduring fatigue. It is employed chiefly in finding partridges, pheafants, &c. either for the dog or gun.

Englifh Setter, a hardy, nimble, and handfome dog, poffeffed of an exquifite fcent and fagacity in difcovering various kinds of game, and which is upon the whole efteemed one of the moft valuable of our hunting dogs.

> "The Setter ranges in the new-fhorn fields,
> His nofe in air erect; from ridge to ridge
> Panting he bounds, his quartered ground divides
> In equal intervafs, nor carelefs leaves
> One inch untried: at length the tainted gales
> His noftrils wide inhale: quick joy elates
> His beating heart, which awed by difcipline
> Severe, he dares not own, but cautious creeps
> Low-cow'ring, ftep by ftep; at laft attains
> His proper diftance: there he ftops at once,
> And points with his inftructive nofe upon
> The trembling prey." Somerville.

Alco, a kind of dog defcribed by Buffon, and which is faid to be diftinguifhed by the fmallnefs of its head, and pendulous ears, curved back, and fhort tail. The alco is reported to be the original, or indigenous dog found by the Spaniards in South America, at the time of the difcovery of that vaft continent. It is fubject to two diftinct varieties, one of which Hernandez calls *Tizucinte porcotl*: this alfo bears, according to Fernandez, the name of *Michuncanens*; the other is called *Techichi*. The former has the head white in front, with the ears yellowifh, the neck fhort, the back curved, and covered with yellow hair: tail white, fhort, and pendulous, belly large and fpotted with black, and the legs white. The other corresponds pretty nearly with this, but has a wilder and more melancholy air. The beft account extant of this kind of dog is not fo fatisfactory as we could wifh; and the following variety alfo appertains fo nearly to the wolf tribe, that we cannot admit it among the dog tribe without expreffing fome doubt as to its propriety.

Dingo, or New Holland Dog.—In this animal the fnout is pointed, the ears erect, and the tail bufhy and pendulous; its ftature is that of the largeft fhepherd's dog, and its colour a reddifh dun brown, the hair long, thick, and ftraight. It is capable of barking, though not fo readily as the European dogs, but fnarls and howls exactly like them, notwithftanding which, it has been reprefented as unable to either bark or fnarl. Thofe which have been brought to Europe evince a favage and untractable difpofition, altogether diftinct from that fhewn by the dog race to the kind familiarity of man.

The above appear to conftitute the leading varieties of this generous breed of animals; but of this let us be underftood to fpeak with hefitation, for it cannot be unknown that fcarcely any two writers agree in this refpect. By fome the diftinctive breeds or varieties of this race are multiplied perhaps in a fuperfluous manner, while others condenfe them within a fmaller compafs than is neceffary. It is indeed.

ceed a task of difficulty to mark the line of definition, by which the varieties ought, in every instance, to be divided. The transitions dependant on crossing the breed, the influence of different climates, their employment, feed, and training, all contribute so materially to effect a change in their appearance, as to offer innumerable, if not insurmountable, obstacles, to the establishment of any systematic arrangement that shall be free from objection. How, indeed, can we dwell on the permanency of distinctive varieties in dogs, when the ablest and most experienced observers affirm, that the same breed, transported into different climates, becomes so dissimilar, as to be scarcely, if at all, recognizable. Thus, the bull-dog, it is asserted, transported into the north of Europe, is become the little Danish dog, or nurtured in the hotter regions of Africa, the naked dog; and similar changes are observed to be produced by change of climate in other varieties. By crossing the breeds, likewise, we have varieties innumerable. Thus, it is believed, that the Danish dog, the Irish greyhound, and the common greyhound of this country, though they appear so different, are but one and the same dog. The shepherd's dog, the Pomeranian, the Siberian, the Lapland and Canadian dogs, are also said to constitute only one kind: and the same is observed again of the hound, the harrier, the turnspit, water-dog, and even spaniel. Among the cross breeds, we may instance the bull-dog and little Dane producing the pug-dog; the small Danish dog and the spaniel, the lion dog; and the little spaniel, and the lesser water-dog, the Maltese kind. Many other instances might be adduced, were not these esteemed sufficient to shew that several of the supposed primitive varieties are not really such, but depend on the influence of climate, and intermixture of the breeds.

Dr. Caius, an English physician in the reign of queen Elizabeth, has given the following systematical arrangement of British dogs:

- I. The most generous kinds.
  - Dogs of chace.
    - Hounds.
      - Terrier.
      - Harrier.
      - Blood-hound.
      - Gaze-hound.
      - Grey-hound.
      - Leviner, or Lyemmer.
      - Tumbler.
  - Fowlers.
    - Spaniel.
    - Setter.
    - Water-spaniel, or Finder.
  - Lap-dogs.
    - Spaniel gentle, or Comforter.
- II. Farm-dogs.
  - Shepherd's dog.
  - Mastiff, or Ban-dog.
- III. Mongrels.
  - Wappe.
  - Turnspit.
  - Dancer.

The law takes notice of a grey-hound, mastiff-dog, spaniel, and tumbler; for trover will lie for them. (Cro. Eliz. 125. Cro. Jac. 44.) A man hath a property in a mastiff; and where a mastiff falls on another's dog, the owner of that dog cannot justify killing of the mastiff; unless there was no other way to save his dog, as that he could not take off the mastiff, &c. (1 Saund. 84. 3 Salk. 139.) The owner of a dog is bound to muzzle him if mischievous, but not otherwise: and if a man keeps a dog that is used to do mischief, as by worrying sheep, biting cattle, and the like, the owner must answer for the consequences, if he knows of such an evil habit. (Cro. 254. 487. Stra. 1264.) By stat. 10 Geo. III. c. 18. stealing of dogs incurs a forfeiture from 20*l.* to 30*l.* and charges of conviction for the first offence, or an imprisonment for any time between six and twelve months, at the discretion of two justices; and for a subsequent offence, of not less than 30*l.* nor more than 50*l.* and charges, or on nonpayment, imprisonment for twelve to eighteen months, and public whipping. Persons also, in whose custody dogs, or their skins are found, are liable to like penalties.

We shall wave speaking at any considerable length on the many valuable qualities which so eminently characterize this valuable race of animals, in a general point of view: these are too obvious to require demonstration, and have abundant claim to the generous impulse of our gratitude, as well as panegyric. The dog is our servant, but he is also our companion and our friend, and who, by his vigilance and attachment, more than amply repays the kindness we bestow on him. But the good qualities of this animal, though uniformly felt, are not invariably acknowledged. In England the dog is cherished and protected, but there are many parts of the world, not even to instance the more uncivilized states, where the condition of these ill-fated animals may justly excite our commiseration; countries in which the most solid and beneficial advantages are derived to society from their zeal and industry, and in reward for which they receive only the most inhuman and ungrateful treatment, detestation, and contempt. It is, indeed, but too generally in the cruel disposition of man, to recompense the most important services of the brute creation with the coldest insensibility and barbarity.

Notwithstanding the extraordinary natural faculties of the dog, it must be allowed that much depends on his education, and such is his docility as well as sagacity, that he rarely fails to improve to the utmost expectation of his tutor. There are numberless instances in which he must have exceeded every reasonable idea that could have been entertained of him. Instances of this kind must be familiar to every reader, but there are two or three anecdotes on record of such an extraordinary nature, that we cannot refrain repeating them; they seem to evince a degree of dexterity and talent so much beyond the comprehension of the brute creation, that they cannot prove irrelevant. It is recorded of a dog, belonging to a nobleman of the Medici family, that he always attended at its master's table, changed the plates for him, and carried him his wine in a glass placed on a salver, without spilling a drop! This is surely a most astonishing instance of canine sagacity, but its attainments were perhaps outrivalled by the dog who was taught to speak. The dog alluded to is mentioned by the French academicians; it lived in Germany, and could call in an intelligible manner for tea, coffee, chocolate, &c. The account is given by the celebrated Leibnitz, and was briefly this: the dog was of a middling size, and was the property of a peasant in Saxony. A little boy, the peasant's son, imagined that he perceived in the dog's voice an indistinct resemblance to certain words, and was therefore determined to teach him to speak distinctly. For this purpose he spared neither time nor pains with his pupil, who was about three years old, when his learned education commenced; and at

at length he made ſuch a progreſs in language as to be able to articulate no leſs than thirty words. It appears, however, that he was ſomewhat of a truant, and did not very willingly exert his talents, being rather preſſed into the ſervice of literature, and it was neceſſary that the words ſhould be firſt pronounced to him each time before he ſpoke. The French academicians add, that unleſs they had received the teſtimony of ſo great a man as Leibnitz, they ſhould ſcarcely have dared to report the circumſtance. This wonderful dog was born near Zeitz, in Miſnia in Saxony.

There is not, perhaps, in the univerſe, a country in which the dog enjoys a greater degree of liberty than in Britain, nor any in which the different breeds in general are to be found in a higher ſtate of improvement: particular nations may boaſt of their peculiar or local varieties, but we ſpeak generally.

Dogs in many countries are ſubjected to the ſevereſt labour. In Lapland and Siberia the dogs are compelled to convey travellers over the ice and ſnows of thoſe inhoſpitable regions, in return for a ſcanty daily meal of the filthy offals of fiſh, ſcarcely ſufficient to ſupport life, and which they receive only when the labour of the day is over. Nor is their fate leſs ſevere in Newfoundland, where the dogs of that country are employed as animals of draught for every ſimilar purpoſe. In Holland, according to Mr. Pratt, there is not an idle dog of any material ſize to be ſeen in the whole ſeven provinces. You ſee them in harneſs at all parts of the Hague, as well as in other towns, tugging at barrows and little carts with their tongue nearly ſweeping the ground, and their poor palpitating hearts almoſt beating through their ſides: frequently three, four, five, or ſometimes ſix abreaſt, drawing men and merchandize with the ſpeed of little horſes. On paſſing from the Hague-gate to Scheveling, you perceive, at any hour of the day, an incredible number loaded with fiſh and men, under the burden of which they run off at a long trot, and ſometimes at full gallop, the whole mile and half, which is the preciſe diſtance from gate to gate; nor on their return are they ſuffered to come with their barrows empty, being filled not only with the men and boys before mentioned, but with ſuch commodities as are marketable at the village. This writer further adds, that it is no uncommon thing in the middle of ſummer to ſee theſe poor patient, perſevering animals urged and driven beyond their utmoſt ability, till they drop down on the road. Theſe dogs in the ſummer time are occaſionally brought down to the beach and bathed in the ſea, a practice calculated to prevent the diſorders incidental to the canine breed, and highly conducive to their health and vigour. The cuſtom of employing dogs for the conveyance of little carts of a peculiar conſtruction, has begun, within the laſt three or four years, to be prevalent in the vicinity of our own metropolis, but they are only dogs of the more robuſt kinds that are in uſe for this purpoſe.

In the city of Liſbon an immenſe multitude of dogs are allowed to wander in troops without any ſettled habitation, or owners, and which ſubſiſt entirely on the offals, and offer five filth of every deſcription, thrown from the windows of the houſes into the ſtreets at a certain hour of the night, appointed by the police. During the day-time theſe poor, diſguſting, and half-famiſhed animals, are ſeen lurking under the door-porches, in alleys, ſtables, or ruined buildings, from whence they iſſue in the evening, and perambulate the ſtreets in troops in queſt of food. At ſuch times it becomes adviſable for paſſengers to avoid as much as poſſible approaching them, as their hunger and conflicts between each other render them extremely ferocious, and, ſhould they attack them, would not fail to puniſh their temerity for not keeping at a diſtance. Theſe canine ſcavengers are not ſanctioned or protected by the law, but, as before intimated, are permitted by the police, for the ſake of cleanlineſs, to inſeſt the ſtreets of Liſbon. Throughout Turkey, and other Mahometan countries, dogs are reared in conſiderable numbers, but are in general treated with harſhneſs and indifference. In Kamtſchatka, independently of the ſervices which dogs afford during a ſhort and painful life, already mentioned, their ſkins are worn as cloathing, and their long hair for ornament. In America, and various other parts of the world, the fleſh of the dog is eaten, and is to be found commonly with other kinds of meat and game in the public markets. In the Society iſlands they are fattened with vegetables, crammed down their throats, when they will not voluntarily eat any more, as we cram turkies. They are killed by ſtrangling, and the extravaſated blood is preſerved in cocoa-nut ſhells, and baked for the table. The ancients alſo reckoned a young and fat dog excellent food, eſpecially if it had been caſtrated. Hippocrates claſſed it with mutton or pork. The Romans admired ſucking whelps, and ſacrificed them to their divinities; a practice then obſerved by the Aſiatic and American ſavages, to enſure favour or avert evil; and the Romans thought them alſo a ſupper in which the gods themſelves delighted.

Dogs, *Diſeaſes of.* Theſe animals are ſubject to a great variety of diſeaſes, even in a ſtate of nature, and much more ſo when they are domeſticated with man. In theſe latter circumſtances, we find them attacked with almoſt as great a variety of diſeaſes as man himſelf. As this is the caſe, it will at once appear how very unfit a huntſman, a groom, or even a farrier, muſt be to adminiſter to the ſick wants of an animal, incapable of deſcribing his diſeaſe, and rendered tender by art. Mr. Blaine, who has directed his particular attention to this ſubject, has furniſhed us with the following abſtract, or ſummary of thoſe diſeaſes, that are moſt prevalent, and that commit the greateſt ravages among theſe animals, aſſuring us that the remarks here made are the reſult of actual and attentive obſervation.

Aſthma.—There is a kind of affection of the cheſt to which dogs are ſubject, that in its appearances and effects ſo much reſembles the human diſeaſe of this name, and is ſo little like any other diſeaſe, that it may with great propriety be called aſthma. It has, however, this ſpecific difference from human aſthma, that whereas this latter attacks perſons of all ages, and under every peculiarity of circumſtance, the canine aſthma is hardly ever obſerved to attack any but either old dogs, or thoſe who, by confinement, too full living, and want of exercite, may be ſuppoſed to have become diſeaſed by theſe deviations from a ſtate of nature. There are very few dogs that live much within doors, or are accuſtomed to much confinement of any kind, which at 5, 6, or 7 years old are not troubled with a ſhort dry diſtreſſing cough, which firſt ſteals on them by unperceived degrees, with a ſlight huſk and diſpoſition to bring ſomething up, gradually becoming more frequent, till at laſt it is almoſt inceſſant; producing a dry ſonorous cough, accompanied with moiſt eyes and continued efforts to bring up a ſmall quantity of frothy mucus. This gives momentary relief, but the cough ſoon returns. After laſting a longer or ſhorter period (ſometimes for ſeveral years) according to circumſtances, the dog has occaſional fits, and from the united effects of theſe, he is at laſt cut off, either by ſtrangulation or emaciation. In ſome caſes the origin of the complaint may be aſcribed to a cold, but even in theſe inſtances the foundation has been previouſly laid by too much confinement, or by the animal's being too fat, which laſt circumſtance is ſo certain a cauſe of it, that it is hardly poſſible to keep a dog very fat for any great length of time, without bringing it on.

This

This cough is frequently confounded with the cough that precedes, or accompanies distemper, but it may be readily distinguished from this by an attention to circumstances; as the age of the animal, its not affecting the general health, nor producing immediate emaciation, and its less readily giving way to medicine.

The Cure.—This is often very difficult, because the disease has in general been long neglected before it is sufficiently noticed by the owners. As it is in general brought on by confinement, too much warmth, and over feeding; so it is evident the cure must be begun by a steady persevering alteration in these particulars. The exercise should by no means be violent, but gentle and long continued. The food must be moderate, and principally vegetable; and without being exposed the dog should have plenty of free air. As the want of pure air brings the disease on in most instances, so the access of it must tend to remove it. The former is so certain, that it almost invariably happens to those dogs, who are permitted to sleep within side a bed, even though they should have in other respects proper treatment, as moderate feeding and plenty of exercise. The medicines most useful are alteratives, and of these occasional emetics are the best. One grain of tartarised antimony (*i. e.* tartar emetic) with two, three, or four grains of calomel, is a very useful and valuable emetic. This dose is sufficient for a small dog, and may be repeated twice a week with great success, always with palliation.

Blindness.—Dogs are subject to almost as many affections of the eyes as ourselves, many of which end in blindness. In distemper it is very common for a small abscess to form immediately on the pupil of the eye; sometimes this becomes so large as to let out the whole contents of the globe of the eye, in which case blindness is the inevitable consequence; but more frequently it heals and leaves only an opaque spot, and even this generally in a few months disappears. In these cases it is of more consequence to attend to the disease than to the eye itself, which may be simply washed with a mild wash of Goulard.

Blindness comes on frequently from cataract, which is an opacity of the inner part of the eye within the pupil; most old dogs have partial cataract, that is, the bottom of the eye becomes milky and opaque; but the crystalline lens does not harden or become wholely white. No treatment yet discovered will remove or prevent this complaint.

Sore Eyes, though not in general ending in blindness, are very common among dogs. It is an affection of the eyelids, and is not unlike the scrophulous affection of the human eyelids, and is equally benefitted by the same treatment: an unguent made of equal parts of nitrated quick-silver ointment, prepared tutty and lard, very lightly applied. Dropsy of the eyeball is likewise sometimes met with, but is incurable.

Cancer.—The virulent dreadful ulcer that is so fatal in the human subject, and is called cancer, is unknown in dogs; yet there is very commonly a large schirrous swelling of the teats in bitches, and of the testicles (though less frequent) in dogs, that as it sometimes becomes ulcerated, so it may be characterized by this name. When bitches are not permitted to breed, the milk they form, which they do without being pregnant, nine weeks after their heat, coagulates in the teats, and becomes a source of irritation, and gradually a schirrous swelling is formed, which increases to a very large size; we have seen them of several pounds. Sometimes ulcers break out on the surface, which increase gradually, but do not appear to distress the animal, or affect the health in any degree equal to the apparent magnitude of the complaint. In the early state of the disease discutients prove useful, as vinegar with salt. Camphor and Spanish flies, with mercurial ointment, have sometimes succeeded; taking care to avoid irritating the part so much as to produce blister. But when the swelling is detached from the belly, and hangs pendulous in the skin, it had better be removed, and as a future preventive suffer the bitch to breed.

Schirrous testicles are likewise sometimes met with; for these no treatment yet discovered succeeds, but the removal of the part, and that before the spermatic chord becomes much affected, or it will be useless.

Colic.—Dogs are subject to two kinds of colic; one arising from constipation of the bowels, the other is of a kind peculiar to dogs, apparently partaking of the nature of rheumatism, and also of spasm. From a sudden or violent exposure to cold, dogs become sometimes suddenly paralytic, particularly in the hinder parts; having great tenderness and pain, and every appearance of lumbago. In every instance of this kind, there is considerable affection of the bowels, generally costiveness, always great pain. A warm bath, external stimulants, but more particularly active aperients, remove the colic. The future treatment will be detailed under the head RHEUMATISM.

Colic, arising from costiveness, is not in general violently acute in the pain it produces; sometimes, however, it appears accompanied with more spasm than is immediately dependant on the confinement of the bowels. In the former give active aperients, as calomel with pil. cochiæ, *i. e.* aloetic pill and glysters; in the latter castor oil with laudanum and ether.

Cough.—Two kinds of cough are common among dogs, one accompanying distemper, the other is an asthmatic affection of the chest. See ASTHMA, and the next article.

Distemper.—This is by far the most common and most fatal among the diseases of dogs. This alone destroys by thousands more than all the other diseases together: hardly any young dog escaping it. And of the few who do escape it in their youth, three-fourths are attacked with it at some period afterwards: it being a mistake that young dogs only have it. No age is exempt. We have seen repeated instances of it after ten, twelve, and even fourteen years of age. It however generally attacks before the animal arrives at eighteen months old. When it comes on very early the chances of recovery are very small. It is peculiarly fatal to greyhounds, much more so than to any other kind of dog, generally carrying them off by excessive scouring. It is very contagious, but it is by no means necessary that there should be contagion present to produce it; on the contrary, the constitutional liability to it is such, that any cold taken may bring it on: and hence it is very common to date its commencement from a dog's being thrown into water, or shut out in a rainy day, &c. &c. There is no disease that presents such varieties as this, either in its mode of attack, or during its continuance. In some cases it commences by purging, in others by fits. Some have cough only, some waste, and others have moisture from the eyes and nose, without any other active symptom.

Moist eyes, dulness, wasting, with slight cough, and sickness, are the common symptoms that betoken its approach. Then purging comes on, and the moisture from the eyes and nose becomes from mere mucus, pus, or matter. There is also frequently sneezing, with a weakness in the loins. When the disease in this latter case is not speedily removed, universal palsy comes on. During the progress of the complaint, dogs have some of them fits. When one fit succeeds another quickly, the recovery is extremely doubtful. Many dogs are carried off rapidly by the fits, or by purging; others waste gradually from the running from the nose

nose and eyes, and these cases are always accompanied with great marks of putridity.

The remote cause of the distemper it is difficult to explain, nor do the most careful dissections in every stage of the complaint ascertain more than that there is a general inflammation of the mucous membrane: but whether the true seat of the disease is confined to *that* membrane, and all the other symptoms are the consequences of it, or are real affections of the other parts, is an undecided point; although it is certain, that its first appearance is an inflammation of the pituitary membrane, and that this is one of the most lasting as well as constant symptoms. That this inflammation is communicated from the membrane of the nose to the upper part of the gullet and windpipe, is evident by the swelling of the glands of the throat, the tenderness and dry cough; and that this inflammation extends from thence to the same membrane of the stomach and intestines is equally so, producing vomiting, costiveness, or purging. The distemper in dogs is thought to have one characteristic in common with the putrid sore throat in human beings, that it generally attacks the weakest; children being the most and women more liable to it than men, and so young hounds more readily catch the distemper than old ones. When at their walks, or first taken up from them, the disorder is considered as most dangerous, and if one has the disease, they will all take it. Mr. Beckford also coincides in the opinion that madness, the dog's inflammatory fever, is less frequent than it was before the distemper was known.

The Cure.—In the early stages of the complaint give emetics, they are peculiarly useful. A large spoonful of common salt, dissolved in three spoonfuls of warm water, has been recommended; the quantity of salt being increased according to the size of the dog, and the difficulty of making him to vomit. While a dog remains strong, one every other day is not too much: the bowels should be kept open, but active purging should be avoided. In case the complaint should be accompanied with excessive looseness, it should be immediately stopped by balls made with equal parts of gum arabic, prepared chalk, and conserve of roses, with rice milk as food. Two or three grains of James's powder may be advantageously given at night, in cases where the bowels are not affected, and in the cases where the matter from the nose and eyes betokens much putridity, we have witnessed great benefit from balls made of what is termed Friar's balsam, gum guaicum, and chamomile flowers in powder: but the most popular remedy is a powder prepared and vended under the name of Distemper Powder, with instructions for the use of it. Dogs, in every stage of the disease, should be particularly well fed. A sitton we have not found so useful as is generally supposed; where the nose is much stopped, rubbing tar on the upper part is useful, and when there is much stupidity, and the head seems much affected, a blister on the top is often serviceable.

Mr. Beckford mentions a remedy for the distemper, communicated to him by a friend, whose hounds had found great benefit from it; this was an ounce of Peruvian bark in a glass of port wine, taken twice a day. Norris's drops have also been given with success in the quantity of a large tablespoonful in an equal quantity of port-wine, three times a day, lessening the quantity as the dog grew better.

Mr. Daniel (Rural Sports, vol. i.) informs us, that he has witnessed extraordinary success from Dr. James's powders, applied in the following manner: when the symptoms of the distemper are apparent, a *third* of one of the parcels inclosed in the half-crown packets should be given, well mixed up with butter; the dog to have plenty of warm broth or milk and water, and if possible, to be near a fire, or be kept very warm; two hours afterwards another third part is to be administered. If neither of these should operate by vomiting or purging, at the end of four hours give the remaining third. Should the two first portions have effect, the remaining third should not be given until four or six hours (according to the quantity of the evacuation) after the expiration of the four hours; in the mean while the dog is to be encouraged to lap, and if he refuses, be forced to take plentifully of the warm broth or milk and water. Warmth and warm liquids will perfect the recovery: and as soon as the dog's appetite returns, he should be fed (at first sparingly) with animal food. The following remedies have been recommended, and in some cases of the disorder, have been effectual in its cure; *viz.* $1\frac{1}{2}$ gr. of calomel, and 5 gr. of rhubarb, to be repeated every other day;—4 gr. of turbith mineral, and 1 gr. of emetic tartar, the dog having been first bled;—a tea-spoonful of jalap, half the quantity of grated ginger, a table spoonful of syrup of buckthorn, made into a ball, or given liquid in warm water, no milk but water-gruel being given to drink, and the dog kept very warm:—gamboge, dragon's blood, and Jesuit's bark, of each half an ounce, made into pills the size of a hazle nut; one pill to be given every morning to a full grown dog, till cured; and to a whelp, three times a week; the dogs having full liberty to run out. Dr. Darwin has given the following account of this disorder, and of the method of counteracting its malignity. In dogs, he says, the catarrh is generally joined with symptoms of debility early in the disease; the animals should be allowed to go about in the open air, because the air which they breathe passes twice, in inspiration and expiration, over the putrid sloughs of the mortified parts of the membrane, which lines the nostrils, and the maxillary and frontal cavities, and must, therefore, be loaded with contagious particles. Fresh new milk, and fresh broth should be given them very frequently, and they should be suffered to go amongst the grass, which they sometimes eat for the purpose of an emetic; and if possible, they should have access to a running stream of water, as the contagious mucus of the nostrils generally drops into the water, which they attempt to drink. Bits of raw flesh, if the dog will eat them, are preferable to cooked meat, and from five to ten drops of tincture of opium, according to the size of the dog, may be given with advantage when symptoms of debility are evident, every six hours. If sloughs can be seen on the nostrils, they should be moistened twice a day with a solution of sugar of lead or of alum, by means of a sponge fixed on a bit of whalebone, or by a syringe. The lotion may be made by dissolving half an ounce of sugar of lead, or of alum, in a pint of water.

Fits.—Dogs are peculiarly subject to fits. These are of various kinds, and arise from various causes. In distemper, dogs are frequently attacked with convulsive fits, which begin with a champing of the mouth and shaking of the head, gradually extending over the whole body. Sometimes an active emetic will stop their progress, but more generally they prove fatal.

Worms are often the cause of fits in dogs. These deprive the animal wholly of sense; he runs wild till he becomes exhausted, when he gradually recovers, and perhaps does not have one again for some weeks. Confinement produces fits likewise. Whenever a dog has been long confined, on coming into active exercise he frequently falls into an epileptic fit. Thus, after long sea voyages, they are very common, and the same with pointers and spaniels, particularly the latter on their first beginning to hunt.

Costiveness will produce fits sometimes.

Cold water thrown over a dog will generally remove the present

present attack of a fit; and for the prevention of their future recurrence it is evident, that the foregoing account of causes must be attended to.

Inflamed Bowels.—Dogs are very subject to inflammation of their bowels, from costiveness, from cold, or from poison. When inflammation arises from costiveness, it is in general very slow in its progress, and is not attended with very acute pain, but it is characterised by the want of evacuation, and the vomiting up of the food taken, though it may be eaten with apparent appetite. In these cases the principal means to be made use of, are the removal of the constipation by active purging, clysters and the warm bath. Calomel with aloes forms the best purge. But when the inflammation may be supposed to arise from cold, then the removing of any costiveness that may be present is but a secondary consideration. This active kind of inflammation is characterised by violent panting, total rejection of food, and constant sickness. There is great heat in the belly and great pain; it is also accompanied with great weakness, and the eyes are very red. The bowels should be gently opened with clysters, but no aloes or calomel should be made use of. The belly should be blistered, having first used the warm bath.

When the inflammation arises from poison, there is then constant sickness, the nose, paws, and ears are cold, and there is a frequent evacuation of brown or bloody stools. Castor oil should be given, and clysters of mutton broth thrown up, but it is seldom any treatment succeeds.

Inflamed Lungs.—Pleurisy is not an uncommon disease among dogs. It is sometimes epidemic, carrying off great numbers. Its attack is rapid, and it generally terminates in death on the third day, by a very great effusion of water in the chest. It is a complaint that exhibits but few varieties in dogs, attacking almost all alike, and terminating in a similar manner in all. It is seldom that it is taken in time, when it is, bleeding is useful; but it must be liberally employed. A dog will bear to lose in this instance from three ounces to sixteen, according to his size. If the disease has proceeded beyond the second day, and bleeding is employed, it produces generally immediate death. Blisters may be applied to the chest also.

Madness.—The late alarming prevalence of this complaint among dogs, renders the consideration and description of it interesting and important. Except the occasional observations of sportsmen, or the cursory notices of the symptoms attendant on it by those who write on human hydrophobia, nothing has ever been written on this head that could give any clear idea of the disease. The writer of this article has attentively observed, during its whole progress, more than two hundred cases; and has dissected near an hundred bodies of dogs who have died of the malady; he presumes, therefore, that he must be tolerably conversant with the subject. There certainly is no disease more frequently mentioned, none on which every one supposes that he has clear notions, and yet on which such total ignorance prevails. Several causes conspire to render this the case: one is, that except at particular periods, perhaps once in 20 years, to see a mad dog is a very rare occurrence: another is, that the peculiar symptom which characterises the complaint, brought on by the bite of the mad dog, in the human subject, has been applied to the disease in the dog, and has occasioned it to be called by the same name, hydrophobia. This, in the first place, is a palpable misnomer; for in no instance does there ever exist any dread of water; on the contrary, dogs are in general very greedy after it. This, therefore, has led persons into a very fatal error; for it being the received opinion that no dog was mad who would drink water, many persons have been lulled into a dangrous security. Another equally fatal prejudice has existed in the minds of persons relative to this complaint, which is, that every mad dog must necessarily be wild and furious; and in every description I have ever read of the complaint it has been so described; but so erroneous is this, that in by far the greater number of instances there is very little of that wild savage fury that is expected by the generality of persons, or that it is described by the majority of those who have attempted any delineation of the disease. Hence, as it is evident that the term hydrophobia, characterising the affection in the dog, is a misnomer, so it is evident that the term madness is equally so. In no instance have I ever observed a total alienation of the mind; in very few have the mental faculties been disturbed. The disposition to do mischief is rather an increased irritability than absence of sense, for in most instances, even in those that are furious, they acknowledge the master's voice, and are obedient. Sportsmen distinguish two kinds of madness, a dumb and a raging; but the distinction is not always very clear. The varieties in the disease are immense; it is hard to say what is the first symptom that appears. Mr. Meynell, of sporting celebrity, drew up some remarks, which appeared in the 19th vol. of the Medical Commentaries, and were at the time considered as the best account that had appeared. In this paper, he says, that loss of appetite is the first symptom; but this we by no means consider to appear in many instances the first; but a certain peculiarity in the manner of the dog; some strange departure from his usual habits; and this peculiarity cannot be laid too much stress on, for it is almost invariable, and a never failing criterion of the complaint. In a very great number of instances the peculiarity consists in a disposition to pick up straws, bits of paper, rag, threads, or the smallest objects that may lie on a floor; and this is industriously persisted in till the floor or carpet is actually cleared of every small object; this peculiar characteristic is very common in smaller dogs; others again shew an early peculiarity by licking the parts of another dog; in one instance the approach of the disease was foretold, by our observing a very uncommon attachment in a pug puppy, towards a kitten, which he was constantly licking; and likewise the cold nose of a healthy pug that was with him; an attachment to the sensation of cold appears in many cases, it being very common to observe them licking the cold iron, cold stones, &c. Some dogs, early in the disease, will eat their own excrement, and lap their own urine; this is by no means uncommon, and is a very strong sign of madness: an early antipathy to dogs and cats is very commonly observed; but particularly to cats. This is almost invariable; the progress of their irritability is often very clear, the cats are the first objects of their anger, next strange dogs; as the disease advances they do not spare the dogs they are domesticated with, and lastly the persons around; but, except in a moment of irritability, they seldom absolutely attack any human person. The irritability that induces them to bite is very strong; but is devoid of wildness, and is rather at least early in the disease. It is more like the peevishness of a child than any fury. We speak of domesticated dogs. In them, in the majority of instances, the same gentleness, attachment, and obedience, are observed during the first days of the disease; by degrees, however, he gently snaps at them, or runs at their feet, as though in play, and will not bite, but will take their hand or foot in his mouth; but a stick held even in this stage is sure to excite his anger to a violent degree, even against those he is most fond of. This is a very strong symptom, and almost a certain criterion; throughout the disease here is, nevertheless, a wonderful impatience of con-

troul, and the animal is with great difficulty frightened, though in ſome inſtances we have obſerved the meekneſs of the temper laſt wholly through the diſeaſe.

In moſt caſes there is a very treacherous diſpoſition obſerved. A dog labouring under rabies, if called, comes, wags his tail, ſhews every mark of fondneſs, permits himſelf to be noticed, and ſeems pleaſed with attention; but on a ſudden he turns and ſnaps. It is not every dog that makes any noiſe under rabies. Some have a violent inflammation of the mouth and throat, producing a total inability to bark; this by ſportſmen is termed dumb madneſs: but where any noiſe is made, which occurs in two-thirds of the caſes that happen, this very noiſe forms the trueſt character of the diſeaſe. and affords a mark ſubject to the feweſt varieties. It conſiſts in a very remarkable ſhort howl, or lengthened bark, for it partakes of both; and is ſo totally unlike any thing beſides, that when once heard, it can never be forgotten or miſtaken. It more nearly reſembles the giving tongue of a heavy ſlow hound, and is commonly made with the head held up in the air. There is great diſtreſs apparent in the countenance, with a quick anxious look; the eyes are always red, frequently ſo inflamed as to produce matter, and the ſight, in ſome inſtances, becomes deceptive, and they ſnap at objects they fancy they perceive. In moſt there is a remarkable tendency to carry ſtraw about in their mouths, and to ſcratch it up under their bellies into heaps. Whenever this is done, the bowels have been found very highly inflamed after death. Gnawing is almoſt invariable with them; boards, chains, the veſſel that holds their food or water, is gnawed, or taken up and ſhook to pieces. In many the attempt to eſcape is very great. This anxiety to eſcape is a very remarkable trait in the diſeaſe. It is not the effect of delirium, as is ſuppoſed, nor of pain; on the contrary, when a dog has eſcaped, he commonly returns home again, unleſs worried and hunted. But it is, as it were, a peculiar anxiety to propagate the diſeaſe, for he travels induſtriouſly ſeeking objects to bite. Horſes, cows, ſheep, but peculiarly dogs, he anxiouſly ſeeks: much leſs frequently does he attack human perſons. Having tired himſelf, unleſs he is moleſted, he returns home. It is ſaid that a rabid dog will not turn out of his road to bite, but this can only apply to the laſt ſtages of the diſeaſe; for in the middle ſtage, which is when the miſchievous propenſity is the ſtrongeſt, and when the dog is ſtrong and active, he is induſtrious in ſeeking objects, in fact, it is his ſole purſuit. In no inſtance is there any averſion to water, but on the contrary, the fever accompanying the diſeaſe makes the dogs very dry, and they are continually lapping, though in ſome inſtances unable to ſwallow. The complaint is generally accompanied with coſtiveneſs, and there is evident mark of pain and uneaſineſs in the bowels in almoſt every inſtance. It is this inflammatory affection of the bowels that makes many of them paralytic, and ſaulter behind. We have ſeen ſome, from this ſame cauſe, have a conſtant tendency to ſit upright on the rump. We have diſſected carefully nearly one hundred caſes, in every ſtage of the complaint, and under every variety of the diſeaſe, and ſome appearances have been found common to all. More or leſs, every inſtance ſhews inflammation of the ſtomach and bowels, together with the lungs. But theſe are by no means in equal degrees. In thoſe caſes where there are much reſtleſſneſs, quickneſs, violent panting, and much miſchievous tendency, with almoſt inceſſant barking, the inflammation of the lungs is found to be exceſſive; and the bowels, though never without ſome inflammation, are found leſs ſo But when there is more mildneſs, when the dog appears affected in his loins, when he eats much ſtraw, dirt, or unuſual ſubſtances, and frequently brings up what he has taken down, then, on diſſection, it will be found that the ſtomach and bowels are principally inflamed. In what is termed dumb madneſs, the ſtomach and bowels are ſtill the organs that ſuffer moſt, but to this is ſuperadded a peculiar affection of the throat and mouth. In ſome the throat alone is affected, producing a difficulty of ſwallowing, and a very odd deep choaking noiſe; in others the whole mouth is affected; the tongue is inflamed to the end, nearly black. The jaw drops, and ſlaver runs faſt from the mouth, and there ſeems almoſt a total paralyſis of the parts. There is ſeldom much miſchievous tendency in this variety of the diſeaſe; on the contrary, ſome are to the full as mild and as tractable as at any other time, and ſhew not the ſmalleſt diſpoſition to bite throughout. We have ſeen the moſt tender offices performed in many inſtances of this kind, not only with impunity, but with great expreſſions of gratitude from the manner of the ſuffering animal. In theſe caſes the parts of the mouth and throat do not ſhew any alteration of appearance after death, further than a ſlight increaſe of vaſcularity.

In the wild kind there is a very ſlight redneſs in the veſſels of the brain. In almoſt every inſtance the ſtomach is filled with the moſt unuſual ſubſtances, ſtones, ſtraw, coals, wood, and whatever can be got at. It is a remarkable fact, but it has occurred to us ſo often, that we are poſitive as to its exiſtence; that if, in the progreſs of the complaint, any very great violence is offered to the animal, the diſeaſe ſeems arreſted, and he lives many more days than he otherwiſe would have done, judging from analogy. The duration of the complaint is various: it ſeldom deſtroys before the third day, and few ſurvive beyond the ſeventh. The average number die on the fourth or fifth day from the firſt appearance of the diſeaſe.

We know of no inſtance of the complaint being cured, nor have we in any inſtance ever attempted any thing of this kind, but we flatter ourſelves that we have been ſucceſsful in bringing forward a preventive. We claim not the diſcovery of this moſt valuable and truly important remedy; we only, by exertion, reſcued it from oblivion, and by a long courſe of well-conducted experiments, have eſtabliſhed the certainty of its efficacy. Out of more than 90 animals, as horſes, ſheep, ſwine, and dogs, one only has gone mad to whom this remedy was adminiſtered; and this failure did not occur under our own immediate inſpection; ſo that it might have been waſted or brought up. This remedy was detailed by us as early as laſt December, 1807, in the Medical Review of that month, where every circumſtance relative to the original recipe is communicated. This remedy, as by us prepared, is as follows:

Take of the freſh leaves of the tree-box	2 ounces
of the freſh leaves of rue -	2 ounces
of ſage - - - - -	½ ounce.

Chop theſe fine, and boil in a pint of water to half a pint; ſtrain carefully, and preſs out the liquor very firmly: put back the ingredients into a pint of milk, and boil again to half a pint; ſtrain as before; mix both liquors, which forms three doſes for a human ſubject. Double this quantity is proper for a horſe or cow. Two-thirds of the quantity is ſufficient for a large dog; half for a middling ſized, and one-third for a ſmall dog. Three doſes are ſufficient, given each ſubſequent morning faſting; the quantity directed being that which forms theſe three doſes. As it ſometimes produces ſtrong effects on dogs, it may be proper to begin with a ſmall doſe, but we hold it always prudent to increaſe the doſe till effects are evident, by the ſickneſs, panting, and uneaſineſs of the dog. In the human ſubject, where this remedy appears equally efficacious, we have never witneſſed

any unpleasant or active effects. About 40 human persons have taken this remedy, and in every instance it has succeeded equally as with animals: but candour obliges us to notice that in a considerable proportion of them, other means were used, as the actual or potential cautery: but in all the animals other means were purposely omitted. That this remedy, therefore, has a preventive quality, is unquestionable, and now perfectly established; for there was not the smallest doubt of the animals mentioned either having been bitten, or of the dog being mad who bit them, as great pains were in every instance taken to ascertain these points.

The symptoms of madness are concisely summed up by Mr. Daniel in the following words: "At first the dog looks dull, shews an aversion to his food and company, does not bark as usual, but seems to murmur; is peevish and apt to bite strangers; his ears and tail drop more than usual, and he appears drowsy; afterwards he begins to loll out his tongue and froth at the mouth, his eyes seeming heavy and watery: if not confined he soon goes off, runs panting along with a dejected air, and endeavours to bite any one he meets. If the mad dog escapes being killed, he seldom runs above two or three days, when he dies exhausted with heat, hunger, and disease." In Mr. Meynell's account, already referred to, a distinction is made between dumb madness and raging madness: in the former, the nether jaw drops and is fixed, the tongue hangs out of the mouth, and slaver drops from it. In the latter, the mouth is shut, except when the dog snaps or howls, and no moisture drops from it. It has been said that this disorder is occasioned by heat or bad food; but in Mr. Meynell's account, communicated to him by a physician, it is asserted, that the complaint never arises from hot weather or putrid provisions, or from any other cause but the bite; for however dogs have been confined, however fed, or whatever may have been the heat of the season, the disorder never commenced without being able to trace it to that cause, nor was it ever introduced into the kennel, but by the bite of a mad dog. Accordingly, this malady is rare in the northern parts of Turkey, more rare in the southern provinces of that empire, and totally unknown under the burning sky of Egypt. At Aleppo, where these animals perish in great numbers, for want of water and food, and by the heat of the climate, this disorder was never known. In other parts of Africa, and in the hottest zone of America, dogs are never attacked with madness.

It appears that the prevention of canine madness has been attempted, even in the early ages. For this purpose Pliny recommends *worming* of dogs, and from his time to the present it has had, most deservedly, says Mr. Daniel, (ubi supra) its advocates. He tells us, that he has had various opportunities of proving the usefulness of this practice, and recommends its general introduction.

Mange.—This is a very frequent disease in dogs, and is an affection of the skin, either caught by contagion, or generated by the animal. It is, however, not so contagious as is supposed. It becomes hereditary also. White dogs, and those with strong wired hair, are peculiarly liable to it. It has some varieties, as red mange, which consists in an universal red scabby eruption over the whole body, having great acrimony, and great stubbornness. This mange is frequent in setters, pointers, and the larger kind of terriers.

The scabby mange breaks out in blotches along the back and neck, and is common to Newfoundland dogs, terriers, pointers, and spaniels, and is the most contagious. White terriers, white spaniels, the white shock, and, in fact, almost all white dogs, are subject to a variety that shews itself by a simple redness and intolerable itching in the skin. There is a kind also that attacks the claws and toes of dogs. Canker in the ear, and on the flap of the ear, is to be considered as an appendage to mange.

The cure should be begun by removing the first exciting cause, if removeable, such as filth or poverty, or, as is more general, the contrary, (for both will equally produce it,) too full living. Then an application should be made to the parts, consisting of sulphur, sal ammoniac, and tar-lime-water will also assist. When there is much heat and itching, bleed and purge. Mercurials sometimes assist, but they should be used with caution; dogs do not bear them well.

The following mixture has been recommended for rubbing on any spot as soon as it is perceived, *viz.* a pint of train oil, ½ a pint of oil of turpentine, ¼ of a pound of ginger, in powder, and ½ an ounce of gunpowder, finely powdered; to be mixed up cold. Previously to the anointing with this preparation, sulphur made into a ball, with butter or hog's lard, may be given for two or three following mornings. There are many other remedies prescribed for this disorder. When it is very bad, the affected places should be anointed with an unguent formed by mixing a pound of sulphur vivum, ½ a pound of white hellebore, powdered, a quart of train oil, and one pint of spirits of turpentine: or, half a pint of white wine, half a pint of spirits of turpentine, 2 ozs. of nitre in powder, and one quart of very strong beer, may be mixed and made milk warm, and then rubbed in with the hand all over, taking care of the eyes, and dried in by a fire; after which the dog should be put into clean straw. Three times' dressing, it is said, will cure, should the dog be naked and in the worst state; or, a table spoonful of soot, two ditto of sulphur vivum, half a spoonful of oil of turpentine, and four ounces of hog's-lard, mixed well, may be used for anointing the part. When the mange is very inveterate, white hellebore root, powdered, 6 ozs., sulphur vivum, ½lb., black pepper, powdered, 2 ozs., oil of tartar per deliquium, 2 ozs., sal ammoniac, finely powdered, 1 oz. hog's-lard, 1lb., and olive oil, ½ a pint, should be mixed well; and a moderate portion of the ointment rubbed on the diseased parts every night and morning for *seven*, and if the mange be of long standing, for *nine* days: and the first morning when the recipe is used, the dog should take the following purging ball, to be repeated twice, at the distance of three days; *viz.* jalap in powder, 30 grs., calomel, 6 grs., ginger in powder, 3 grs., conserve of roses or hips, ½ dram, and a few drops of syrup of buckthorn, for assisting to form the ingredients into a ball, which is to be rolled up in a piece of fresh butter. Two days after the last use of the ointment, the dog should be well washed with soap and warm water. The ingredients above specified are adapted for a fox-hound, pointer, or grey-hound; and for larger or smaller dogs, they may be increased or diminished. Another mixture consists of half a pint of train oil, one ounce of saltpetre, well powdered, four ounces of sulphur vivum, powdered, spirit of turpentine a table spoonful, and the like quantity of honey, which should be rubbed in by the hand morning and evening.

Two ounces of the best gun-powder mixed with strong white wine vinegar, until it becomes a thick salve, may be used for anointing the affected places, until the blood appears, and inwardly may be given as much stone-brimstone, powdered fine, as will lie upon a shilling, daily, for ten days: the brimstone to be mixed with butter or hog's lard.

For the red mange, the following remedies are recommended; *viz.* 4 ozs. of quicksilver, 2 ozs. of Venice turpentine, and 1lb. of hog's-lard, the quicksilver and turpentine are to be rubbed together until all the globules disappear; and an

an ounce may be rubbed daily, for three ſucceſſive days, on the parts affected, and uſed when the hair comes off, or any redneſs appears. Alſo, 1½ oz. of caſſia fiſtularis, well cleanſed, 2½ drams of ſtavefacre, powdered, 2½ drams of ſcammony, prepared in white wine vinegar, and four ounces of oil of olive, ſhould be tempered together and warmed a little, and given to the dog in the evening, keeping him from food until morning: he is then to be bled, and within two days after anointed with the following ointment, *viz.* 3lbs. of nut-oil, 1½lb. of oil of cade, 2lbs. of oil of worms, and 3lbs. of honey; boil theſe together till half is conſumed; then add of reſin and pitch or tar, of each 2½lbs., and half a pound of new wax unwrought; melt them, and then add 1½lb. of brimſtone, 2 lbs. of copperas well dried, and 12 ozs. of verdigreaſe, which ſtir together till they are cold; waſh the dog well, before he is anointed, with ſalt and water, and dry him before a fire; his diet ſhould be warm broth, in which ſhould be put a little brimſtone. This proceſs followed for a week will certainly cure.

Worms.—Dogs ſuffer very much from worms, which, as in moſt animals, ſo in them, are of ſeveral kinds; but the effects produced are nearly ſimilar. In dogs having worms the coat generally ſtares; the appetite is ravenous, though the animal frequently does not thrive; the breath ſmells, and the ſtools are irregular, ſometimes looſe and ſlimy, at others hard and dry; but the worſt evil they produce, is occaſional fits, or ſometimes a continued ſtate of convulſion, in which the animal lingers ſome time, and then dies; the fits they produce are ſometimes of the violent kind, at others they exhibit a more ſtupid character, the dog being ſenſeleſs, and going round continually. The cure conſiſts, while in this ſtate, in active purgatives joined with opium, and the warm bath; any rough ſubſtance given internally, acts as a vermifuge to prevent the recurrence.

Aloes, hartſhorn, the juice of wormwood, with ſome flour of brimſtone being mixed together; a piece of the ſize of a hazle nut, wrapped up in ſweet butter, may be given three or four times in a week and the dog ſhould faſt a few hours afterwards. Thus, it is ſaid, the worm will be deſtroyed. The method of giving any bolus or pill to a dog is to pull out his tongue, then put the bolus down his throat as low as poſſible, and when the dog draws in his tongue, the medicine will ſlip down in ſpite of his efforts to hinder it. Pulveriſed pewter, 1 dr. 10 grs., and æthiops mineral, 16 grs. may be taken three times a day, with the interval of a day between each doſe; the dog being kept warm and from cold water. Whey or pot liquor may be given him two or three hours after, and ſhould be continued inſtead of meat, whilſt he is taking the medicine. It is beſt given by mixing it in butter, and making it into balls with a little flour.

To make hounds fine in their coats, uſe the following dreſſing, *viz.* 1lb. of native ſulphur, one quart of train oil, one pint of oil of turpentine, and 2lbs. of ſoap. This uſed three times in a year will keep them clean in their ſkins. In ſome kennels this is applied once in two months; and, of courſe, the oftner it is renewed, the cleaner will the hounds look.

The *worming* of whelps is performed with a lancet, to ſlit the thin ſkin which immediately covers the worm; a ſmall awl is then to be introduced under the centre of the worm to raiſe it up; the farther end of the worm will, with very little force, make its appearance, and with a cloth taking hold of that end, the other will be drawn out eaſily; care ſhould be taken that the whole of the worm comes away without breaking, and it rarely breaks unleſs cut into by the lancet, or wounded by the awl.

Dog, *Allegorical*, the emblem of fidelity, on which account it is generally repreſented at the feet of female ſtatues on the ſepulchral monuments of the middle ages; as a lion, the type of courage, is placed at the feet of the ſtatues of men.

Dog *draw*, in *Foreſt Law*, a manifeſt deprehenſion of an offender againſt veniſon in a foreſt; when he is found drawing after a deer by the ſcent of a hound led in his hand; or, where a perſon hath wounded a deer, or wild beaſt, by ſhooting at him, or otherwiſe, and is caught with a dog drawing after him to receive the ſame.

There are four offences in the foreſt, noted by Manwood; *viz.* ſtable-ſtand, dog-draw, back-bear or back-berond, and bloody-hand. See Stable *ſtand*, &c.

Dog's *bane*, in *Botany*. See Apocynum and Aſclepias.

Dog-*Berry*. See Cornus.

Dog's *Cabbage*. See Theligonum.

Dog-*days*. See Canicular *days*.

Dog-*fiſh*, *Canis Galeus*, in *Ichthyology*. See Squalus *Galeus*.

Dog *fiſh*, *greater*. See Squalus *Canicula*.

Dog *fiſh*, *leſſer*. See Squalus *Catulus*.

Dog *fiſh*, *picked*. See Squalus *Acanthias*.

Dog *fly*, *Cynomyia*, in *Natural Hiſtory*, the name of a ſpecies of fly common in woods and among buſhes, and particularly troubleſome to dogs. It uſually ſeizes upon the ears, and it is in vain to beat it off; for it returns in a moment, and cannot be prevented but by being killed. It ſtings very ſeverely, and always raiſes a bliſter in the part. It ſomewhat reſembles the flat black fly, ſo troubleſome to cattle. It has no trunk, but has two teeth, much reſembling thoſe of the waſp. Its wings are always placed ſo cloſe upon its body, that they are not ſeen. There are two kinds of it, one larger, and found in woods, and the other common in hedges.

Dog's *head*, in *Geography*, a cape of Ireland, on the weſt coaſt of the county of Galway, oppoſite to the iſland of Inisbofin. N. lat. 53° 33′. W. long. 10° 7′. Beaufort.

Dog *iſland*, one of the ſmaller Virgin iſlands, near the N.W. coaſt of Virgin Gorda and E. of Tortola. N. lat. 18° 20′. W. long. 62° 55′.

Dogs, *iſle of*, a ſmall tract of low land in the county of Middleſex, oppoſite to Greenwich; where Togodumnus, brother of Caractacus, is ſaid to have been killed in a battle with the Romans, A. D. 46.

Although it is now converted to commercial purpoſes, the Iſle of Dogs derived its name from being the depôt of the ſpaniels and grey-hounds of Edward III.; and this ſpot was choſen, becauſe it lay contiguous to his ſports of woodcock ſhooting, and courſing the red deer, in Waltham and the other royal foreſts in Eſſex, for the more convenient enjoyment of which he generally reſided, in the ſporting ſeaſon, at Greenwich.

Dog *ribbed Indians*, a tribe of Indians, who inhabit the environs of lake Edlande in the N. W. part of N. America, and who are often at war with the Athapuſcow Indians. Both theſe tribes are reckoned among the moſt ſavage of the human race. They trade with the Hudſon-bay company's ſettlements. Edlande lake lies N. of the Athapuſcow ſea or lake, and near the Arctic circle.

Dog *river*, a river in the N. W. part of N. America, which diſcharges itſelf into the Slave river in N. lat. 59° 45′. W. long. 111° 20′. At this ſtation the latter river is nearly two leagues in breadth.

Dog-*roſe*, in *Botany*, a name for the common briar, or hip tree. It is obſervable of ſome kinds of this ſhrub, that the-

the flowers ſmell extremely ſweet in the night, or very early in the morning, but not at all in the day-time. The reaſon of which ſeems to be the ſame as in all the noctuolent plants, of which there are ſeveral kinds, as ſome of the geraniums, and of the jaſmines, &c. that is, that the ſun exhales and diſſipates their odorous effluvia in the day-time, as ſoon as they are expanded from the flower, but that in theſe cold times the vapours are condenſed, and reach our noſtrils in an agreeable manner. Phil. Tranſ. N° 114.

DOG's *Rue*. See SCROPHULARIA.

DOG's *ſtones*. See ORCHIS.

DOG's-*tail graſs*. See CYNOSURUS.

DOG's-*tail graſs*, in *Agriculture*, a name commonly applied by farmers to a well known ſpecies of natural graſs, the *cynoſurus criſtatus*, which is uſeful in ſheep paſtures.

It is a ſort of graſs that grows in the moſt perfect manner in dry ſituations, but which will not thrive in very moiſt meadows. It is frequently found in dry, ſound, feeding paſtures. It flowers nearly at the ſame period with the meadow feſcue-graſs, but it is not very productive of foliage. It has been ſuppoſed that its benty appearance in high poor moiſt paſtures, has led to the notion of its being but an indifferent graſs plant. But from its being particularly abundant in moiſt of the richeſt grazing paſtures in different parts of the kingdom, and conſtituting in ſome the chief herbage, it would ſeem to be an uſeful graſs. As its flowering ſtems and heads are rarely conſumed by cattle, its ſeeds may be readily collected in caſes where the paſtures are fed; and as they are in great plenty this may be done by children at the ſmall expence of about one ſhilling the pound. It is contended that land may be laid down with this graſs with ſucceſs, provided proper attention be beſtowed in having the ſeed gathered when perfectly ripe, as it has been known to fail on this ground. It is in high eſtimation on the continent as a paſture graſs. But from the fibrous nature of its roots not permitting their running down much into the ſoil, there may be danger of its being deſtroyed in dry ſummer-ſeaſons; however, as it abounds ſo greatly in the beſt paſtures, and is a blade graſs which ſhoots up the firſt after the land has been mown, its thick tufts may afford much food for ſheep in the time of ſnow and ſevere weather, during the winter ſeaſon. It is obſerved, that thoſe who are not accuſtomed to diſtinguiſh the difference of graſſes with any great accuracy, may deſpiſe it as being of an improper and uſeleſs kind; but the ſheep and the ox, who muſt be allowed to be better judges, will ſoon convince them of its importance. From the great rapidity of its growth, it may be apt to get coarſe, if not cut down more quickly than is often the caſe. The ſeed is ſmall and fine, but may be obtained with much facility by paſſing the ſtem through the hand, in a rather tight manner. It has, in particular ſituations, been provided at the low expence of ſixpence the quart. See GRASS.

DOG's *teeth*, in *Anatomy*. See CRANIUM and DENTES.

DOG's *tongue*, in *Botany*. See CYNOGLOSSUM.

DOG's *tooth*, or *Dog's tooth violet*. See ERYTHRONIUM.

DOG's *tooth ſhell*. See DENTALIS.

DOG-*wood*. This wood, when put into water, is ſaid to ſtupify fiſh there, ſo that they are eaſily taken with the hand. It is uſed in America for this purpoſe; and the method is to tie it to the ſtem of the fiſhing boat. It is the wood of a ſpecies of *cornus*, which ſee.

DOG-*wood of Jamaica*. See ERYTHRINA.

DOGA, in *Antiquity*, a large veſſel into which the wine was put when newly brought from the vintage.

DOGADO, in *Geography*, a part of the Venetian ſtates, in which is the capital extending from the mouth of the Liſonzo to that of the Adige, between the country of the Friuli, the Paduan, and the Poleſin-de-Rovigno, including the canals of Venice and the canals of Marano.

DOGE, the chief magiſtrate in the republics of Venice and Genoa. For the preſent ſtate of theſe countries, ſee VENICE and GENOA.

The word properly ſignifies *duke*, being formed from the Latin *dux*; as *dogate* and *dogado*, from *ducatus*, duchy.

The dogate, or office and dignity of doge, is elective: at Venice, the doge is elected for life; at Genoa, only for two years; he is addreſſed under the title of *Serenity*, which among the Venetians is ſuperior to that of highneſs.

The doge is the chief of the council, and the mouth of the republic: yet the Venetians do not go into mourning at his death, as not being their ſovereign, but only their firſt miniſter. In effect, the doge of Venice is no more than the phantom or ſhadow of the majeſty of a prince, all the authority being reſerved to the republic. He only lends his name to the ſenate; the power is diffuſed throughout the whole body, though the anſwers be all made in the name of the doge. If he gives any anſwers on his own account they muſt be very cautiouſly expreſſed, and in general terms, otherwiſe he is ſure to meet with a reprimand. So that it is abſolutely neceſſary he be of an eaſy and pliable diſpoſition.

Anciently, the doges were ſovereigns; but things are much altered; and at preſent, all the prerogatives reſerved to the quality of doge, are thoſe which follow: he gives audience to ambaſſadors; but does not give them any anſwer from himſelf, in matters of any importance; only he is allowed to anſwer according to his own pleaſure to the compliments they make to the ſignory; ſuch anſwers being of no conſequence. The doge, as being firſt magiſtrate, is head of all the councils; and the credentials which the ſenate furniſhes its miniſters in foreign courts, are written in his name; and yet he does not ſign them, but a ſecretary of ſtate ſigns them, and ſeals them with the arms of the republic. The ambaſſadors direct their diſpatches to the doge; and yet he may not open them, but in preſence of the counſellors. The money is ſtruck in the doge's name, but not with his ſtamp, or arms. All the magiſtrates riſe, and ſalute the doge, when he comes into council; and the doge riſes to none but foreign ambaſſadors.

The doge nominates to all the benefices in the church of St. Mark; he is protector of the monaſtery delle Virgine; and beſtows certain petty offices of uſhers of the houſehold, called "Commanders of the Palace." His family is not under the juriſdiction of the maſter of the ceremonies; and his children may have ſtaff officers, and gondoliers in livery.

His grandeur, at the ſame time, is tempered with a variety of circumſtances which render it burdenſome. He may not go out of Venice, without leave of the council; and if he does go out, he is liable to receive affronts, without being entitled to demand ſatisfaction; and, if any diſorder ſhould happen where he was, it belongs not to him, but to the podeſta, as being inveſted with the public authority, to compoſe it.

The children and brothers of the doge are excluded from all the chief offices of ſtate. They may not receive any benefice from the court of Rome; but are allowed to accept of the cardinalate, as being no benefice, nor including any juriſdiction. The doge may not diveſt himſelf of his dignity, for his eaſe; and after his death, his conduct is examined by three inquiſitors, and five correctors, who ſift it with great ſeverity.

The ceremony of the reigning doge's marriage with the Adriatic ſea by throwing a gold ring into it, which is practiſed yearly at Venice on Aſcenſion-day, is ſaid to have taken

taken its rise in the year 1173 from the following circumstance. The state of Venice, having taken part with pope Alexander III. against the emperor Frederic Barbarossa, who had obliged that pope to fly to Venice for protection, made the emperor's son, Otho, a prisoner in a sea-fight on the coast of Istria, and took the Admiral gally, with 48 other ships. Upon which the pope, coming to meet the doge Sebastian Zani, at Venice, presented him with a gold ring, in testimony of his gratitude, saying, "Take this ring, and bind the Adriatic sea therewith to thee in wedlock; which ceremony you and your successors shall annually perform, that latest posterity may know you have acquired a dominion of this sea by right of conquest, and that as the wife is subject to her husband so is this sea to your republic." Such are the grounds of the mighty pretensions of this republic to the dominion of the Adriatic sea. Yet so wise a state as Venice for a long time availed themselves of this trivial circumstance to their substantial advantage; for in consequence of it they assumed the title of sovereigns of the Adriatic, and to be its guard from pirates, and other invaders; and even to prohibit the navigation of it to such nations as they disliked, and to demand a tribute of all foreign ships sailing upon it. Nevertheless, so early as the 13th century, Ancona disputed Venice's right to this exclusive privilege, which is quite obsolete in our days.

Keysler (Travels, vol. iv.) has given the following account of this splendid ceremony. On Ascension-day, about 10 o'clock in the morning, the signal being given by a discharge of great guns and ringing of bells, the doge, or in case of his illness, the vice-doge, goes on board the bucentoro or bucentaur, (see BUCENTAUR,) and accompanied by several thousand barques and gondolas, a great number of gallies finely ornamented on this occasion, and the splendid yachts of foreign ambassadors, is rowed out to sea, about 200 paces, between the islands of St. Erasmo and Il Lido di Malamocco. The patriarch, (who, on this day, according to ancient custom, in commemoration of the simple diet of the primitive clergy, is entertained in the Olivetan convent, in the island of St. Helena, with chesnuts and water,) and several of the dignified clergy, come on board the Bucentaur, and present the doge and signoria, as they pass, with artificial flowers or nosegays, which, at their return, they make presents of to their acquaintance. The doge, at his setting off, and again on his return, is saluted by the cannon of a fort on the Lido, of the castle on the island of Erasmo, and with the small arms of the soldiers, who are drawn up along the shore of Lido. An eminence on this island affords a distinct view of this pompous procession, and of the vast number of boats, &c. which cover the surface of the water and make a brilliant appearance. In the mean time several hymns are performed on board the Bucentaur, by the band of music belonging to St. Mark's church, and several prayers appointed for the occasion are read or sung, till the doge has passed the two forts of Lido and St. Erasmo; and then he proceeds a little further towards the Lido shore, the stern of his barge being turned towards the main sea. Here the patriarch pours into the sea some water which has been consecrated with some particular prayers, and is said to have the virtue of allaying storms, and the fury of the waves. After this the doge drops a gold ring into the sea through a hole near his seat, at the same time repeating these words, "Desponsamus te mare, in signum veri perpetuique dominium;" *i. e.* "We espouse thee, O sea, in token of our perpetual dominion over thee." The doge on his return goes ashore at the island of Lido, where he hears mass performed by the patriarch in St. Nicholas's church. In the evening the principal members of the council, and all who attended the doge in the Bucentaur, are entertained at the doge's palace, where the desert, which represents gondolas, forts, &c. is exposed the whole day to the admiration of the populace.

DOGGER, in *Sea Language*, a strong vessel with two masts, used by the Dutch, &c. for fishing in the German sea, and on the Dogger-bank. On the main-mast are set two square-sails; on the mizen-mast a gaff sail; and above that a top-sail.—Also, a bow-sprit with a sprit-sail, and two or three jibs.

DOGGER-*bank*, in *Geography*, a very extensive sand-bank in the German ocean, between the coast of England and Germany. It stretches S. E. and N. W. beginning about 12 leagues from Flamborough-head, and extending near 72 leagues towards the coast of Jutland. Between the Dogger and the Well-bank, to the S., are the silver pits of the Marinus, which supply London with cod; a fish, which loves the deep water near the banks, while the flat fish delight in the shallows.

DOGGER-*fish*, in our *Statutes*, seems to be fish brought in the fishing-vessels called doggers to Blackness-haven, &c. anno 31 Edw. III. stat. 3. cap. 2.

DOGGER-*men*, fishermen, belonging to dogger-ships, 25 Hen. VIII. cap. 4.

DOGGERS, in the English *Alum Works*, a name given by the workmen to a sort of stone found in the same mines with the true alum-rock, and containing some alum, though not nearly so much as the right kind. The county of York, which abounds greatly with the true alum rock, affords also a very considerable quantity of these doggers; and in some places they approach so nearly to the nature of the true rock, that they are wrought to advantage. See ALUM.

DOGGS, machines of iron for burning wood on.—Also, hooks fixed in large timbers, for drawing them with horses.

DOGGET. See DOCKET.

DOGLIANI, in *Geography*, a mountain of Bosnia; 12 miles N. of Verajo.

DOGMA, Δογμα, a maxim, tenet, settled proposition, or principle; particularly in matters of religion or philosophy.

DOGMATICAL, something relating to a doctrine, or opinion.

In common use, a dogmatical philosopher is one who asserts every thing positively; in opposition to a sceptic, who doubts of every thing. See DOGMATISM.

A dogmatical physician is he, who, on the principles of the school philosophy, rejects all medicinal virtues not reducible to manifest qualities.

DOGMATICI, DOGMATISTS, a sect of ancient physicians, called also logici, logicians, from their using the rules of logic and reason in subjects of their profession.

They laid down definitions and divisions, reducing diseases to certain genera, those genera to species, and furnishing remedies for them all; supposing principles, drawing consequences, and applying those principles and consequences to the particular diseases under consideration; in which sense the dogmatists stand contradistinguished to empirics and methodists.

The dogmatists were those who brought physic into a form and arrangement, like those of other speculative sciences; defining, dividing, laying down principles, and drawing conclusions; and hence they had also the appellation of logici; *q. d.* reasoners. They also applied themselves to seek the causes of diseases, the nature of remedies, &c.

Erasistratus, a famous dogmatist, went so far, that, not content to dissect dogs, and other brute animals, he begged condemned criminals of the magistrates, and opened them while alive, and searched in their entrails.

DOGMATISM, in its primitive sense, meant no more than

than the holding of ſome particular tenet or ſyſtem of opinions; and thus it was anciently applied to every ſect of philoſophers, except the *Middle* ACADEMY, and the SCEPTICS. Thus far dogmatiſm is not only free from blame, but even unavoidable; becauſe, when a ſubject is extenſive or complicated, it becomes neceſſary to make certain combinations of ideas, or to adopt thoſe which have been made, with regard to it, by others; that is, in other words, a ſyſtem. But from the abuſe of dogmatiſm, eſpecially in religion, the term has acquired a ſignification very different from its original import. At preſent it ſeems to have three principal ſenſes. It ſometimes ſignifies the adopting of opinions without any adequate evidence, or the maintaining of them with ſuch inflexible rigidity, as excludes further information and enquiry: ſometimes it denotes that fond attachment to our own ſentiments, which induces us to conſider them as the infallible ſtandard of right and wrong, and reject thoſe of others as criminal and abominable: at other times, it is uſed to ſignify that intolerant ſpirit, which *violently* wreſts from others the rights of conſcience, and impoſes upon them our own ſentiments, in an arbitrary, and, as it is called, *dogmatical* manner. In whichever of theſe ſenſes dogmatiſm be conſidered, it is equally abſurd, as it is founded in preſumption. No man can be without his opinions, and his ſyſtem; but theſe opinions, and this ſyſtem, may be profeſſed with modeſty, and maintained with candour. They ſhould be held as the reſult of our beſt inquiries, not as the dictates of infallibility. They may be maintained as recommended by their ſuperior evidence; but others muſt be allowed the ſame liberty we take to ourſelves, that of adopting ſuch opinions as we like beſt. Nothing but infallibility can juſtify dogmatiſm; and as dogmatiſm reſts on ſelf-conceit, whatever be the ſubject, this foundation of it is doubly conſpicuous in religion, becauſe the nature and ſublimity of the object may the more eaſily expoſe us to miſtake; at the ſame time that its importance renders it more incumbent upon us to guard againſt being deceived. Dogmatiſm alſo leads to injuſtice, as it violates the rights of conſcience and of private judgment. What Tacitus (when he ſays, "Rara temporum felicitas, ubi ſentire quæ velis, et quæ ſentias, dicere licet") deems the characteriſtic of times uncommonly happy, ſhould belong to every period, and to every ſociety. To reſtore this liberty was one main end of the Chriſtian revelation; but, ſuch is the perverſity of human nature, ſuch its propenſity to dogmatiſm and ſpiritual tyranny, that the inſtrument of deliverance was again converted into an inſtrument of ſlavery; inſomuch, that ſpiritual uſurpation, and the oppreſſion of conſcience, have been carried to greater lengths among Chriſtians than perhaps they ever were in the Heathen world.

Dogmatiſm, with regard to its effects, obſtructs religious improvement, and thus deſtroys the very eſſence of religion; and it has, directly or indirectly, produced all the corruptions which have diſgraced Chriſtianity. Should it be aſked, what is the proper medium between dogmatiſm and ſcepticiſm? This part of the queſtion refers either to the beſt way of avoiding theſe ourſelves, or to the moſt effectual method of diſcouraging their prevalence in the world. With reſpect to the former we may obſerve, that the only ſure preſervative againſt both a dogmatical and a ſceptical ſpirit, is the knowledge of the principles of pure religion, unſophiſticated by the comments and inventions of men. With regard to the latter, great attention ſhould be paid to the ſtudy of natural religion, and of the ſcriptures; in explaining which, a diſtinction ought always to be made between fundamental doctrines, and others which are either indifferent, or of ſmall conſequence. Let thoſe doctrines, which ſcripture unequivocally reveals, be laid down as fundamentals:—let every other be propoſed with thoſe marks of doubt with which the word of God has characteriſed them, by leaving them in a certain degree of ſhade and obſcurity, and inſiſting upon them as little as poſſible. The very words of ſcripture, tranſlated as nearly as the genius of each language will admit, ſhould be uſed. Even with regard to fundamental truths, great care ſhould be taken not to think of impoſing them violently upon others, or even to load those who reject them with opprobrious epithets. An excellent writer obſerves, in reference to this ſubject, "that Chriſtianity will never appear in its native luſtre, till the moſt perfect unequivocal toleration be every where eſtabliſhed; becauſe this alone will allow religion to exert its natural energy, and enjoy the ſame advantage with every other ſcience, and, by means of free enquiry, extracting freſh light and evidence, bring it nearer and nearer to the ſtandard of divine truth." See on this ſubject a diſſertation, which obtained the gold medal, by Dr. Brown, miniſter of the Engliſh church at Utrecht, afterwards profeſſor of moral philoſophy and eccleſiaſtical hiſtory in the univerſity of that city, and now principal of the Mariſchal college of Aberdeen, in "Taylor's Prize Diſſertations," vol. vii. 4to Haerlem, 1787.

DOGOROBUSH, in *Geography*, a village, or as the people of the country call it, a city, together with a diſtrict, in the government of Smolenſko, in Ruſſia, ſeated on the Dnieper. This is built upon a riſing hill, and exhibits, like Smolenſko, though on a ſmaller ſcale, an intermixture of churches, houſes, cottages, corn-fields, and meadows. Some of the houſes, conſtructed at the expence of the empreſs Catherine, are of brick covered with ſtucco, and appear like palaces when contraſted with the meanneſs of the ſurrounding hovels. This place was formerly a ſtrong fortreſs, and frequently beſieged during the wars between Ruſſia and Poland. The remains of an old citadel are ſtill to be ſeen, and the ramparts command an extenſive proſpect of a champaign country, marked by meanders of the Dnieper, and bounded by diſtant little hills.

DOHALIZ, a town of Bohemia, in the circle of Konigingratz; four miles N.W. of Konigingratz.

DOHNA, anciently DONYN, a ſmall town of Saxony, in the circle of Miſnia, on the river Muglitz, eight miles of Dreſden, remarkable for having been, during ſix centuries, the reſidence of the earls or bourgraves of Dohna, who were driven from it, in 1402, by the margraves of Miſnia. It contains about 800 inhabitants, many of whom are butchers, who, ever ſince the year 1462, enjoy the privilege of ſelling their meat on Wedneſdays, Thurſdays, and Saturdays, at Dreſden; but they muſt diſpoſe of it one farthing cheaper *per* pound than the Dreſden butchers.

DOIAGOI, an iſland of Ruſſia, in the Frozen ſea, at the entrance of the ſtraits of Vagatſkoi. N. lat. 70° 5′. E. long. 57° 14′.

DOJAR, a town of Arabia, in the country of Yemen; 44 miles E. of Chamir.

DOIGTER, *Fr.* the art of fingering upon keyed-inſtruments. M. Rameau has condeſcended, in his laſt work, "Code de Muſique," to place the young muſician's hand on the keys, and to regulate the fingers; but the buſineſs ſeems to have been better done by Couperin. Rouſſeau excludes the uſe of the right hand, which is an erroneous precept: but the rules with which Duphlip has furniſhed him are in general good. Rameau's fingering is the old French method, which has been long abandoned. Couperin's fingering, in the minority of Louis XV., 1717, was new and admirable, and has been often adopted by the beſt maſters, among the reſt, Emanuel Bach. See FINGERING.

DOIRE, in *Geography*. There are two rivers of that name,

name, in that part of France which formerly was called Piémont, and belonged to the king of Sardinia. The Roman name of both rivers was Duria. The grande Doire was ſtyled Duria major, or Doria Baltea; the petite Doire, Duria minor, or Doria Riparia. The French name is derived from Doria.

The grande Doire, or Doria Baltea, is the moſt conſiderable of the two rivers, and has given its name to a department. It has its ſource in the Alps, near the Little St. Bernard, runs from N.W. to S.E., paſſes by Aoſta, the caſtle of Bard, Yvrée, and falls into the Po, above Caſal. A canal of communication between the Doire and the river Seſia, likewiſe in Piémont, has been lately opened; it begins at Yvrée, and ends at Verceil.

The petite Doire, Doria Riparia, has its ſource at the foot of mount Genevre, flows from weſt to eaſt, paſſes by Exilles, Chaumont, Suze, where it receives the Ceniſelle, and takes afterwards a ſouth-eaſt direction towards Turin, below which city it likewiſe falls into the Po.

Doire, *the Department of the*, is the firſt of the ſix departments into which the whole principality of Piémont, in Italy, which formerly belonged to the king of Sardinia, has been divided by the French, when it was annexed to France, by a ſenatus conſultum of the 8th fructidor, in the tenth year of the republic, or the 26th of Auguſt, 1802. It comprizes the ancient duchy of Aoſta, and what was called the Canaveſe. Its name is derived from the grande Doire, Doria Baltea, (ſee the preceding article,) and is irrigated by that river, which divides it into two almoſt equal parts, and by the Orco, which has its ſource on the borders of the department of Mont Blanc, paſſes by Locana, Cuorgne, Rivarol, and falls into the Po, not far from Chivas.

The department of the Doire is bounded to the north by the new republic of Vallais; to the north-eaſt by the kingdom of Italy; to the eaſt by the department of the Seſia; to the ſouth-eaſt by the departments of Marengo and Tanaro; to the ſouth by that of the Po; to the weſt by that of the Mont Blanc; and to the north-weſt by that of the Leman. Its extent is of 4772½ ſquare kiliometres, about 200 ſquare leagues, or 935,060 arpens. The ſoil, even in the vicinity of the Po, is mountainous; but it is particularly northwards of the valley of Aoſta that mountains have been heaped, as it were, one upon the other. Yet they ſeem only ſecondary mountains, formed by fragments detached from the higher ſummits of the Alps, as Mont Blanc, and the great St. Bernard. Theſe mountains are covered with foreſts, peopled with bears, wolves, foxes, and white hares. Cheſnut and wallnut trees thrive at the foot of the hills. On the higheſt Alps there are no trees. Marmots are found among the rocks, covered with a ſcanty graſs.

One of the higheſt ſummits of the Alps, the Mont Joux, or Great St. Bernard, forms the boundary between the department of the Doire and the republic of Vallais. It has at its top a celebrated convent of monks, founded by Bernard of Menthon, for the benefit of travellers who have loſt their way. There is alſo an hoſpital at the ſummit of the Little St. Bernard, over which paſſes the road from the department of the Doire into that of the Mont Blanc.

The valley of Aoſta, formed by an opening of the mountains from eaſt to weſt, begins at the caſtle of Bard, a little above Ivrée, and ends in the eaſt by Mont Jouet, at ſome diſtance from Aoſta. There is much hemp grown in this department, which abounds beſides in excellent paſtures and all ſorts of fruit trees, but chiefly cheſnut and mulberry trees, which are of great uſe for the rearing of ſilk worms. There is alſo ſome corn and ſome wine. The northern part of the department is rich in mines of iron and other metals, and mineral ſprings. It is even reported to poſſeſs ſome mines of gold, which are not worked, becauſe it is ſuppoſed that their produce would be inconſiderable.

The department of the Doire has ſome manufactures of linen cloth, but its principal trade is with hemp and cattle. It is divided into three diſtricts, Aoſte, Ivrée, and Chivas; 27 cantons, and 227 communes. The chief place of the department is Ivrée; the other principal towns are Aoſte, Chivas, Caſtellamont, Locana, Strambino. The whole population amounts to 224,127 individuals, or about 1121 inhabitants *per* ſquare league. The annual contributions to the ſtate are 951,159 livres, or about 4*s.* 4*d.* ſterling for each individual.

There are ſeveral remains of Roman architecture at Suze and Aoſte. Herbin. Statiſtique de la France.

DOIT, in *Commerce*, the fourth part of a ſtiver in Holland.

DOITKIN, a kind of baſe coin of ſmall value, prohibited by the ſtatute 3 Hen. V cap. 1. Hence came the phraſe, "Not worth a doitkin."

DOKE, in *Agriculture*, a term ſometimes applied to a deep furrow.

DOKOWICHE, in *Geography*. a town of Poland, in the palatinate of Belez; 28 miles N. W. of Belez.

DOL, a ſmall town of France, in the department of Ille and Vilaine, chief place of a canton in the diſtrict of St. Malo, with a population of 2787 individuals. It is ſituated in a marſhy country, but fertile in hemp, corn, and apples, of which they make cyder; ſix miles from the ſea, 18 miles S. E. of St. Malo, 36 N.W. of Rennes, and 249 W. of Paris. Lat. 48° 33′ 9″. The canton has an extent of 200 kiliometres, 8 communes, and 12,600 inhabitants.

DOLA, an appellation applied in Arabia, in the country of Yemen, much in the ſame manner as pacha in Turkey, excepting its being reſtricted to a more narrow ſtage. He commands the forces ſtationed in his province, regulates the police, and collects the taxes. From lucrative governments the dolas are recalled every two or three years, to prevent their accumulating too much wealth. When the Imam continues a dola in office, he ſends him a horſe, a ſabre, and robes. All are obliged to render an account, from time to time, of their adminiſtration; and when guilty of high miſdemeanours, or convicted of malverſations in office, they are puniſhed by impriſonment, or by confiſcation of their property, but ſeldom capitally. Sometimes a dola, who has been thus diſgraced, is raiſed from priſon to an office of greater conſequence than that of which he was diveſted. In every little town a ſub-dola, with a ſmall garriſon, conſiſting ſometimes of only five or ſix ſoldiers, reſide, to maintain order. The dolas of conſiderable governments are attended by a "baſkatib," or controller, whoſe buſineſs is to keep a ſtrict eye upon their conduct, and to inform the Imam of what is going forward. Every city in which a dola reſides has alſo a Kadi, dependent on the chief Kadi of Sana.

DOLABRIFORM Leaf, in *Botany*. See Leaf.

DOLABRUM, among the Romans, a kind of knife uſed in ſacrifices among the people. Vide Hiſt. Acad. Inſcript. tom. ii. p. 345.

DOLALYCZE, in *Geography*, a town of Lithuania, in the province of Novogrodek; 12 miles N. N. E. of Novogrodek.

DOLAN, a town of Bohemia, in the circle of Koniginggratz; 4 miles W. of Gitſchin.

DOLANOVA, a river of Ruſſian Siberia, which runs into the Oka; 12 miles S. of Bratſkoi.

DOLBA, in *Ancient Geography*, a town of Asia, in Adiabene, according to Arrian.

DOLBEN, John, in *Biography*, an English prelate of considerable reputation, was born in the year 1625, at Stonewick in Northamptonshire, of which place his father was rector. In 1636, he was admitted a king's scholar at Westminster, whence he was elected to Christ-church college, Oxford, in 1640, and admitted a student on queen Elizabeth's foundation. He seems to have been adapted to the troublesome times in which he lived; for during the civil wars, his attachment to the cause of his sovereign was so great, that he took up arms in his defence, and served successively, as ensign, captain, and major. Frequently he was exposed to all the dangers of warfare, and at the battle of Marston Moor he was dangerously wounded: and again in the defence of York, his thigh was broken by a musket-ball, which occasioned him to be confined to his bed for twelve months. When he saw the cause of the king was absolutely indefensible and hopeless, he returned to his college, where he pursued his studies with so much ardour as if determined to make up for the time which he had spent, in a service, though equally honourable, as he thought, yet totally inappropriate to his intended profession. In 1647, he took the degree of M. A., and continued at college till he was ejected by the parliamentary visitors. He now became the champion of the church as he had been the vindicator of the king. He accordingly took orders in 1656, and in the following year he married a niece of Dr., afterwards archbishop, Sheldon, and from that period till the restoration of Charles II., he resided at Oxford, and in conjunction with Dr. Fell, and Dr. Allestry, constantly performed divine service, and administered the sacraments according to the liturgy of the church of England, at a private house, whither many of the royalists and ejected students resorted and formed a regular and numerous congregation. Upon the restoration of Charles, his zeal and sufferings were not forgotten: he was first made canon of Christ-church, Oxford, and took his degree of doctor in divinity. He now rose in the church by rapid strides, and was soon installed dean of Westminster. In 1664, he was chosen prolocutor of the lower house of convocation, and in a short time was appointed clerk of the closet to the king, and, in 1666, he was nominated to the bishopric of Rochester, which he was enabled to hold with the deanery of Westminster. In a few years after he undertook the office of lord high almoner, the duties of which he performed with much benefit to the poor. In 1683, he was translated to the archiepiscopal see of York; this was the last instance of his preferment; in them all, and in every station of life, he conducted himself with prudence, with integrity and great zeal. He died of the small-pox in 1689, in the sixty-second year of his age. He is described by Anthony Wood "as a man of a free, generous, and noble disposition, and of a natural, bold, and happy eloquence." His powerful talents gave him great weight and ascendancy in the house of lords. He had studied much of our laws, especially those relating to parliament, and was not to be daunted by the arrogance of courtiers and favourites. In him, says his biographer, we lost the greatest abilities, the most useful conversation, the most faithful friendship, and one who had a mind that practised the best virtues, and a wit that was best able to recommend them to others. Biog. Brit.

DOLCE Ludovico, an Italian writer, was born at Venice in 1508, and passed his life in pursuits of literature, which afforded him a scanty maintenance. He published many works in history, grammar, philosophy, &c. and the belles lettres. By some of these he acquired a considerable share of celebrity, though his writings were not of the first or even of the second rate. His style was easy and clear, and he was equally ready at verse as at prose. He translated many of the ancient Roman poets, and some of Cicero's pieces: his dialogue on painting, and his life of Charles V. are his most esteemed works. He died about the year 1568.

Dolce *Aqua*, in *Geography*, a small town of France, in the department of the maritime Alps, which formerly constituted the county of Nice, bordering upon the Mediterranean sea, and belonging to the kings of Sardinia. It is situated in a fertile country, abundant, particularly, in excellent wine and olive oil; 6 miles N. of Vintimille.

Dolce, in *Music*. See Doux.

DOLCI, Carlo, or Carlino, in *Biography*, an eminent painter of history and portrait, was born at Florence in the year 1616, and was a disciple of Jacopo Vignali. His first attempt in a whole figure of St. John, when he was only eleven years of age, was much approved; and this was succeeded by the portrait of his mother, which placed him in the highest rank of merit. His style, which was new and delicate, procured him ample employment at Florence, and in other cities of Italy. His works are distinguished by the peculiar delicacy of his compositions; by a pleasing tint of colour, improved by a judicious management of the chiare-scuro, which gave a surprising relief to his figures, by the graceful air of his heads, and by a placid repose diffused over the whole. He took great pains in the execution of his pictures, and he was so slow, that his brain is said to have been affected by observing Luca Giordano dispatch more business in four or five hours, than he would have done in as many months. Some of his pictures, particularly that of St. Sebastian, and another representing the four evangelists, are repoited in the Palazzo Corsini, and the Palazzo Ricardi at Florence: and in the Pembroke collection at Wilton, there is a fine picture of the Virgin, ornamented with flowers by Mario da Fiori. This artist died at the age of 70, in 1686. He left a daughter, Agnese Dolci, who imitated, without equalling her father, and furnished many of the copies made from his numerous pictures. Pilkington by Fuseli.

DOLCIGNO, or Dulcigno, *Ulcinium*, *Olchinium*, in *Geography*, a town of Turkey, in Europe, in Upper Albania, or Arnaut, with a strong castle, and a good sea port. It is the see of a Greek bishop, and is situated on the river Drin, or Drino Nigro, not far from the ancient town of Dulcigno, 12 miles S. of Antivari, and 24 S. W. of Scutari. Long. 19° 2′. Lat. 41° 54′. Its inhabitants, called Dulcignots, are noted for their maritime depredations.

DOLE, in *Agriculture*, a word frequently applied provincially to a long narrow slip of green land, left in arable fields untouched by the plough: also, a piece of land on a common or heath, of which only one particular person has a right to cut fuel. It is often written *deol*.

Dole, John, Dolæus, in *Biography*, physician to the landgrave of Hesse-Cassel, and member of the Imperial Academy, was born at Geismar in 1651. He studied medicine first at Heidelburg, and then visited the university at Paris, then in Holland, and then in England, and, at length, returning to his native country, he took the degree of doctor in medicine, where he soon acquired a degree of popularity in his profession, which continued to him to the time of his death, which happened in 1712. His publications are, "Encyclopædia Medicinæ Theoretico-practicæ," 4to. an useful compilation. It has been several times reprinted, and was, for a long time, a standard work, as containing numerous useful practical observations. "Encyclopædia Chirur-

gica rationalis," Francof. 1689, 4to. He had feen inveterate head-achs cured by opening the temporal artery, a liver weighing eight pounds, a very large calculus in the gall-bladder, two bones, and a tuft of hair, found in the ovarium of a woman, aphonia, or lofs of voice, fupervening the fmall-pox, and at the end of fome weeks, fponteneofuly cured, &c. "De furia podagræ lacte victa et mitigata." Amft. 1707. 12mo. This was tranflated into Englifh by Stevens, and publifhed in 1731. The works of Dolæus were collected, and publifhed together, "Opera omnia," in two vols in folio, at Francf rt, 1693, and republifhed in 1703. Haller, Bib. Med. Pract.

Dole, *Dola Sequanorum*, in *Geography*, a handfome town of France, in the department of the Jura, chief place of a diftrict, fituated in an agreeable and fertile plain on the river Doubs, 30 miles S. W. of Befançon, 33 S. E. of Dijon, 84 N. W. of Geneve, and 270 S. E. of Paris. Lat. 47° 5′ 42″. It has a population of 8235 individuals. Its canton contains 17 communes, and 14,257 inhabitants, on a territorial extent of 150 kiliometres.

Dôle has fome manufactures of hofiery and of hats. As chief place of a diftrict it has a fub-prefect, a court of juftice, a regifter office, and a ranger. The foil of the diftrict is uncommonly fertile; it produces abundance of corn and fruits. There are iron and copper mines, and quarries of beautiful marble. Thofe of the village of Sampans yield fine marble of a cherry colour with white fpots; that of the village of Damparis is of a reddifh hue. Menfley has a quarry of good mill-ftones.

The whole diftrict of Dôle comprizes 9 cantons, 155 communes, 63,581 inhabitants, and a territorial extent of 1195 kiliometres.

Dole, one of the higheft fummits of the Mont Jura in France, which ftretches from the Helvetian Alps to the Vofges. It is 1630 metres, or 846 fathoms, above the level of the fea.

Dole, in the Saxon and Britifh tongue, fignifies a part or portion, moft commonly of a meadow.

Hence alfo dole meadow; a meadow wherein feveral perfons have fhares. See Dalus.

The word ftill fignifies a fhare; a diftributing, or dealing of alms; or a liberal gift made by a great man to the people.

Dole, in the *Law of Scotland*, is ufed for a malevolent intention; or, that malicious and wilful purpofe of the mind, which in conformity with the dictates of nature and reafon, and agreeably to the uniform current of authorities, is neceffary to the guilt of every tranfgreffion. The word is taken from the civil law term dolus.

Dole, in the law of Scotland, as well as in the civil law, is an effential ingredient to conftitute an action criminal. In crimes wherein the will, not the event, muft be regarded, no negligence can equal dole; unlefs the negligence be fo extremely fupine, as not to be conceivable without implying dole.

Under dole are comprehended the vices and errors of the will, which are immediately productive of the criminal fact, though not premeditated, but the effect of fudden paffion. In this refpect dole differs from what the Englifh law calls malice. However both laws agree in this, that the bare intention never brought forth into act, is no crime; yet giving counfel to perpetrate is criminal, if the fact is done purfuant thereto.

Dole *fifh*, in our *Statutes*, feems to be that fifh which the fifhermen, yearly employed in the North feas, do of onftom receive for their allowance or fhares. Vide ftat. 35 Hen. VIII. cap. 7.

Dole-*ftone*, in *Agriculture*, a term often provincially applied to a land mark, or boundary ftone.

DOLET, Stephen, in *Biography*, was born at Orleans about the year 1509, and fufpected by fome of being the natural fon of Francis I., but there feems little foundation for the furmife. He received the early parts of his education at Paris, and went from that city to Padua for farther improvement. Here he ftudied under, and became a favourite pupil of Simon de Villeneuve, after whofe death he engaged as private fecretary to John de Langeac, ambaffador from France to the republic of Venice. At Venice he purfued the ftudy of the claffics under the inftructions of the celebrated Baptifta Egnatius. The learned languages feemed to be his favourite purfuit, and in early life he made large collections with a view of publifhing on the fubject. He next turned his attention to jurifprudence, and ftudied the law in conjunction with the belles lettres at Toulouife. Here he prefided at the head of a literary fociety, and in that fituation delivered a difcourfe, which involved him in an unfortunate difpute. This was carried to fuch lengths, that he was difgraced, and banifhed the city. From this period, rankling, perhaps, for revenge, he was feldom free from contefts; and he provoked fo many enemies, that his life was frequently in danger. At Lyons, in defending himfelf, he had the misfortune to kill his antagonift; to avoid the penal confequences he fled to Paris, and threw himfelf on the clemency of Francis I., who was the patron of learned men, and from whom he received his free pardon. He then returned to Lyons, and became a printer and bookfeller, where he was active, induftrious, and fucceefsful. His enemies were, however, ever watchful of his conduct; their animofity, and probably their jealoufy of his fuperior talents, magnified all his failings, and when he avowed lax opinions refpecting religion, he was purfued by the clergy, arrefted, and thrown into prifon, from which he efcaped, through the intereft of fome perfons of learning and rank, and in the ftate. But he was ftill imprudent, and at length wearied out his friends, fo that when he was arrefted in the year 1545, they did not appear in his behalf; but abandoned him to the fury of the inquifitors. By them, who never wanted evidence of crimes, which they wifhed to impute to an enemy, he was convicted of atheifm, and condemned to be burnt, which fentence was carried into execution in 1546, when he was fcarcely 37 years of age. Confidering his youth, he was author of numerous works, the titles of which would occupy too large a fpace to admit of their being enumerated; many of them were curious, and on important topics. Moreri.

Dolet, in *Natural Hiftory*, a word ufed by fome writers, in *Medicine*, for red vitriol, or colcothar of vitriol.

DOLG-Bote, in the Saxon *Laws*, a recompence, amends, or fatisfaction, made for a fcar or wound.

DOLGAIA, in *Geography*, a bay of Ruffian Lapland, in the White fea. N. lat. 73° 25′. E. long. 20° 14′.

DOLGANOVA, a town of Ruffian Siberia; 32 miles N. N. E. of Nertfchinfk.

DOLGELLY, or Dolgellen, a parifh and market town of Merionethfhire, Wales, is feated in a deep narrow valley on the fouthern bank of the river Avon, over which is a good ftone bridge, and is nearly furrounded with mountains. Its name is derived from its fituation in a vale once abounding with woods: Dol being of the fame import with Dale in Englifh, and Gellen or Kellen a place where much hazle grows. Its antiquity has not been noticed. Camden fays, Roman coins of Trajan and Hadrian

were found in his time, near a well called Fynnon-yawr. A parliament was assembled here, in 1404, by Owen Glyndwer, who here assumed the style and claims of royalty.

The summer assizes are held here; the houses are chiefly built of quartz, or lime-stone, without mortar, smaller pieces of the same being forced into the interstices: few are higher than two stories, with pent-houses in front upon poles, and the streets are so narrow as not to admit two carriages passing each other. The church is built of lime-stone, and consists of a tower, and a large nave. The seats are forms, and the floor is paved with lime-stone flags, a circumstance extraordinary for Wales. The mode of perpetuating the remembrance of departed friends is expressed in a whimsical way; the coffin plates, exhibiting the name, age, &c. of the deceased, are placed as *memento mori's* against the walls and other conspicuous parts of the church.

The town is improving in building and population; and from the increasing trade in coarse cloth, it promises to become no inconsiderable place. That kind of woollen cloth called Gwen, or Webs, strong or high country cloth, occupies the inhabitants of the town and neighbourhood. Every little farmer makes webs; and scarcely a cottage is found without a loom. All kinds of wool are indiscriminately used; fleece, refuse from staplers, and even the skin yards. Some of the growers manufacture their own wool, and the produce from this is the best cloth. The webs run from six to seven quarters wide, and are two hundred yards long, divided into two pieces. In its rough state, it may be purchased of the manufacturer from one shilling to three shillings *per* yard. The quality has varied, since the staple of wool has been better understood, and it has risen full 20 *per cent.* within the last seven years. The webs used to be carried to Liverpool or Shrewsbury to market; but the Liverpool dealers now employ persons on the spot to purchase of the makers; and to assist the poorer manufacturers with money to carry on their trade; as the Blackwell-hall factors do many of the smaller clothiers in the west of England. Here, as in that country, much is made up by commission. After undergoing the operation of scouring, bleaching, and milling, it is packed in large bales, and sent to Liverpool and London; and thence exported to Germany, Russia, and the West Indies. Dolgelly is situated 209 miles N. W. from London; has a weekly market on Tuesdays, and six annual fairs. It contains, according to the late return, 630 houses, and 2949 inhabitants. The living is a rectory.

Five miles from this town is the cataract of *Dol y Myllyn*, which falls from a height of 35 feet into a large bason, whence it is precipitated, with a great noise, 20 feet lower. It is a peculiarly picturesque scene.

Immediately to the S. E. of Dolgelly is the base of Cader-Idris, a mountain of great altitude, and, from its rocks, lakes, botanical productions, &c. peculiarly interesting to almost every species of travellers. The ingenious Mr. A. Aikin has furnished a concise and scientific account of this lofty region; which has been given in this work, vol. v. (See CADER-IDRIS) And the Rev. I. Evans, in his "Tour through North Wales," gives a circumstantial description of this mountain, with its dependent hills, vallies, lakes, &c.

DOLGENSEE, a lake of Germany, in the circle of Upper Saxony, and Ucker Mark of Brandenburg, a little to the north of Templin.

DOLHINOW, a town of Lithuania, in the palatinate of Wilna; 80 miles E. of Wilna.

DOLIANI, a small town of France, in the department of the Sture, which formerly was a part of Piémont in Italy. It has 4000 inhabitants, and is the chief place of a canton in the district of Mondovi. The canton contains five communes, and 8294 inhabitants.

DOLICHA, in *Ancient Geography*, a town of Macedonia, in the Pelasgiotide territory. Ptol.—Also, a town of Asia, in the northern part of Syria, which had been episcopal under the patriarchate of Antioch.

DOLICHE, a town of Asia, in Syria, situated in the mountains of Comagene, to the W. of the Euphrates and near it, N. W. of Zeugma.

DOLICHODROMUS, in the *Ancient Exercises*, one who ran the length of a dolichos.

DOLICHOLITHOS, in *Natural History*, a name given by some authors to a species of stone, of a blackish colour, and the shape of a kidney bean, found in great abundance about Tyrol, and yielding a smell on rubbing.

DOLICHOS, in *Antiquity*, a word used by different writers in different senses. The ancient physicians understood by it long or prolix, and used it in this sense in their description of diseases. Others used it for the fruit or pod of the kidney-bean. Suidas makes it signify a race, or course, of twelve stadia, or of twenty-four.

The dolichos, or long course, in the Olympic stadium, consisted of many diauli, or doublings of the course; the dolichodromi, when they came to the barrier, turned again round the pillar erected at that end, in order to continue and prolong their course. In this exercise the course consisted of 7, 12, or even of 24 stadia, for these different measures are assigned to the dolichos by different authors. Accordingly, besides agility and swiftness, a great strength of body and a long wind was necessary for holding out through so long a course; and besides, as the dolichodromi were obliged to make many short turnings round the pillars erected at each end of the stadium, the labour of the race was considerably increased, and the activity and skill of the racers put to more frequent and severer trials than in the simple foot-race and the diaulus or double stadium. But notwithstanding the length of this course, and the swiftness necessary for gaining the victory in the other two, instances occur of people, in whom the two qualities of agility and strength, which are seldom found together, were nevertheless so united and so eminent as to enable them to obtain the crown in all the three races in one and the same day.

DOLICHOS, in *Botany*, (δολιχος, *long*, a name applied by Theophrastus to the French-bean, φασηλος of Dioscorides, in allusion rather to the length of its climbing stem, than, as some have thought, to the dimensions of its legumes. Some species or other of our genus *Dolichos* may have been the plant of the above ancient writers, as probably as the *Phaseolus*, our French-bean. The species of each genus are very numerous, mostly esculent, and cultivated throughout the warmer parts of the globe. In such cases nothing can be more difficult than to point out the precise plant intended by any ancient author.) Linn. Gen. 372. Schreb. 494. Willd. Sp. Pl. v. 3. 1037. Mart. Mill. v. 2. Juss. 356. Gærtn. t. 150. Class and order, *Diadelphia Decandria*. Nat. Ord. *Papilionaceæ*, Linn. *Leguminosæ*, Juss.

Gen. Ch. *Cal.* Perianth of one leaf, very short, with four teeth of equal length, the uppermost emarginate. *Cor.* papilionaceous. Standard large, roundish, notched, entirely reflexed, furnished with two solid excrescences, attached to its lower side near the base, which are oblong, parallel, and longitudinal, serving to compress the wings. Wings ovate, obtuse, the length of the keel. Keel crescent-shaped, compressed, closely shut up at the lower edge, its top ascending. *Stam.* Filaments diadelphous, one solitary, the other in nine segments,

ſegments, the former curved at its baſe; anthers ſimple. *Piſt.* Germen linear, compreſſed; ſtyle aſcending; ſtigma bearded, running along the inner edge of the ſtyle from the middle to the extremity, the point of the ſtyle being callous and obtuſe in front. *Peric.* Legume pointed, large, oblong, of two valves, ſeparated internally into ſeveral cells by tranſverſe membranes (Gærtner.) *Seeds* one in each cell, elliptical, moſtly compreſſed.

Eſſ. Ch. Stigma downy. Standard with two oblong parallel protuberances at the baſe, which compreſs the wings beneath them.

Obſ. *Phaſeolus* differs from this genus in having its keel ſpirally twiſted. In habit they are altogether ſimilar.

Willdenow enumerates 53 ſpecies of *Dolichos*, of which 42 are climbers, nine upright, and two ſo ill deſcribed by Thunberg, that no one can tell to which of thoſe tribes they belong: we preſume, however, to the former.

The moſt remarkable in that ſection are D. *Lablab*, the Egyptian Kidney-bean, figured by Proſper Alpinus, Pl. Ægypt. t. 75. "This," ſays that writer, "is a climbing tree which grows as large as a vine. It lives for 100 years, and is always green, bearing leaves exactly like thoſe of the common French-bean, and flowering both in ſpring and autumn. Its flowers ſomewhat reſemble thoſe of the French-bean, and produce long pods like very broad beans. The ſeeds are ſome of them black, others reddiſh, exactly like French-beans. The Egyptians uſe them as pulſe, and they are very pleaſantly flavoured." This plant is cultivated in Egypt for making bowers as well as for its ſeeds; but Haſelquiſt thought it not a native of the country, it being called there European-bean. It is ſeen with us in the ſtoves of the curious, but has not much to recommend it to notice. D. *purpureus*. Linn. Sp. Pl. 1021. Sm. Exot. Bot. t. 74, is a handſomer flower, and likewiſe perennial, ſoon filling the ſtove with its wide-extended branches. It is ſaid to be a native of both Eaſt and Weſt Indies. D. *pruriens*. Linn. Sp. Pl. 1019. Woodv. Med. Bot. t. 172, is the celebrated Cowhage, Cow-itch, or *Stizolobium*, uſed in the Weſt Indies as a vermifuge. It bears long magnificent cluſters of violet-coloured flowers. The legumes are denſely clothed with rigid very pungent barbed briſtles, cauſing intolerable itching in the ſkin, but ſwallowed with ſafety, in the form of a bolus, into the ſtomach, where they act mechanically, ſo as to deſtroy all kinds of worms. D. *ſcarabæoides* is ſingular for the appearance of its ſeeds, which reſemble little two-horned beetles, and are very well figured by Plukenet, Phyt. t. 52. f. 3. D. *lignoſus*. Linn. Sp. Pl. 1022. Sm. Spicil. t. 2. Curt. Mag. t. 380, is a pretty climber, bearing numerous heads of roſe-coloured flowers, thriving well with very moderate protection from our winters. It is found in many different climates, and the beans ſerve for food in India.

Of the upright kinds, D. *Soja*, Linn. Sp. Pl. 1023. Jacq. Ic. Rar. t. 145, a native of Japan and the Eaſt Indies, is famous for its ſeeds, a great article of food in China and Japan. They are made into a kind of jelly or curd, eſteemed very nutritious, and rendered palatable by adventitious ſeaſoning; or they are prepared with ſalt, ſo as to produce the liquid well known at our tables by the name of Soy. The flowers of this ſpecies are ſmall and unornamental.

The greater part of the *Dolichi* are annuals, ſeveral of them cultivated for their beans in the Eaſt as well as Weſt Indies, South America, &c., and few collections of ſeeds ſent from China are without ſeveral different ſpecies. They are puzzling to the botaniſt, troubleſome and unintereſting to the cultivator of exotics, and ſuperfluous to the kitchen-gardener. The roots of ſome of the perennial kinds are ſtrongly purgative, diuretic, and emmenagogue.

Dolichos, in the *Materia Medica*, *Cowhage*, or *Cowitch* The outſides of the pods of the dolichos are denſely covered with ſharp hairs which penetrate the ſkin when touched, and cauſe a moſt exceſſive and troubleſome itching.

Advantage has been taken of this irritating quality to expel worms from the human inteſtines, and it has been found to be an anthelmintic of very conſiderable efficacy. The natural mucus which lines the whole alimentary canal prevents any inconvenience which might ariſe from the irritation of the cowhage on the ſtomach or inteſtines, but that mucus is inſufficient to protect the worms from its irritating quality. The dolichos is merely mixed up with ſyrup or treacle into the form of an electuary, and the uſual doſe is a tea-ſpoonful to a young child, and more in proportion to an adult, given in the morning faſting for three ſucceſſive days, after which the inteſtines are cleared by a briſk purgative. This medicine may be given with great ſafety in all conſtitutions, as it produces no ſenſible diſturbance; and as a proof that its action is merely mechanical it may be added, that neither the tincture nor decoction of this plant has any perceptible effect whatever on the conſtitution.

In preparing the electuary care ſhould be taken not to get any of the hairs on the tender parts of the face, as the irritation they produce is very ſevere.

DOLICZA, in *Geography*, a town of Poland, in the palatinate of Podolia; 26 miles N. E. of Kaminiec.

DOLIMAN, a kind of long caſſock worn by the Turks, hanging down to the feet, with narrow ſleeves, buttoned at the wriſt.

The Turks, both men and women, wear drawers next the ſkin; over that a ſhift, or ſhirt; and over the ſhirt a doliman. In ſummer it is linen, or muſlin; in winter ſattin or ſtuff.

DOLIOCARPUS, in *Botany*, (from δολιος, *treacherous*, and καρπος, *a fruit*, becauſe the berries, though beautiful, are poiſonous,) Rolander in Stockholm Tranſ. for 1756. 261. Schreb. 348. Juſſ. 433. Mart. Mill. Dict. v. 2. (Calinea; Juſſ. 434. Aubl. Guian. v. 1. 556. t. 221) Claſs and order, *Polyandria Monogynia*. Nat. Ord. uncertain, Juſſ.

Gen. Ch. *Cal.* Perianth of five oblong, rounded, concave, unequal, coloured, permanent leaves. *Cor.* Petals three, roundiſh, concave, plaited. *Stam.* Filaments numerous, capillary, inſerted into the receptacle; anthers compreſſed. *Piſt.* Germen ſuperior, globoſe; ſtyle long, incurved; ſtigma compreſſed, flat, ſomewhat cloven. *Peric.* Berry globoſe, crowned with the ſtyle, of one cell. *Seeds* two, coated, oblong, rounded, flat on one ſide, convex on the other. *Schreber.*

Eſſ. Ch. Calyx of five leaves. Petals three, plaited. Berry ſuperior, with two coated ſeeds.

Obſ. Lamarck, t. 463, unites with this genus the *Soramia* of Aublet, t. 219, to which Schreber was inclined, but in his appendix 832 changes his opinion. The latter has five petals and a ſolitary ſeed, but ſeems otherwiſe to agree with *Calinea*.

The ſpecies of *Doliocarpus*, as far as we have any account of them, are,

1. D. *Rolandri*. Gmel. Syſt. Nat. v. 2. 805. Mart. Mill. Dict. v. 2. "Stem upright. Leaves ovato-lanceolate, toothed. Flowers terminal." A ſtiff erect ſhrub with pendulous *leaves*, found in Surinam. 2. D. *major*. ibid. "Stem climbing. Leaves ovate, toothed. Flowers ſolitary on lateral ſimple ſtalks." From the ſame country. The *ſtem* is ſlender and zig-zag, with ſpreading *branches* and *leaves*. *Flowers* unpleaſantly aromatic. *Berries* poiſonous. 3. D. *Calinea*. ibid. (Calinea ſcandens; Aubl. Guian. t. 221.) "Stem climbing. Leaves ovate, entire. Flowers in axil-

lary bundles." Native of Guiana. *Stem* twining. *Flowers* small, white, produced in April. Aublet did not see the ripe fruit.

DOLIONES, in *Ancient Geography*, a people of Asia Minor, in Mysia, placed by Pliny near the town of Cyzicus, and inhabiting the territory called Doliona, extending from the river Æsepus as far as Rhyndacus and the country of the Dascyliani.

DOLIUM, in *Natural History*, the name of a genus of shells called by some conchæ globosæ, and by the French, tonnes, and referred to the genus *buccinum*. The characters are these: it is an univalve shell, with a globose, or round belly, with a lax aperture, sometimes smooth, and sometimes dentated. The clavicle is either moderately umbonated or depressed; and the columella is in some species smooth, in others wrinkled. Some authors have called those conchæ ampullaceæ; and they have had, at times, many other names, but all tending to the same sense, and expressing the globular figure of the body, which is the great character by which these are distinguished from all other shells. See CONCHOLOGY.

The Persian shell, so much esteemed in cabinets, is a very singular one; but the globose figure of its body evidently refers it to this genus, though it differ in many other particulars from all the species of it. Aldrovandus could not tell what to make of the shells of this genus, but has thrown them together at the end of his book: observing, that they seemed to be of the turbinated kind, but that they want the turbo.

DOLLAR, or DALLER, a silver coin, nearly of the value of the Spanish piece of eight, or French crown.

Dollars are coined in divers parts of Germany and Holland; and have their diminutions, as semi-dollars, quarter-dollars, &c.

They are not all of the same fineness, nor weight. The Dutch dollars are the most frequent. The Danish dollar, called Slesswick and Holstein specie dollar, is a silver coin, with much alloy, which passes for about 4*s.* 6*d.* sterling. This coin has a general circulation all over Slesswick and Holstein, even including Hamburgh itself; and is divided into halves, quarters, &c. In the Levant they are called astaini, from the impression of a lion thereon. See COIN and MONEY.

DOLLART, in *Geography*, is a large bay between the departments of Groningen and East Friesland, in the kingdom of Holland, formed by a considerable tract of land which was flooded over by the North sea, in 1277, when 33 villages were swallowed up by the water. However, it gradually recedes from the East Friesland side: the Dollart grows less every day, and the land which is gained is uncommonly fertile.

DOLLENDORF, a town of Germany, in Westphalia, and county of Blankenheim; three miles S. E. of Blankenheim.

DOLLEREN, a river of France, in the department of the Upper Rhine, which runs into the Ilc, about two miles N. of Mulhausen.

DOLL's POINT, a cape on the S. coast of the island of Jamaica, betwen West harbour and Peake bay.

DOLLINGEN, or DOELLINGEN, a small town of Saxony, in the Electoral circle, which has some vineyards. Pitch is made in its neighbourhood. It is situated near a lake in a large forest.

DOLLOND, JOHN, in *Biography*, an eminent optician, who deserves to be recorded on account of his valuable improvement in refracting telescopes, was born in Spitalfields, London, June 10, 1706. His parents, who were French protestants, and who resided in Normandy, were obliged to quit their country in consequence of the revocation of the edict of Nantes, in the year 1685, and to seek refuge in England, in order to avoid persecution, and to preserve their religion. Mr. Dollond, in the earlier period of his life, was employed at the loom; but the turn of his mind being always studious and philosophical, he devoted his leisure hours to mathematical pursuits. Having the misfortune to lose his father when he was very young, he was under a necessity of applying to business; but the bent of his mind was even then apparent; so that at the age of 15, before he had an opportunity of perusing elementary treatises of science, he amused himself by constructing sun-dials, drawing geometrical figures, and solving problems. His favourite studies were somewhat obstructed by an early marriage and an increasing family; but though business demanded much of his attention, he found time, by abridging his hours of rest, to extend his mathematical knowledge; and he made, under the disadvantages of his situation, a considerable proficiency in optics and astronomy, for which he was previously prepared by the knowledge of algebra and geometry, which he had acquired in the earlier period of his life. Such were the powers and the activity of Mr. Dollond's mind, that, without intermitting his philosophical pursuits, or relaxing from the labours of his profession, he directed his attention to the study of anatomy, and even of theology; and acquired such a knowledge of the Latin and Greek languages, as soon enabled him to translate the Greek testament into Latin. It should at the same time be mentioned to his honour, that he retained and cherished just sentiments of the wisdom and goodness of the Creator, not only as they are exhibited in the mechanism of the human frame, but as they are manifested in the revelation of his word. His religious principles seem to have been rational and liberal, and under a conviction of the importance and utility of social worship, he regularly attended, with his family, on the public service of the French protestant church, and occasionally joined in the worship of the protestant dissenters, admiring as preachers, and esteeming as men, the nonconformist ministers, Benson and Lardner, well known to the world by their valuable writings. "In his appearance Mr. Dollond was grave, and the strong lines of his face were marked with deep thought and reflection; but in his intercourse with his family and friends, he was cheerful and affectionate, and his language and sentiments are distinctly recollected as always making a strong impression on the minds of those with whom he conversed. His memory was extraordinarily retentive; and, amidst the variety of his reading, he could recollect and quote the most important passages of every book which he had at any time perused." For some time Mr. Dollond, and his eldest son, Mr. Peter Dollond, carried on their manufactures together in Spitalfields, but this employment did not suit either the expectations or the disposition of the son, who, by means of the instruction of his father had acquired very considerable acquaintance with mathematical and philosophical subjects, and who was well apprised of the high estimation in which his father's knowledge in optics was held by professional men. He therefore determined to apply that knowledge to the benefit of himself and family; and, accordingly, under the directions of his father, commenced optician. Success attended his efforts; and in the year 1752 Mr. John Dollond joined his son in this business. He began with improving the combination of the eye-glasses of refracting telescopes; and at length produced some of these furnished with five eye-glasses. (See Phil. Trans. vol. 48, p. 108.) Soon after he made a very useful improvement in

in Mr. Savery's micrometer. (See Phil. Tranſ. vol. 48, p. 178.) In conſequence of theſe communications, and Mr. Dollond's known ſcientific attainments, he enjoyed the friendſhip and protection of the moſt eminent mathematicians and philoſophers of that period Thus countenanced and encouraged, he proſecuted his enquiries into a ſubject which at that time not only intereſted this country but all Europe. To thoſe who are acquainted with Mr. Dollond's ſubſequent diſcoveries it is needleſs to add, that this ſubject was the improvement of the refracting teleſcope. In this purſuit he was perſevering and indefatigable; and after a courſe of well-conducted experiments, continued from the year 1757 to June 1758, he diſcovered "the difference in the diſperſion of the colours of light, when the mean rays are equally refracted by different mediums;" and from this principle he inferred, that the object-glaſſes of refracting teleſcopes were capable of being made without the images formed by them being affected by the different refrangibility of the rays of light. (See Phil. Tranſ. vol. 50, p. 753.) In honour of this diſcovery he was preſented by the Royal Society with ſir Godfrey Copley's medal. Having eſtabliſhed a new principle in optics, he was ſoon able to conſtruct object-glaſſes, in which the different refrangibility of the rays of light was corrected, and the name of "Achromatic" was given to them (not by M. de la Lande, as we have ſtated from Dr. Hutton, under that article,) but by the late Dr. Bevis, on account of their being free from the priſmatic colours. Mr. Peter Dollond, in a paper communicated to the Royal Society, ſtated and vindicated, in the moſt unexceptionable and convincing manner, his father's right to the firſt diſcovery of this improvement in refracting te eſcopes, as well as of the principle on which it was founded. In ſo doing he has corrected the miſtakes of M. de la Lande in his account of this ſubject; thoſe of M. N. Fuſs, profeſſor of mathematics at St. Peterſburg, in his "Eulogy on Euler," written and publiſhed in 1783; and thoſe of count Caſſini, in his "Extracts of the Obſervations made at the Royal Obſervatory at Paris, in the year 1787." It muſt appear to every impartial and candid examiner, that Mr Dollond was the ſole diſcoverer of the principle which led to the improvement of refracting teleſcopes. The improvement was of ſuch importance, that it reflects great honour on the inveſtigations of Mr. Dollond; as it was of the greateſt advantage to aſtronomy, in the application of his refracting teleſcopes to fixed inſtruments, and to navigation in their connection with Hadley's quadrant. In the year 1761, Mr. Dollond was elected fellow of the Royal Society; and he was alſo appointed optician to his majeſty; but he did not long live to enjoy theſe honours. On the 30th of November, in the ſame year, as he was reading a new publication of M. Clairaut, on the theory of the moon, and on which he had been intently engaged for ſeveral hours, he was ſeized with apoplexy, which immediately deprived him of ſpeech, and occaſioned his death a few hours afterwards. Mr. Dollond left two ſons and three daughters. The ſons carried on the buſineſs of opticians in St. Paul's church yard, after their father's death; and one of them, *viz.* Mr. John Dollond, being ſince dead, the ſurvivor, Mr. Peter Dollond, already mentioned, who is well known as a philoſopher and artiſt, and much reſpected, continues it in partnerſhip with his nephew, Mr. George Huggins, who has taken the name of Dollond. Kelly's Life of John Dollond, F. R. S. &c. ed. 3. 1808. For a particular account of Mr. Dollond's diſcoveries, ſee Aberration, Dioptric *Teleſcope*, Micrometer, Quadrant, and Teleſcope.

DOLLSTADT, a river of Pruſſia, in the province of Oberland; ſix miles N.W. of Preuſchmark.

DOLMAR, a mountain of Germany, in the circle of Franconia, and county of Henneberg; five miles ſouth of Schmalkalden.

DOLMATOF, a town and diſtrict of Ruſſia, in the government of Perm, and province of Catharinenburg, or Echaterinenburg, ſeated on the left ſhore of the Iſſet; 80 miles S E of Echaterinenburg.

DOLMAYRAC, a town of France, in the department of the Lot and Garonne; three leagues north of Agen.

DOLNSTEIN, a town of Germany, in the circle of Franconia, and biſhopric of Aichſtat, on the Altmuhl; ſix miles weſt of Aichſtat.

DOLOMITE, in *Mineralogy*, chaux carbonatée aluminifere. Haüy.

Its colour is white, with a ſlight tinge of grey or yellow. It occurs in maſs or foliated; its luſtre is glimmering, between pearly and vitreous; its texture is fine-granular; its fracture is compact uneven, paſſing into imperfectly lamellar. It breaks into irregular blunt-edged fragments. It is tranſlucent on the edges; may be ſcratched by fluor ſpar, and is often more or leſs friable between the fingers. Sp. gr. 2.8. It is for the moſt part phoſphoreſcent in the dark, by percuſſion.

It is ſoluble in nitric acid, but ſlowly, and with little effervescence. Its component parts, according to Vauquelin, (Journal des Mines. xvi. 77.) are,

Carbonated lime	-	52
Carbonated magneſia	-	46.5
Oxyd of iron -	-	0.5
Ditto manganeſe	-	0.25
		99.25

It is found in various parts of the Alps, in beds alternating with micaceous ſchiſtus; and containing tremolite, orpiment, and cupreous pyrites.

The firſt analyſis of this ſubſtance was made by Theod. Sauſſure, according to which, it conſiſted of about 88 *per cent.* of lime, with an exceſs of carbonic acid, between five and ſix *per cent.* of alumine, and the reſt magneſia and oxyd of iron. This, however, has been ſhewn by Vauquelin to be wholly erroneous, and the dolomite appears to bear the ſame relation to bitterſpath and magneſian limeſtone, as granular limeſtone does to calcareous ſpar and common limeſtone.

DOLONCÆ, or Dolonci, in *Ancient Geography*, a people of Thrace, according to Herodotus, Steph. Byz., and Solinus; the latter of whom ſays that they inhabited the vicinity of the river Hebrus. They had been once maſters of the Cherſoneſus.

DOLONOSKOI, in *Geography*, a fortreſs of Ruſſian Siberia, in the government of Kolyvan, ſeated on the Irkutſk, 16 miles weſt of Semipolatnoi.

DOLOPES, in *Ancient Geography*, a people who inhabited part of Theſſaly and part of Epirus, between the mountains that bore the name of Pindus. Thucydides ſays, that the Achelous, which ſprang in this mountain, traverſed their country. They are ſuppoſed to have formed one of the twelve nations, or diſtricts, which ſent deputies to the council of the Amphictyons. Theſe people poſſeſſed the iſle of Scyros; and they are ſaid to have been a body of Corſairs who infeſted the Ægean ſea, and pillaged the merchants that viſited their ports. When Cimon took poſſeſſion of the iſland, he expelled them from it. Their country in Theſſaly was called *Dolopia*.

DOLPHIN, Delphinus, in *Aſtronomy*. See Delphinus.

Dolphin, in *Ichthyology*. See Delphinus.

This

This fish was consecrated by the ancients to the gods, and called the sacred fish. Scarce an accident could happen at sea, but the dolphin offered himself to convey to shore the unfortunate. The story of Arion, the musician, is related by Ovid, Fasti, lib. ii. ver. 113.

Dolphin *Fly*, in *Agriculture*, a name frequently applied to an insect which is often very destructive to bean and other crops.

Dolphin, *Black*. See Black *Dolphin*.

Dolphin's *Island*, in *Geography*, an island in the straits of Magelian. S. lat. 53° 59′. W. long. 71° 41′.

Dolphins *of a Cannon*, in *Gunnery*, are the two handles placed on the second reinforce rings of brass guns, resembling the fish of that name. They serve for mounting and dismounting the guns. See Cannon.

Dolphin *of the Mast*, in *Sea Language*, is a peculiar kind of wreath, formed of a piece of worn hawser-laid rope, nearly as long as the circumference of the mast, which has an eye spliced in each end, and is pointed over the whole length. It is lashed occasionally round the mast, through the eyes, as a support to the puddening, whose use is to sustain the weight of the fore and main-yards, in case the rigging or chains, by which those yards are suspended, should be shot away in the time of battle.

DOLUS, in *Geography*, a small town of France, in the department of the Lower Charente, in the island of Oleron.

DOM, or Don, a title of honour originally Spanish, though used occasionally in other countries. (See Title.) It is equivalent to master, sir; or lord, monsieur, sieur, mynheer, &c.

Gollut, in his Mem. des Bourg. liv. v. chap. 11, assures us, that the first on whom the Spaniards conferred the title, was dom Pelayo; when, upon their being routed and driven out by the Saracens, at the beginning of the eighth century, they rallied again on the Pyreneans, and made him king.

In Portugal, nobody is allowed to assume the title of dom, which is a badge or token of nobility, without the king's leave.

Dom is likewise used in France among some orders of religious, the Chartreux, Benedictines, &c.

We say, the reverend father dom Calmet, dom Alexis, dom Balthasar, &c.

In the plural they write doms, with an *s*, in speaking of several. RR. PP. doms Claude du Ruble, and Jacques Douceur.

The word is formed from the Latin domnus or dominus; of which it is an abbreviature. Domnus is found in diverse Latin authors of the barbarous age. Onuphrius assures us, it was a title first given to the pope alone; then to the bishops, abbots, and others, who held any ecclesiastical dignity, or were eminent for virtue and religion. At length it was usurped by the mere monks.

Some say, the religious declined the title dominus out of humility, as belonging to God alone; and assumed that of domnus, as expressing inferiority, *quasi minor dominus*. Indeed, the appellation domnus for dominus appears very ancient, if we consider the surname of Julia, wife of the emperor Septimus Severus, who is called on medals IVLIA DOMNA, for JULIA DOMINA.

Dom and *Som*, words used in ancient charters, signifying a power of judging, and security of possessing. Hence dome's men, who were persons appointed to determine suits and controversies between parties. See Day's *Man*.

Dom-*Book*. See Domes-*Day*.

DOMA, in *Ancient Geography*, an island of Asia, in the Indian sea, towards the mouth of the river Indus, according to Arrian.

DOMAIN, the inheritance, estate, or possession of any one. See Demesne.

Menage derives the word from domanium, written in the barbarous Latin for dominium.

DOMAINE, in *Geography*. See Domene.

DOMAIZE, a small town of France, in the department of the Puy-de-Dôme; 21 miles S.E. of Clermont.

DOMART, a small town of France, in the department of the Somme, chief place of a canton in the district of Doullens, with a population of 1030 individuals. The canton has 22 communes and 11,748 inhabitants, on a territorial extent of 182½ kiliometres.

DOMAT, John, in *Biography*, an eminent French lawyer, was born at Clermont, in 1625, where he received the elements of learning, and was then sent to the college of Clermont, in Paris: here he distinguished himself by the rapid progress which he made in various departments of literature. He fixed on the law as his future profession, and practised at the bar with reputation and success. He was the intimate friend of the celebrated Pascal, attended him in his last hours, and was entrusted with his most important papers. About his thirtieth year he obtained the office of king's advocate to the court of Clermont, which he held for nearly thirty years. In the duties connected with this situation he was distinguished for justice and integrity, zealous for the interests and comforts of the poor, and attentive to the concerns of the hospitals. Perceiving the confusion which prevailed in the laws, he applied himself to the development of their principles, and published a treatise, entitled "Les Loix Civiles dans leur ordre naturel;" this appeared in three volumes 4to. which is highly esteemed as a truly admirable and scientific work. Domat died at Paris in 1696. An improved edition of his book was published in 1777, by M. de Jouy. Moreri.

DOMAZLIZE, Domazliza, or *Taus*, *Tusla*, in *Geography*, a small town of Bohemia, in the circle of Pilsen, or Plzensko, near the river or torrent of Cadburze; 27 miles S.W. of Pilsen.

DOMBACA, a small island, near the coast of Ava, in the bay of Bengal. N. lat. 17° 32′. E. long. 94° 35′.

DOMBES, Pagus Dombensis, formerly a province of France, which is now a part of the department of the Ain. Trevoux was its capital. Louis XV. had purchased it of the count d'Eu in 1762.

DOMBEY, Joseph, in *Biography*, a French botanist and traveller of much celebrity, was born at Macon, Feb. 22, 1742. He was brought up to the study of medicine, and took the degree of doctor of physic in the university of Montpellier. He there imbibed, under the celebrated professor Gouan, a taste for natural history, more especially for botany. To this taste he sacrificed his profession, and all prospect of emolument from that source. Content with a small patrimony, he resigned himself to the charms of nature in the fine country where he was stationed. The south of France, with its varied and extensive coasts, its fertile plains, and its wild and lofty mountains, was his first theatre of observation. When the season of the year obliged him to retire to his college, he returned to no studies but such as favoured and improved his darling propensity. Whatever time was not devoted to that, was given to the pleasures and dissipation incident to his time of life, his gay and agreeable character, and the society with which he was surrounded. To this dissipation he, perhaps, sacrificed more than prudence could justify, and it was fortunate for his moral character and worldly interest, probably also for his scientific success, that he

he removed to Paris in 1772, to improve his botanical knowledge, under the tuition of the celebrated Bernard de Juſſieu and Le Monnier, and to cultivate the friendſhip of ſuch men as Thouin and Rouſſeau. In 1775, he travelled to Berne to viſit Haller, whoſe buſy and important life was drawing towards a cloſe. While rambling over the Alps in his return, he received a letter from his friend, Thouin, in Auguſt 1775, informing him that M. Turgot had, on the recommendation of Juſſieu, choſen him to go to Peru, in ſearch of plants that might, with advantage, be naturalized in Europe. He returned inſtantly to Paris; was preſented to the miniſter, and received his appointment, with a ſalary of 3000 livres. Part of this was obliged to be mortgaged to pay debts incurred by his youthful prodigality, and he was detained till the Spaniſh court had given its conſent to the undertaking, which could not be procured till the cloſe of the following year, 1776. To the honour of Dombey, it muſt not be forgotten, that he devoted the intermediate period to the moſt ſteady application, in order to qualify himſelf for his great and delightful undertaking. Indeed, if pleaſure, or diſſipation, could have drawn him aſide from ſuch views, he would little have deſerved his appointment, or his ſubſequent fame.

On arriving at Madrid in November 1776, his ardour met with ſeveral ungrateful checks in the ſolemn gravity and miſplaced jealouſy of the Spaniſh court, who encumbered him with futile inſtructions, and with four companions, each of whom had a ſalary of 10,000 livres. Theſe companions proved, in the firſt inſtance, of little uſe, for though two of them were botanical draughtſmen, and profeſſedly deſtined to his ſervice, Dombey was never allowed even a copy of the drawings they made under his directions. On the other hand, he was obliged to expend his own ſalary in buying paper and inſtruments requiſite for his undertaking. That ſalary had, indeed, been doubled, but it was ſtill, even with the economy he now practiſed, inadequate. His courage, however, failed him not. A new world was before him, and nothing chagrined him except what delayed his voyage. That voyage was happily accompliſhed in ſix months, and he arrived at Lima, April 8, 1778, where he obtained a favourable reception from the vice-roy of Peru, Don Emanuel de Guirrior, and from M. de Bordenave, one of the canons of Lima, an old acquaintance of his friend Juſſieu.

His firſt botanical expedition towards Quito was not without danger, from hordes of run-away negroes, but it afforded him an abundant harveſt of ſpecimens of plants, as well as of antiquities from the ſepulchres of the ancient Peruvians. Theſe, with 38 pounds of platina, and a collection of ſeeds, he ſent immediately to Europe. The ſeeds were partly picked up, in the dry ſeaſon, from the arid ſands around Lima, where they lay, blown about by the wind, or ſtored up by ants, awaiting the autumnal fogs neceſſary to their germination; for it never rains at Lima. He accompanied his collections with two manuſcript treatiſes of his own, one on a diſeaſe, which he attributed to the immoderate uſe in that country of the fruits of *Capſicum annuum*, *Phyſalis pubeſcens*, and *Solanum Lycoperſicum*; and the other on a new but uſeleſs ſpecies of *Laurus*, which ignorant obſervers had reported to the Spaniſh government as being the true cinnamon; a miſtake which Dombey found himſelf obliged to rectify. He was employed by the vice-roy to analyſe ſome mineral waters in that neighbourhood. He afterwards ſettled for a time in the mountainous province of Tarma, beyond the Cordilleras, and in May 1780, viſited Huanuco, the extremity of the Spaniſh ſettlements in that direction. In the vaſt and almoſt impervious foreſts beyond, he aſcertained the fact which had been reported of the *Cinchona*, or Peruvian bark, being abundant there, though previouſly ſuppoſed to grow at Loxa only. He determined alſo that there were ſeveral ſpecies of this valuable drug, all more or leſs uſeful in medicine. With theſe the botanists of Europe are now tolerably well acquainted. See CINCHONA

To inveſtigate the botanical riches of theſe forests, ſwarming with inſects, and filled with ſtagnant peſtiferous vapours, proved a labour of no leſs danger than difficulty. As the trees there are moſtly diœcious, it was found neceſſary to fell two of them, in order to obtain perfect ſpecimens of each ſingle ſpecies. Nor are the lofty climbers, which bind theſe ancient woods into one entangled maſs, an inconſiderable impediment to the progreſs of the botanical traveller, their flowers being no leſs inacceſſible than thoſe of the trees which ſupport them. But theſe ſavage regions ſoon became more formidable to our travellers, in conſequence of their more ſavage human inhabitants, 200 of whom were advancing by night to plunder them, had they not eſcaped by a precipitate and perilous retreat to Huanuco. From thence Dombey returned alone to Lima, where various difficulties, attended by various reſources, awaited him. The celebrated Necker, then in power, had increaſed his pecuniary income, but it was ſtill not adequate to his wants. He had, moreover, to encounter the ſcorn of the rich and ignorant, who deſpiſed his knowledge, and the perſecution of the bigotted prieſthood, who, by a natural inſtinct, dreaded it. Though correct and wary in his moral and religious deportment, his being a Frenchman was enough to excite their ſuſpicions, and nothing but the public protection of his king ſecured him from the fangs of the inquiſitors. Here, however, his medical knowledge proved of the greateſt uſe. It augmented his income, and gained the reſpect and favour of all ranks, for even monks themſelves did not diſdain to be cured of their diſeaſes by a French philoſopher, who was found more ſkilful than their more orthodox countrymen. Thus, ſelf-intereſt ſecured what ſenſe and juſtice could not obtain; and the ſituation of our adventurer was ſtill further improved by the favour which his agreeable perſon and manners found with the fair ſex, to whoſe aſſemblies the young and lively Frenchman was no unwelcome gueſt. Even in the ſociety of Lima, Dombey met with ſome enlightened and diſintereſted characters, who could appreciate his merit, and who rendered him, from time to time, the moſt eſſential ſervices.

Having ſent off his ſecond collection to Europe, Dombey returned to Huanuco in the end of December 1780, though to the other difficulties of his ſituation the deſolating plague of a civil war was then ſuperadded. But this apparent misfortune turned out to his advantage. He roufed the latent patriotiſm of the Spaniards by offers, not only of money, but even of his perſonal ſervices, to repel the inſurgents. Though his pecuniary aſſiſtance was very properly declined, his zeal was publicly applauded by all orders of people, and accompanied by authentic documents of their gratitude. When the inſurrection was quelled, Dombey preſented to the public hoſpital the ſum he had offered towards the defence of the ſtate.

He had, ſhortly after, the mortification of hearing that his firſt collection had been taken by the Engliſh, and redeemed at Liſbon by the Spaniſh government. Conſequently, that a very valuable part of it, the ancient Peruvian veſes and a compleat dreſs of one of the Incas, which he had deſtined for his own ſovereign, had been preſented to the Spaniſh monarch by Profeſſor Ortega, duplicates of the dried plants and ſeeds only having been forwarded to Paris. To this, as legally juſt, he could not but ſubmit; but when complaints were tranſmitted to him, "that the

herbarium which he had made for the French king was ſuperior to that deſtined for the king of Spain," he ventured to repreſent in his turn the injuſtice of not ſending to France at leaſt the duplicates of his drawings, and the vice-roy of Lima ſo far acceded to the propriety of his repreſentation, as to write accordingly to Europe; with what ſucceſs we know not.

Dombey in the mean while, leaving his more recent acquiſitions in ſafety at Lima, undertook a journey to Chili. This had always been a principal object of his miſſion, on account of the nearer reſemblance of its climate to that of France, which rendered its vegetable productions more likely to be uſeful there. His journey was neceſſarily attended with vaſt expence, but his character was now ſo well known that he readily met with aſſiſtance. He arrived at La Conception in the beginning of 1782, where his adventurous deſtiny had prepared for him far other cares and purſuits than thoſe of botany. The town was afflicted with a peſtilential fever, and he was cautioned to avoid certain infected houſes where it raged. Inſtead of following this advice, he devoted himſelf to the exerciſe of his medical ſkill, aſſiſting the poor with the moſt valuable charity of his advice as well as with food and with medicine, and avoiding ſuch houſes only as were not infected. His example reſtored the public courage, and the grateful people wiſhed to retain him, with a handſome ſtipend, as their phyſician. Nor were even more tempting attractions wanting to fix him here for life. He was no longer pointed at as an heretical ſcarecrow, for even the biſhop of La Conception endeavoured to promote his union with a young lady of great beauty and riches, on whom his merit had made impreſſions as honourable to herſelf as to him. From motives of miſplaced patriotiſm he tore himſelf away, to purſue the primary object of his life, an object which wou'd have been beſt fulfilled by his permanent reſidence in Chili, from whence he might at leiſure have communicated the ſubſequent fruits of his enquiries. But the lot of Dombey was caſt in labour and ſorrow, and his greateſt mortifications were ſtill to come. Having added greatly to his collection of drawings, ſhells and minerals, as well as of plants, while in Chili, and having diſcovered a new and moſt valuable mine of quickſilver, and another of gold, for the worthleſs and ungrateful government whoſe fooliſh jealouſies rendered almoſt all his own acquiſitions finally abortive; he reviſited Lima to take his paſſage for Europe. A journey of 100 leagues among the Cordilleras, made at his own expence, had much impaired his finances and his health, but he refuſed the repayment which the country, in this inſtance not unjuſt, offered him, ſaying that "though he was devoted to the ſervice of Spain, it was for his own ſovereign, who had ſent him, to pay his expences." In Chili he diſcovered the majeſtic tree, of the tribe of Pines, 150 feet high, now named after him *Dombeya*, of which the Norfolk-iſland pine is another ſpecies. (See DOMBEYA.) While he ſtill remained at Lima, the labours of arranging and packing his collections of natural hiſtory, added to the fatigues he had already undergone, and the petty jealouſies and contrarieties he experienced from ſome of the Spaniards in power, preyed upon his health and ſpirits; and under the idea that he might poſſibly never reach Europe, he wrote to his friend Thouin to take the neceſſary precautions for the ſafety of his treaſures on their arrival in a Spaniſh port. He ſurvived however to undergo far greater diſtreſſes than he had yet known. After narrowly eſcaping ſhipwreck at Cape Horn, and being obliged to wait at the Braſils till his ſhip could be refitted, which laſt circumſtance indeed was favourable to his ſcientific purſuits and acquiſitions, he reached Cadiz on the 22d February 1785, with all the feelings of tranſport which an approach to his native country, a generous ardour to communicate his knowledge and to relate his adventures, and a deſire to reviſit the friends of his earlier years, could excite in a mind like his. But inſtead of the reception he expected and deſerved from the nation he had chiefly benefitted, every Spaniard, from the ſubalterns of the cuſtom houſe to the miniſters of ſtate, ſeemed leagued to mortify him, and to render his labour, even for their own ſervice, of no effect. He was not only tormented with the moſt pettifogging and diſhoneſt behaviour concerning the property of his collections, but thoſe collections were expoſed, without diſcrimination or precaution, to the rude and uſeleſs ſcrutiny of the barbarians at the cuſtom-houſe, ſo as to be rendered uſeleſs, in a great meaſure, even to thoſe who meant to plunder them. The whole were thrown afterwards into damp warehouſes, where their true owner was forbidden to enter. Here they lay for the plants to rot, and the ineſtimable collections of ſeeds to loſe their powers of vegetation, till certain forms of the grave and ſapient moſt catholic court were gone through, which forms, as it afterwards appeared, tended chiefly to the rendering their plunder uſeleſs to others, rather than valuable to their own nation. In the firſt place, as much of theſe treaſures had ſuffered by this ill-treatment, Dombey was required to repair the injury from his own allotment, or from that of his maſter, the king of France. With this he could not of himſelf comply; but an order was, for ſome political reaſon, procured from the French court, and he was obliged to ſubmit. He cou'd never, however, obtain that the ſeeds ſhould be committed to the earth ſo as to be of uſe, and hence the gardens of Europe have been enriched with ſcarcely half a ſcore of his botanical diſcoveries, among which are the magnificent *Datura arborea*, the beautiful *Salvia formoſa*, and the fragrant *Verbena triphylla*, or, as it ought to have been called, *citrea*. This laſt will be a "*monumentum ære perennius*" with thoſe who ſhall ever know his hiſtory. What had been given him for his own uſe by the vice-roy of the Braſils, underwent the ſame treatment as the reſt. Finally he was required to fix a price upon the ſad remains of his collections, which, as a great part was French national property, it was obvious he could not do. He remained at Cadiz without money and without friends. His only hope was that he might hereafter publiſh his diſcoveries, ſo as to ſecure ſome benefit to the world and ſome honour to himſelf. But this laſt conſolation was denied him. Anxious to reviſit his native land, he would have compounded for his liberty with the loſs of all but his manuſcripts; but the tyrants, in whoſe hands he lay, would not let him depart till they had copied all thoſe manuſcripts, and bound him by a written promiſe never to publiſh any thing till the return of his travelling companions. In the mean while thoſe very companions were detained by authority in Peru; and in after times the original botanical deſcriptions of Dombey have, many of them, appeared verbatim, without acknowledgment, in the pompous *Flora* of Peru and Chili, which thence derives a great part of its value. Thus chagrined and oppreſſed, the unhappy Dombey ſunk into deſpair, till, no longer uſeful or formidable to his oppreſſors, he was allowed to return, with ſuch parts of his collections as they condeſcended to leave him, to Paris.

There the writer of the preſent article knew him in 1786. He was no longer the handſome lively votary of pleaſure, nor even the ardent enthuſiaſtic cultivator of ſcience. The leaden hand of tyranny had impreſſed its own ſtamp on his countenance, and he had the ſallow, ſilent, melancholy aſpect of a depreſſed and diſappointed Spaniard. He chiefly aſſociated with his faithful friends, Le Monnier and Thouin, and

and in their ſociety botanical converſe ſtill retained its charms. To the contents of his own collection, which, however injured and diminiſhed, was ſtill a very intereſting one, he paid little attention. Bound by his promiſe, his high ſenſe of honour would not let him make the proper uſe of it, but at length he was induced to part with it to M. de Buffon, who nobly exerted himſelf ſo as to procure from government a penſion of 6000 livres for Dombey, and 60,000 livres to pay his debts. The herbarium was confided to M. L'heritier, with orders to publiſh its contents. This was no ſooner known at Madrid, than intereſt was made by that court to defeat the meaſure, and the court of Verſailles was not in a condition to diſpute, even ſo unjuſt, and politically unimportant a requiſition, from that quarter. Buffon had orders to withdraw the herbarium, but L'heritier on the firſt alarm had taken it over to London, and the writer of this narrative, with his lamented friend, Brouſſonet, and his draughtſman Redouté, were alone entruſted with the ſecret. Happy and ſafe in a land of liberty and ſcience, L'heritier remained about 15 months devoted to the proſecution of his object, chiefly under the hoſpitable roof of his friend, ſir Joſeph Banks. But the diſtreſſed ſtate of his country obliged him to return, and his own dreadful and myſterious murder cloſed the ſcene.

The unfortunate Dombey had long been at reſt, but not without freſh previous toils, and aggravated ſufferings. He had determined to retire to a peaceful retreat at the foot of Mount Jura, where he had a friend devoted to the love and cultivation of plants. His pecuniary circumſtances were now eaſy, and he reſigned his fatal celebrity without regret. He broke off all ſcientific communication, except with M. Pavon, one of his fellow labourers in Peru, and who had all along been innocent of the execrable machinations againſt his honour and his peace. He refuſed a place in the French Academie des Sciences, as well as a large pecuniary offer from the empreſs of Ruſſia for the duplicates of his collection, ſaying, "he was not in want of money, and he had moſt pleaſure in diſtributing his ſpecimens amongſt his friends." Even one of the Spaniſh miniſtry, relenting when too late, offered him a large ſum of money by way of indemnification, which Dombey with due ſpirit abſolutely refuſed. Reſiding at Lyons for ſome time in his way towards Switzerland, he had the miſfortune to be preſent during the ſiege of that town. That energy of mind which neither vanity nor riches could recall into action, revived at the ſight of diſtreſs and danger, and thoſe who were ready to periſh found the wonted aſſiſtance of Dombey, who ſupplied their neceſſities, and healed their diſeaſes. But he ſickened at the ſight of public miſeries on every ſide, which he could not alleviate, and he procured a commiſſion to viſit North America, in order to purchaſe corn from the United States, and to fulfil ſome other objects of public importance, eſpecially relating to ſcience and commerce. A tempeſt obliged him to take ſhelter at Guadaloupe, and that ill-fated iſland was then in as diſtracted a ſtate as its mother-country. Having been ſent out by the French republic, he was conſequently odious to the royaliſt governor, and on being ſummoned into his preſence, he rather preferred making his eſcape on board a veſſel freighted by ſome republican deputies for Philadelphia. But before he could embark he was ſeized and thrown into priſon. This violence excited a public commotion in his favour, and the governor thought proper to releaſe him. In labouring to appeaſe the tumultuous mob, which threatened vengeance on his enemies, he was thrown accidentally into the river, and the conſequences were nearly fatal to his life. When recovered he waited on the governor, and though found innocent, was ordered to quit the colony in the American veſſel in which he came. That veſſel was no ſooner out of the harbour, than it was attacked by two privateers, and taken. Dombey, diſguiſed as a Spaniſh ſailor, was thrown into a priſon in the iſland of Montſerrat, where ill-treatment, mortification, and diſeaſe, put a period to his life on the 19th of February 1796. It muſt ever be the regret and the ſhame of an Engliſhman that a man like Dombey periſhed in a priſon where Engliſh laws were known. It has juſtly been the pride of civilized ſociety in our days that ſcience, being excluſively of no nation, has ſuſpended even the horrors of war in favour of its cultivators, but the horrors of war are much more commonly found to brutalize all nations in common. There muſt ſurely have been ſome perſons at Montſerrat who could read and write; ſome who, though ſlave-dealers, profeſſed Chriſtianity, but it was all in this caſe, as in many others, to very little purpoſe; for a man, the pride of his ſpecies, who went about doing good, and whoſe whole life was devoted to the ſervice of uſeful ſcience, periſhed unheeded among them! See Deleuze's Notice in Annales du Muſeum d'Hiſtoire naturelle, v. 4. 136, literally tranſlated in Sim's and Konig's Annals of Botany, v. 2. 474. Alſo Annual Regiſter for 1796, Chronicle, 57. S.

DOMBEYA, in *Botany*, (named by Lamarck in honour of his meritorious and unfortunate countryman whoſe hiſtory is given in the preceding article. L'heritier alſo gave the ſame name to a plant diſcovered by Dombey, but which its diſcoverer had already publiſhed under the appellation of *Tourretia*. Cavanilles, who is followed by Willdenow, eſtabliſhed a *Dombeya*, which ſeems not generally diſtinct from the old Linnæan *Pentapetes*. We therefore, as Schreber and Mr. Lambert have done, follow Lamarck as the original and beſt authority, though Juſſieu has given our *Dombeya* the barbarous American name *Araucaria*.) Lamarck Encyclop. v. 2. 301. Schreb. 704. Mart. Mill. Dict. v. 2. Lambert Pinus, append. 87. (Araucaria; Juſſ. 413.) Claſs and order, *Dioecia Monadelphia*. Nat. Ord. *Coniferæ*.

Gen. Ch. Male. *Cal.* Catkin cylindrical, ſomewhat ovate, ſpirally imbricated with numerous, ſhort, woody *ſcales*, each terminated by a lanceolate, acute, coriaceous, tapering point, concave beneath, recurved at the extremity. *Cor.* none. *Stam.* Filaments none, except the ſcale of the catkin: anthers 10 or 12, cluſtering round each ſcale, linear, furrowed, the length of the ſcale, attached by their upper ends to the end of the ſcale, below its tapering point, and ſeparating at their lower extremities when it is broken.

Female. *Cal.* Catkin large, roundiſh-ovate, cloſely imbricated with numerous germens reſembling ſcales. *Cor.* none. *Piſt.* Germen oblong-wedge-ſhaped, a little compreſſed, tapering at the baſe, dilated and thickened upwards; ſtyle none; ſtigma of two unequal valves, the inner one ſmall and obtuſe; the outer very large, with a broad thick baſe, curved inwards upon the ſmall valve, and terminating in a linear, acute, thin, aſcending point, almoſt as long as the germen, and bent in upon it at a right angle. *Peric.* none. *Seeds* numerous, imbricated cloſely ſo as to form the cone, each of them oblong, ſomewhat cylindrical, obtuſely quadrangular towards the baſe, furniſhed at the ſummit with a broad, ſpatulate wing, or appendage, which is curved inwards and upwards, and thickened at its margins. Shell coriaceous, coloured, without valves, containing an oblong kernel, ſlightly angular at its baſe. *Receptacle* without ſcales, downy, ſlightly cellular, cylindrical.

Eſſ. Ch. Male, Calyx the ſcales of a catkin, embraced by numerous ſeſſile anthers, and tipped with a naked point. Corolla none.

Female, Calyx the pointed imbricated ſcales of a catkin,

each tipped with a ſtigma Seed ſolitary in the coriaceous ſwelling baſe of each ſcale.

1. D *chilenſis*. Lamarck loc. cit. 301. t. 828. Mart. Mill. Dict. v. 2. (Pinus Araucana; Molin. Chil. 182. Baſilaire; Daubenton in Mem. d'Agriculture, ann. 1787, faſc. 4. 191. t. 1.) Chili Pine. Adult leaves ovate, imbricated, ſharp-pointed. Points of the cone-ſcales awl-ſhaped, nearly as long as the ſeeds. Diſcovered by Dombey in Chili. It forms a majeſtic pyramidal ever-green tree of ſlow growth, about 150 feet high, its *trunk* perfectly ſtraight and erect, its *branches* ſpreading horizontally in four directions, and its *wood* white, ſolid, but not ſo proper for maſts as was at firſt expected from the great height and ſtraightneſs of the tree, being rather brittle Outer *bark* thick, furrowed, and wrinkled, like cork. *Leaves* cloſely and ſomewhat ſpirally imbricated, ſeſſile, an inch long, ovate, entire, concave, coriaceous, rigid, ſmooth, with a broad baſe and ſtraight ſpinous point. *Stipulas* none. *Catkins* ſolitary, terminal. *Cones* ovate, thick, three or four inches long, compoſed of innumerable ſcales, whoſe long awl-ſhaped points are curved inwards. In the hollow purpliſh baſe of each ſcale is a ſolitary, oval, eatable kernel, ſcarcely an inch long. 2. D *excelſa*. Lambert loc. cit. t. 39, 40. (Cupreſſus columnaris; Forſt. Prod. 67.) Norfolk-iſland Pine. Adult leaves cloſely imbricated, inflexed, pointleſs. Cone-ſcales winged, with very ſhort points. Diſcovered by captain Cook, in his ſecond voyage, on Queen Charlotte's Foreland, New Caledonia; alſo in the iſle of Pines. It has ſince been found abundantly on Norfolk Iſland, from whence living plants have been brought into England, but as they will not bear our climate, and ſoon overgrow our loftieſt conſervatories, they can never be ſeen here in perfection. This ſpecies riſes to 150 or 220 feet in height, and is from 12 to 30 feet in circumference, generally very ſtraight, and deſtitute of branches to the height of 40, ſometimes 60, feet from the ground. According to Capt. Hunter, the wood is ſeldom ſound; very heavy when freſh, as it abounds with a watery ſap; its grain ſhort and ſpongy, the gum which exudes from the bark is ſoluble in water, and not of the nature of turpentine. That experienced navigator eſteems this timber wholly unfit for the navy, though very uſeful for building houſes. The *leaves* of this tree on the young plant are awl-ſhaped, ſpreading every way, ſomewhat imbricated, about half an inch long, ſeſſile, ſmooth. *Cotyledons* four, whorled, equal, lanceolate, obtuſe, near an inch and half long. Adult *branches* numerous, cylindrical, obtuſe, ſpreading every way, covered with innumerable, cloſely imbricated, ſeſſile, ovate, inflexed, pointleſs *leaves*, about a quarter of an inch long. *Cones* almoſt globular, about ſix inches in diameter, formed of innumerable *ſcales*, which are deciduous when ripe. Each of theſe *ſcales* is dilated or winged at the ſides, and their tips are very ſhort, though greatly dilated at the baſe.

Dombeya of Cavanilles. See Pentapetes.

Dombeya of L'Heritier. See Tourretia.

DOMBROWAZ, in *Geography*, a town of Poland, in the palatinate of Lemberg; 60 miles S. W. of Lemberg.

DOMBROWKEN, a town of Pruſſia, in the province of Natangen; 10 miles E. of Nordenberg.

DOME, in *Architecture*, is a roof or vault riſing from a circular, elliptic or polygonal plan, with a convexity outwards, or a concavity inwards, in ſuch a manner that all the horizontal ſections made by planes will be ſimilar figures round a vertical axis.

Domes are denominated by the figure of the baſe on which they are erected; and are therefore called polygonal, circular, or elliptic domes. Circular domes are of ſeveral kinds, as ſpherical, ſpheroidal, or ellipſoidal, hyperboloidal, paraboloidal, &c. Domes that riſe higher than the radius of the baſe are called ſurmounted domes; and thoſe that riſe leſs than this dimenſion, are termed diminiſhed or turbaſed domes. Domes which riſe from circular baſes are called cupolas.

Hiſtory.

With regard to the antiquity of domes, it does not appear from authentic hiſtory, that any of the ancient nations, prior to the time of the Roman emperor Auguſtus, were acquainted with the uſe of the arch, and conſequently not of the dome. It is probable that the arch was invented by the Greeks; but that ſpecies of it, called domes, ſeems to have originated in Italy among the Romans or Hetrurians. The oldeſt dome that hiſtory informs us of, is that of the Pantheon at Rome, built in the reign of this emperor, and is ſtill entire. Its cavity is hemiſpherical and enriched with coffers, and terminates upwards in an aperture called the eye of the dome. The exterior ſide riſes from ſeveral degrees or ſteps not vertically, but in a ſloping direction, which is nearly a tangent to the ſeveral internal quoins of the ſteps; and conſequently preſents to the eye a truncated ſegment of a ſphere much leſs than a hemiſphere.

The dome of the temple of Bacchus is alſo hemiſpherical internally; but without coffers. It is now covered externally with a common roof, which perhaps might have been the original form, a form which is alſo to be ſeen in the roof which covers the dome of the temple of Jupiter in the palace of Dioclesian at Spalatro in Dalmatia. Domes were of very frequent uſe among the Romans, as may be ſeen by their coins, and in the remains of their ancient edifices. But Greece, though the mother of architecture, has not furniſhed us with a ſingle example of a dome, which may be ſaid to be built; for that which covers the monument of Lyſicrates is only a ſingle ſtone, and is therefore but a lintle.

In point of antiquity, the dome of Santa Sophia at Conſtantinople comes next in order. It was built in the reign of the emperor Juſtinian by Anthemius and Iſidorus, whom the emperor had ſelected as the moſt eminent of the Grecian architects. As this church had been ſeveral times burnt, it was determined that no combuſtible materials ſhould be employed in its fabrication. Anthemius had boaſted to Juſtinian that he would outdo the magnificence of the Roman pantheon, by ſuſpending in the air a much greater dome. For this purpoſe he raiſed four pillars on the angles of a ſquare, diſtant from each other about 115 feet, and nearly of the ſame altitude. As this church was to be made in the form of a croſs, and to be vaulted with ſtone, it became neceſſary to throw arches over the pillars, and to fill up the four angular ſpaces between the archivolts, gradually forming them into a complete circle at the level of the four ſummits of the arches. Upon this circular ring the dome, the firſt ever erected upon pendentives, was raiſed. The preſſure of the eaſtern and weſtern arches was reſiſted by walls almoſt ſolid, running longitudinally in a meridional direction, two from the north, and two from the ſouth ſides of the pillars, to the diſtance of about 90 feet, forming tranſepts. It was thought that the cylindrical walls covered with half domes, which abutted on the eaſtern and weſtern arches, would have made a ſufficient reſiſtance to the preſſure of the arches on the north and ſouth; but this was not the caſe, for the dome gave way towards the eaſt, and after having ſtood a few months, it fell with the half dome on this ſide. Anthemius dying, Iſidorus, who ſucceeded to the charge, ſtrengthened the eaſtern piers by filling up certain voids, and then

then turning the dome a ſecond time; but its preſſure was ſtill too great for the reſiſtance of the eaſtern end, which was now ſo much fractured, that it gave way a ſecond time before its completion. Iſidorus finding ſtill that the puſh was directed eaſtwardly, built ſtrong pillared buttreſſes againſt the eaſtern wall of a ſquare cloiſter, which ſurrounded the building, and thence buttreſſes ſpanning over the void, and then turned the dome a third time. But though every precaution was taken to diminiſh its gravity, both by procuring light materials (which was pumice ſtone), and by reducing its thickneſs, the arches were ſo much fractured, that the architect was under the neceſſity of filling up the great arcades, on the north and ſouth, by other ſmaller ones in three ſtories. From theſe circumſtances we find that profeſſional men of this age were not ſo well acquainted with the principles of conſtruction in dome-vaulting as thoſe in modern times, who perhaps would have hooped or chained ſuch a dome immediately over the arches and pendentives; and by this means it might have been ſecured by making its preſſure incline more towards the perpendicular, as was the practice in after ages, firſt by Michael Angelo in the vaſtly more ponderous dome of St. Peter's at Rome; and then by ſir Chriſtopher Wren, in the interior dome and cone of St. Paul's cathedral. This dome of St. Sophia, which the Turks have preſerved, is nearly 113 French feet diameter.

The veneration with which the Chriſtian world did, and ſtill holds for this church, gave ſtimulus to the erection of the dome upon the church of St. Mark at Venice, about the year of Chriſt 973, upon a ſimilar plan.

Shortly after the commencement of the eleventh century, the dome of the cathedral church at Piſa was built after the ſame model.

The vaſt cathedral of St. Maria dei Foire, at Florence, was begun in 1298 by Arnolfo Luſii, who died in two years after. From the deceaſe of this great man there was no architect to be found who would engage to execute the dome with which the original architect Arnolfo had intended to finiſh this edifice: in conſequence of which it ſtood for 120 years, and then a convocation of architects was aſſembled; many extravagant plans were propoſed, but were all rejected. Filipo Bruneleſchi was at length choſen as the only perſon, who could be entruſted with the enterpriſe. He carried on the building, and completed the dome without difficulty, in a manner truly worthy of his great reputation. This cupola is of an octangular ſhape, and of great elevation, far exceeding in dimenſions any of the ancient Roman domes, and only inferior to St. Peter's in point of magnitude. It is double, or formed of two vaults, with a cavity between: it was erected without centering, and is only ſupported by the ſpringing wall without buttreſſes.

The church of St. Peter's at Rome, the largeſt temple ever erected, was begun by Bramante, A. D. 1513, and carried on ſucceſſively by Raphael, San Gallo, and Michael Angelo. The dome of this edifice, deſigned by Michael Angelo, is nearly an ellipſoid on the exterior ſide. It riſes vertically from its baſe, and at the height of about 50 feet, branches into two thin vaults, which gradually ſeparate as they riſe. They are connected together by thin partitions dovetailed to each ſhell; by this means the whole is rendered extremely light and ſtiff. eat

St. Paul's cathedral, London, conſtructed by that great architect and mathematician ſir Chriſtopher Wren, was begun A. D. 1685, and completely finiſhed by 1710. The dome is of 18 inch brick work, and as it riſes every five feet in the altitude, has a courſe of long bricks inſerted the whole thickneſs. "The concave was turned upon a centre, which was judged neceſſary to keep the work even and true, though a cupola might have been built without a centre; but it was obſervable, that the centre was laid without any ſtandards from below to ſupport it; and as it was both centering and ſcaffolding, it remained for the uſe of the painter. Every ſtory of this ſcaffolding being circular, and the ends of all the ledgers meeting as ſo many rings, and truly wrought, it ſupported itſelf." "Although the dome wants not butment, yet for greater caution it is hooped with iron in this manner; a channel is cut in the bandage of Portland ſtone, in which is laid a double chain of iron, ſtrongly linked together at every ten feet, and the whole channel filled up with lead." The exterior dome is conſtructed of oak timber, and ſupported by a cone of brick work, ſpringing from the ſame baſe with the exterior dome, and ſupporting on its ſummit, or truncated end, a beautiful ſtone lantern, weighing 700 tons. This dome riſes higher than a ſemicircle; the ſidea of its ſection being ſtruck with centres in the baſe line, and would meet in an angle, if continued, in the axis of the dome.

It may be proper to obſerve, in this place, that all the ancient Roman cupolas, on the convex ſide, are a much leſs portion of the ſphere than the hemiſphere; but thoſe from the completion of the building of Santa Sophia, to the finiſhing of St. Paul's cathedral, are all ſurmounted domes, approaching in a certain degree to the proportion of ſpires or towers, which were ſo much affected in the middle ages. Since the revival of legitimate Grecian architecture by Stewart and others, the figure or contour of the Roman dome has been again revived, particularly when the other parts of the building are decorated with any of the orders; indeed exterior domes of any deſcription are improper, when applied to the pointed ſtyle of architecture.

The preſent Pantheon at Paris, formerly the church of St. Genevieve, is the conſtruction of that diſtinguiſhed architect Souffiot. Its dome is very lofty, and is ſuſtained by four pillars arched over the croſs parts. The angular ſpaces are made good with pendentives, which terminate in a circular ring: upon this ring is erected the cylindrical wall, which ſupports the dome. In this reſpect it is ſimilar to St. Paul's.

The dome of the Halle du Bled, at Paris, is an excellent example of a wooden dome, it is more than 200 feet diameter, and only one foot in thickneſs. See our principles of CARPENTRY.

In the interior of the great towers, over the interſection of the croſs, in our Gothic cathedrals, we find domes riſing from a ſquare baſe, and generally pierced by two windows on each of the four walls, which form a beautiful groins with the interſection of the domic ceiling within.

Spherical domes have this property, that they may be interſected by cylindrical or conic vaulting in every direction, and that the interſection will always be circles, provided that the axis of the cylinder, or cone, tend to the centre of the ſphere. For every ſection of a ſphere made by a plane is a circle, and every ſection of a right cylinder, or cone, perpendicular to the axis, is alſo a circle. Let the ſphere be ſo cut as to make a ſection of an equal diameter to a ſection of the cylinder or cone perpendicular to the axis; then the ſection of the cone, or cylinder, being applied to that of the ſphere, ſo that the centres of both may coincide, the circumferences of the circles will alſo coincide, and therefore only make one common line of meeting in the ſame plane, which is perpendicular to the axis of the cylinder, or cone: for the right line drawn from the centre of the circle, which is the ſection of the ſphere, to the centre of the ſphere, is perpendicular to the plane of this ſection;

tion; and ſince the axis of the cylinder, or cone, is alſo perpendicular to the ſame plane, the axis of the cylinder, or cone, and the remaining part of the radius of the ſphere, will be in the ſame ſtraight line. From this it follows, when the axis of a cylindrical, or conic vaulting, is horizontal, and tends to the axis of a ſpheric vaulting, that their mutual interſection muſt be in the circumference of a circle, the plane of which will be perpendicular to the horizon. Hence the beautiful interſections of ſphero-cylindric groins, which are ſo much admired in our principal buildings, and which never fail to ſtrike the mind, and lead it to an inveſtigation. For to people who view ſuch forms of groins, it appears, at firſt ſight, that the interſection will incline towards the vertical axis of the ſphere at the top; but upon reflecting upon the properties of the ſphere, they will ſoon diſcover that the interſection is in a plane perpendicular to the horizon.

From the above principle, any building having a polygonal baſe, may be made to terminate in a circle, and to ſuſtain either a cupola or cylindrical wall; for if the tops of the ſide walls of the polygon are brought to a level, and equal ſegments of circles raiſed on the top, meeting each other in the lines of interſection of the ſides of the polygon, the ſegments being either ſemicircles, or leſs portions; and if the angular ſpaces between theſe circular headed walls be made good to the level of the ſummits of the arches, ſo as to coincide with the circumference of a circle, which is a great circle of the ſphere, they will terminate in a circular ring at the level of the ſummit of the arches, and be portions of a ſphere, which our workmen call ſpandrals, and the French pendentives. Upon the circular ring a cornice is generally laid, and on the cornice a cylindric wall, or dome, of any deſcription is raiſed.

In the practice of building, the figures of the plans of apartments on which circular domes may be created are generally ſquares, or octagons, and the pendentives are generally equal in number to the angles of the walls; but this is not neceſſary, for arches may be thrown acroſs the angles to double the number of ſides of the polygon, and to preſerve the equal ſides; then over the middle part of the walls may be built equal, and ſimilar arches, touching thoſe acroſs the angles at the bottom, and having their ſummits in the ſame level. Inſtead of walls, piers may be carried to a proper height upon each angle of the polygonal plan, returning on each ſide of the angle; then over every two adjacent piers, on each ſide of the polygon, let archivolts be turned, and the ſpandrals filled in to the level of the ſummits of the arches, or archivolts, as before, and the termination will be a circle on the inſide, as has been obſerved. The under bed of the cornice is not always laid on a level with the top of the archivolt; but the ſpheric ſurface is ſometimes continued another courſe, or two courſes with brick or ſtone work; then over this a cupola or cylindrical wall may be raiſed. In this manner the piers of the veſtibule of St. Paul's cathedral, London, have archivolts thrown over them, on each ſide of the octagonal plan, reſting upon every two adjacent piers, forming eight arcades below, then the ſpandrals are filled in with ſpheric portions to the ſummits of the archivolts; upon this circular level is laid the entablature, which ſupports upon its cornice the whiſpering gallery; the cylindric wall is then carried up to the baſe of the dome. St. Stephen's church, Walbrook, is a beautiful example of a dome, ſupported upon eight arcades, the arches of which are ſuſtained by the ſame number of inſulated columns; the area of the veſtibule is ſquare, but the columns are ſo diſpoſed in the ſides of it, as to form an equilateral and equiangular octagon; the entablature, ſupported by the columns, is alſo formed upon a ſquare plan; the archivolts between every two contiguous columns form on the plan an octagon; and the ſpheric ſpandrals, being made up to the level of the ſummits of the archivolts, form at laſt a compete circle; on this circular level is laid the cornice, which is at laſt ſurmounted with the dome and lantern.

Plate VII. exhibits the forms of various domes.

Fig. 1. ſhews three different contours upon a ſquare plan. No. 1 is the plan: No. 2 a bell-formed contour, uſed in turrets, upon a ſquare plan, in the reigns of Elizabeth and James I.: No. 3 a pointed contour; and No. 4 a ſemicircular.

Fig. 2. repreſents various contours of domes upon an octagonal plan. No. 1 is the plan: No. 2 an elevation with a ſemi-elliptic-contour upon the greater axis, the leſs being vertical: No. 3 a ſemi-elliptic-contour upon the leſs axis, which is the diameter of the circle of its baſe; and No. 4 an elevation, having its contour, or vertical ſection, pointed at the ſummit. The dome of the cathedral church of St. Maria dei Foire, at Florence, is of this form; for all its horizontal ſections are octagons, and its vertical ſection is a pointed arch.

Fig. 3. repreſents five contours upon a circular plan. No. 1 is the plan: No. 2 the elevation, having a ſemicircular contour, as is ſometimes uſed in modern practice: No. 3 an elevation, ſhewing the contour of a ſegment leſs than a ſemicircle, as was the practice of the Romans; the dome ſpringing from the uppermoſt of a ſeries of ſteps, or degrees, and ſometimes terminating with an eye at the top, as in the Pantheon: No. 4 an elliptic contour, the baſe being the longer axis: No. 5 an elliptic contour, the baſe being the ſhorter axis. Roofs with elliptic contours upon circular plans, are properly denominated ellipſoidal domes, or ſpheroidal domes, as in the two laſt contours: No 6 the pointed contour, as employed in St. Peter's, at Rome, and St. Paul's, London.

Fig. 4. repreſents domes of four different contours upon a circular plan. No. 1 is the plan: No. 2 ſhews the elevation of a parabolical contour: No. 3 the elevation of a hyperbolical contour: Nos. 4 and 5 elevations, having the contours of contrary curvatures on the ſides: No. 4 bends inwardly at the bottom, and No. 5 riſes vertically from its baſe. The ſides of theſe contours are convex below, and concave above; the convex part being a much greater portion of the ſide than the concave part. Such forms may be denominated Moreſque, Turkiſh, or Hindoo domes, as being the practice of the Moors, Turks, and Hindoos. The contour, No. 5, was introduced into England in the reign of king Henry VII., and in conſtant uſe in the time of Henry VIII. Its uſe was in the crownings of turrets, as in the octagonal buttreſſes of king Henry VIIth's chapel, and the towers of king's college chapel, Cambridge: the turrets at the entrance into Chriſt's college, Oxford, executed by ſir Chriſtopher Wren, are ſurmounted with domes of this form. The bell-formed contour, No. 2, *fig.* 1, ſucceeded to No. 5, *fig.* 4; examples of it may be ſeen at Audley-end, in Eſſex, built in the reign of James I., and in the tower of London.

No. 3, *fig.* 1; Nos. 3 and 4, *fig.* 2; Nos. 5 and 6, *fig.* 3, are all ſurmounted domes. Domes with pointed contours, conſiſting of circular ſegments meeting in the apex, were much uſed during the middle ages. The forms exhibited in No. 2, *fig.* 2; Nos. 3 and 4, *fig.* 3, are ſurbaſed domes, being lower than ſemicircles upon the ſame baſe.

Fig. 5. ſhews a complete hemiſphere, or the centre of a hemiſpheric dome. If this hemiſphere is cut by four vertical

cal planes, represented by the lines AB, BC, CD, DA, the middle part will exhibit the form of *fig.* 6. No. 1, in the same position; No. 2 is one of the ends; and No. 3 one of the sides: No. 4 shews the same figure as No. 1 in the middle of four cylinders which are joined with it; the whole forming the centre for erecting a hemispheric dome pierced with four cylindrical vaults. The arches, or groins of the aisles of the cathedral of St. Paul's, are vaulted in this manner; the cylindrical arches, transverse to the length of the building, being of greater diameter than those in the direction of the aisles, form the pendentives double, No. 5 the side of the same.

Fig. 7, a hemisphere joined to four equal cylinders, which do not meet at the base, as in *fig.* 6. This figure forms four equal and distinct pendentives, supposing the upper part above the summits of the arches cut off, or separated by a cornice at the same place. No. 1 shews the plan, or horizontal projection: No. 2 the elevation of one side.

Plate VIII. *fig.* 1. No. 1 is the plan, and No. 2 the elevation of a dome invented by Mr. Bunce, and so constructed as to require no centering. All the abutting joints are continued in vertical planes without interruption; but the horizontal joints of every two stones break on the middle of the stone on either side; therefore in the building every alternate stone of a course will project upwards, and leave a recess for placing each stone of the next course, and so on to the top, as shewn by the figure. It is evident that as the building approaches nearer to the top, the intervals will become more wedge-formed, and as the interior circumference is less than the exterior, the stones can only be inserted from the outside; and, consequently, if made so exact as just to fit their places, they cannot fall inwardly; this dome will therefore require no centering. But though this manner of joining the stones may be convenient, as requiring no centering, yet it is more subject to burst than one constructed in the usual manner, if not equilibrated, as every row of stones, from the base to the top, form arches independent of each other. However, in order to break the vertical joints, the stones may be cut and joined, as in *fig.* 2: No. 1 shews the connection of the stones next to the bottom, and No 2, at the crown.

Fig. 3. is the manner in which the scaffolding and centering of a dome may be supported without standards from below. No. 1 is the plan of the base of the dome and centering: No. 2 the internal elevation, shewing the manner and form of the centering: No. 3 a section of the dome, shewing the different stages as they rise upwards; and No. 4 one of the stays, or brackets. Every bracket is supported on a corbel below, as shewn at A, or the horizontal piece BC may be housed into the wall at C, but care should be taken to strap it to the upright. It is evident, that when a number of brackets, constructed as in No. 4, is placed around the interior circumference, as at Nos. 1 and 2, and fixed into the wall at the bottom, or top, as described with transverse pieces, as at No. 1, fixed firmly to the tops of the brackets, this combination of timbers cannot fall inwardly, because of the wedge-formed sides which form the polygon, and they are prevented from falling downwards by the corbels at their bottoms, or from the housings at the ends of the horizontal pieces at the top. By this means the scaffolding may be made as durable and firm as if carried up from the bottom; nothing more is required to complete it than to cover the bearers with boards. The centering, for supporting the stones or bricks, may be formed by thin pieces of timber placed in vertical planes, in the manner of ribs, at such distances from each other that one may be opposite to the middle of a stone or brick. The centering of the dome of St. Paul's was probably executed in this manner. *Fig.* 4. shews a plan for another mode of scaffolding a dome. Four beams are let into the wall, so as to form a square; and then four others above these, in the same manner diagonally placed; the two upper four may be bolted to the lower four.

Plate VIII. *e. fig.* 1. Given the ichnography of a hemispheric dome, the direction and section of a cylindroidal vault intersecting the domic surface; to find the seat of the intersection, and form of the boarding laid out in plano or ledgement.

Let ABCDA be the plan of the dome, BEFAB that of the cylindroid, and EGFE the section of the cylindroid; divide the arch EGF into any number of parts, and draw lines parallel to AF, so that each line may cut the curve of the base of the dome in two points. On each of these lines, terminated by the curve of the base of the hemisphere, describe a semicircle. On the several points of the base EF, where the several parallels cut it, describe quadrants of circles, with the length of each respective ordinate, so as to cut EF or EF produced on the same side with the semicircles: from the points thus cut, draw lines again parallel to AF, so as to cut each respective semicircle: from these points in the semicircles draw lines perpendicular to each respective diameter, so as to cut it at the points *i, g, k, l, m, n, o*, draw the curve A *i g k l m n o* B, which will give the seat of the angle. The form of the boarding in plano is thus found: let PQ, No. 2, be the perimeter of the arch EGF, crossed at the several divisions intersected by the chords, draw lines perpendicular to PQ, and make the lengths of those lines respectively equal to the lengths of the parallels contained between EF and the seat A *i g k l m n o* B of the angle; then a curve being traced through the points so found, will give the lengths and form of the boards which cover the surface of the cylindroid, so as to coincide with the domic surface at their ends. If the axis of the cylindroid pass through the centre of the hemisphere, only one-half of the lines will be necessary to produce the seat of the intersection of the groin, as at CD, and the boarding, as in No. 3. In this manner the groins of the nave of St. Paul's are formed by the lunettes, or cylindroids, cutting each spheric surface from each window. No. 4 shews the section for bending round the seat A *i g k l m n o* B, so as to coincide with the common section of the cylindroid and the hemisphere. This is found by making RS equal to the seat A *i g k l m n o* B, and the ordinates equal to those of the arch FGE.

Given the ichnography of a dome of a hemispheric form, and the ichnography of a semi-conic-vault cutting the hemisphere obliquely to find the seat of the groin and the form of the boarding of the conic vault.

Let ABCDA (*fig.* 2.) be the ichnography of the dome, and CED be that of the conic vault, E being the vertex. Let the cone be cut by any section CGF perpendicular to its axis, and divide the arch CGF into any number of equal parts, from which draw lines at right angles to the base FC. Through each of these points in the base CF, and the vertex of the cone E, draw lines cutting the ichnography of the dome in two points each; on each of the lines intercepted by the base of the dome as a diameter, describe a semicircle. Draw perpendiculars from the points in the line CF to the several lines drawn from E, and the bottom of the ordinates in CF, and make each respective perpendicular equal to each respective ordinate at the same point. From E draw lines through the ends of these perpendiculars to cut each semicircle: from the points so cut in the semicircle draw lines parallel to the perpendiculars; that is, perpendicular to the bases of the semicircles: then a line being traced

from

from C to D, through these points, gives the seat of the angle.

If the axis of the cone pass through the axis of the hemisphere, the seat of the intersection will be a straight line, as at A B.

Fig. 3. is the representation of a pendentive dome covering an area bounded by a square plan, No. 1 is the plan the pendentives are here shewn at A. No. 2 the elevation. Here the spheric covering is the same as if penetrated by four equal semicylinders, the plane of each wall being the same as the ends of the semicylinders, terminating in semicircles. In this representation, the contour of the dome, and the semicircles which terminate the tops of the wall, are concentric. At the summits of the four arches a cornice is generally carried round, this is shewn by the dotted line E F. The spheric portion above E F may be of any rotative form whatever: it is here continued upwards with the same concavity as the pendentives, that is, a portion of the same sphere of which the pendentives are parts. G E C and H F D shew the parts of the sphere cut off by the four walls.

Fig. 4 is the representation of a pendentive dome, covering an octagonal area, No. 1 is the plan, No. 2 the interior elevation.

Fig. 5. is the representation of a saloon: No. 1 is the plan: No. 2 the interior elevation. This is composed of three different geometrical solids: first an octagonal prism to the spring of the arches: secondly, a portion of a hemisphere extending upwards a little above the summits of the arches, the dotted line shewing the complete hemisphere of which this is the portion; and, thirdly, a cylinder which is crowned with a hemisphere. This is the general form of the saloon of St. Paul's, and other modern churches: the octagonal part is generally decorated with pilasters: the entablature of which separates the prismatic part from that of the spheric zone, and covers every defect at the transition of these two different figures. An entablature or cornice is generally carried round the upper part of the zone. This is the place of the whispering gallery in St. Paul's. The cylindrical part surmounting a high podeum is generally decorated with a pilastrade, and pierced on the sides for windows, as in this last mentioned edifice.

The equilibrium and pressure of domes is very different from that of common arching, though there are some common properties; for in their cylindrical or cylindroidal vaulting of uniform thickness, if the tangent to the arch at the bottom be perpendicular to the horizon, the vault cannot stand, nor can it be built with a concave contour in the whole or in any part, and to equilibrate the arch whether its section be circular or elliptical, supposing the intrados to be given, the two extremes of the arch must be loaded infinitely high between the extrados of the curve which runs upwards, and the tangent to the arch which is an assymptote rising vertically from each foot or extreme of the arch. In like manner in thin domic vaulting of equal thickness, if the curved surface rise perpendicularly from the base, whatever be the contour, it will burst at the bottom. Dome vaulting, though agreeing in this particular with common vaulting, differs essentially in several others, for in order to equilibrate its figure, after the convexity has been carried to its full extent of equilibrium around, and equidistant from the summit on the exterior side, the curvature may then change into a concavity; for hence the interior circumference of the courses is less than the exterior circumference, and therefore whatever be the pressure towards the axis the course cannot fall inwardly without squeezing the stones into a less compass, which is impossible: they must therefore be crushed to powder before such a vault can give way. Hence a vault may be executed with a convex surface inwardly and concave outwardly, and be sufficiently firm; but the strongest form of a circular or rotative vault to carry a load at the top, is a truncated cone; such has sir Christopher Wren adopted in supporting the stone lantern and exterior dome of St. Paul's: with regard to the strength of this vault, it is impossible to conceive any force acting on the summit that is capable of putting it out of equilibrium: since the pressure is communicated in the sloping right line of the sides of the cone, and perpendicular to the joints, the conic sides will have no tendency to bend to one side more than the other, (except from the gravity of the materials towards the axis, but this tendency is counteracted by the abutting verticle joints). The case is very different in dome vaulting, since the contour is convex, there is a certain load which, if laid on the top, must burst the dome outwardly, and this weight will be greater as the contour approaches nearer to the chords of the arches of the two sides, or to a conic vaulting on the same base, carried up to the same altitude, and ending in the same circular course. Let us begin at the key stone and proceed downwards from course to course; supposing a horizontal line to be a tangent at the vertex, it is evident that every successive coursing joint may be made to slope so much, and consequently the pressure of the arch stones of any course towards the axis so great, as to be more than sufficient to resist the weight of all the part above: it is therefore plain that there is a certain degree of curvature to be given to the contour which will just prevent the stones in any succeeding course from being forced outwardly: the circular vault thus balanced is an equilibrated dome; but instead of being the strongest it is the weakest of all intermediate ones between its own contour and that of a cone upon the same base, rising to the same altitude in a key stone, or in an equal circular course. The equilibrated dome is therefore the boldest contour, and is the limit of an infinity of inscribed circular vaults, which are all stronger than itself. Circular vaulting differs from straight vaulting in other respects, being built with courses in circular rings; and the stones in each course of equal length, and pressing equally towards the axis cannot slide inwardly: circular vaults may therefore be open at the top; and the equilibrated dome, which is the weakest, may be made to carry a lantern of equal gravity with the part that would have been necessary to complete the whole; but domes of flatter contours may be made to carry more, according as they are nearer to a conic contour, as has already been observed; and those circular vaults that are either straight or concave on the sides may be loaded without limit, and will never fail till they are crushed to powder, provided they are hooped at the bottom.

Having thus given a popular description of the equilibrium and pressure of domes, such as might easily be comprehended by persons of ordinary conception, though unacquainted with the use of algebra or fluxions, we shall here lay before our readers Dr. Robinson's theory.

Prop. To determine the thickness of dome vaulting when the curve is given, or the curve when the thickness is given.

"Let B *b* A (*fig.* 6.) be the curve which produces the dome by revolving round the vertical axis A D. We shall here suppose the curve to be drawn through the middle of the arch stones, and that the coursing or horizontal joints are every where perpendicular to the curve. We shall suppose (as is always the case) that the thickness K L, H I, &c. of the arch stones is very small in comparison with the dimensions of the arch. If we consider any

any portion H A b of the dome, it is plain that it presses on the curve of which H L is an arch stone, in a direction b C, perpendicular to the joint H I, or in the direction of the next superior element βb of the curve. As we proceed downwards, course after course, we see plainly that this direction must change, because the weight of each course is superadded to that of the portion above it to complete the pressure of the course below. Through B draw the vertical line B C G meeting βb, produced in C. We may take $b c$ to express the pressure of all that is above it, propagated in this direction to the joint K L. We may also suppose the weight of the course H L united in b, and acting on the vertical. Let it be represented by b F. If we form the parallelogram b F G C, the diagonal b G will represent the direction and intensity of the whole pressure on the joint K L.

"We have seen that if b G, the thrust compounded of the thrust b C exerted by all the courses above H I L K, and if the force b F, or the weight of that course be every where coincident with b B, the element of the curve, we shall have an equilibrated dome; if it falls within it, we have a dome which will bear a greater load, and if it falls without it, the dome will break at the joint. We must endeavour to get analytical expressions of these conditions. Therefore draw the ordinates $b\,\delta\,b''$, B D B'', C d C''. Let the tangents at b and b'' meet the axis in M, and make M O, M P, each equal to b C, and complete the parallelogram M O N P, and draw O Q perpendicular to the axis, and produce b F, cutting the ordinates in E and e. It is plain that M N is to M O as the weight of the arch H A b to the thrust b C, which it exerts on the joint K L (this thrust being propagated through the course of H I L K,) and that M Q, or its equal $b e$, or δd, may represent the weight of the half A H.

"Let A D be called x, and D B be called y. Then $b e = \dot{x}$, and e C $= \dot{y}$ (because b C is in the direction of the element βb.) It is plain that if we make $\dot{y}$ constant, B C is the second fluxion of x, or B C $= \ddot{x}$, and $b e$ and b E may be considered as equal, and taken indiscriminately for $\dot{x}$. We have also b C $= \sqrt{\dot{x}^2 + \dot{y}^2}$; let d be the depth or thickness of H I of the arch stones. Then $d\sqrt{\dot{x}^2 + \dot{y}^2}$ will represent the trapezium H L; and since the circumference of every course increases in the proportion of the radius y, $dy\sqrt{\dot{x}^2 + \dot{y}^2}$ will represent the whole course. If $\int$ be taken to represent the sum or aggregate of the quantities annexed to it, the formula will be analogous to the fluent of a fluxion, and $\int dy\sqrt{\dot{x}^2 + \dot{y}^2}$ will represent the whole mass, and also the weight of the vaulting down to the joint H I. Therefore we have this proportion; $\int dy\sqrt{\dot{x}^2 + \dot{y}^2} : dy\sqrt{\dot{x}^2 + \dot{y}^2} = b e : b$ F $= b e :$ C G $= \delta d :$ C G $= x :$ C G. Therefore

$$\text{C G} = \frac{dy\,\dot{x}\sqrt{\dot{x}^2 + \dot{y}^2}}{\int dy\sqrt{\dot{x}^2 + \dot{y}^2}}.$$

"If the curvature of the dome be precisely such as puts it in equilibrium, but without any mutual pressure in the vertical joints, this value of C G must be equal to C B, or to $\ddot{x}$, the point G coinciding with B. This condition will be expressed by the equation $\frac{dy\,\dot{x}\sqrt{\dot{x}^2 + \dot{y}^2}}{\int dy\sqrt{\dot{x}^2 + \dot{y}^2}} = \ddot{x}$, or more conveniently by $\frac{dy\sqrt{\dot{x}^2 + \dot{y}^2}}{\int dy\sqrt{\dot{x}^2 + \dot{y}^2}} = \frac{\ddot{x}}{\dot{x}}$. But this form gives only a tottering equilibrium, independent of the friction of the joints and cohesion of the cement. An equilibrium, accompanied by some firm stability produced by the mutual pressure of the vertical joints, may be expressed by the formula $\frac{dy\sqrt{\dot{x}^2 + \dot{y}^2}}{\int dy\sqrt{\dot{x}^2 + \dot{y}^2}} > \frac{\ddot{x}}{\dot{x}}$, or by $\frac{dy\sqrt{\dot{x}^2 + \dot{y}^2}}{\int dy\sqrt{\dot{x}^2 + \dot{y}^2}} = \frac{\ddot{x}}{\dot{x}} + \frac{\dot{t}}{t}$, where t is some variable positive quantity which increases when x increases. This last equation will also express the equilibrated dome, if t be a constant quantity, because in this case $\frac{\dot{t}}{t}$ is $= 0$.

"Since a firm stability requires that $\frac{dy\,\dot{x}\sqrt{\dot{x}^2 + \dot{y}^2}}{\int dy\sqrt{\dot{x}^2 + \dot{y}^2}}$ shall be greater than $\ddot{x}$, and C G must be greater than C B. Hence we learn that figures of too great curvatures, whose sides descend too rapidly, are improper. Also, since stability requires that we have $\frac{dy\,\dot{x}\sqrt{\dot{x}^2 + \dot{y}^2}}{\ddot{x}}$ greater than $\int dy\sqrt{\dot{x}^2 + \dot{y}^2}$, we learn that the upper part of the dome must not be made very heavy. This, by diminishing the proportion of b F to b C, diminishes the angle C b G, and may set the point G above B, which will infallibly spring the dome in that place. We see here also, that the algebraic analysis expresses that peculiarity of dome vaulting, that the weight of the upper part may even be suppressed.

"The fluent of the equation $\frac{dy\sqrt{\dot{x}^2 + \dot{y}^2}}{\int dy\sqrt{\dot{x}^2 + \dot{y}^2}} = \frac{\ddot{x}}{\dot{x}} + \frac{\dot{t}}{t}$ is most easily found. It is L $\int dy\sqrt{\dot{x}^2 + \dot{y}^2} =$ L $\dot{x}$ + L $\dot{t}$ where L is the hyperbolic logarithm of the quantity annexed to it. If we consider $\dot{y}$ as constant and correct the fluent, so as to make it nothing at the vertex, it may be expressed thus; L $\int dy\sqrt{\dot{x}^2 + \dot{y}^2} -$ L $a =$ L $\dot{x} -$ L $\dot{y} +$ L t. This gives us L $\frac{\int dy\sqrt{\dot{x}^2 + \dot{y}^2}}{a} =$ L $\frac{\dot{x}}{\dot{y}}\,t$, and therefore $\frac{\int dy\sqrt{\dot{x}^2 + \dot{y}^2}}{a} = t\frac{\dot{x}}{\dot{y}}$.

"This last equation will easily give us the depth of the vaulting, or thickness d of the arch, when the curve is given. For its fluxion is $\frac{dy\sqrt{\dot{x}^2 + \dot{y}^2}}{a} = \frac{t\dot{x} + t\ddot{x}}{\dot{y}}$, and $d = \frac{a\dot{t}\dot{x} + a\dot{t}\ddot{x}}{y\dot{y}\sqrt{\dot{x}^2 + \dot{y}^2}}$, which is all expressed in known quantities; for we may put in place of t any power or function of x or of y, and thus convert the expression into another, which will still be applicable to all sorts of curves.

"Instead of the second member $\frac{\ddot{x}}{\dot{x}} + \frac{\dot{t}}{t}$, we might employ $\frac{p\ddot{x}}{\dot{x}}$, where p is some number greater than unity. This will evidently give a dome having stability; because the original formula $\frac{dy\,\dot{x}\sqrt{\dot{x}^2 + \dot{y}^2}}{\int dy\sqrt{\dot{x}^2 + \dot{y}^2}}$ will be greater than $\ddot{x}$. This will give $d = \frac{p\,a\,\dot{x}^{p-1}\,\ddot{x}}{y\dot{y}\sqrt{\dot{x}^2 + \dot{y}^2}}$. Each of these forms has its advantages when applied to particular cases. Each of them also gives $d = \frac{a\ddot{x}}{y\dot{y}\sqrt{\dot{x}^2 + \dot{y}^2}}$, when the curvature is such as in precise equilibrium: and, lastly, if d be constant, that is, if the vaulting be of uniform thickness, we obtain the form of the curve, because then the relation of $\ddot{x}$ to $\dot{x}$ and to $\dot{y}$ is given.

"The chief use of this analysis is to discover what curves are improper for domes, or what portions of given curves may be employed with safety.

"The

"The chief difficulty in the case of this analysis arises from the necessity of expressing the weight of the incumbent part, or $\int dy \sqrt{\dot{x}^2 + \dot{y}^2}$. This requires the measurement of the conoidal surface, which, in most cases, can be had only by approximation, by means of infinite series. We cannot expect that the generality of practical builders are familiar with this branch of mathematics, and therefore will not engage in it here; but content ourselves in giving such instances as can be understood by such as have that moderate mathematical knowledge, which every man should possess, who takes the name of engineer.

"The surface of any circular portion of a sphere is very easily had, being equal to the circle inscribed with a radius equal to the arch. This radius is evidently equal to $\sqrt{\dot{x}^2 + \dot{y}^2}$.

"In order to discover what portion of a hemisphere may be employed (for it is evident we cannot employ the whole) when the thickness of the vaulting is uniform, we may recur to the equation or formula $\frac{dy\dot{x}\sqrt{\dot{x}^2 + \dot{y}^2}}{\ddot{x}} = \int dy \sqrt{\dot{x}^2 + \dot{y}^2}$. Let a be the radius of the hemisphere. We have $\dot{x} = \frac{a\dot{y}\dot{y}}{\sqrt{a^2 - y^2}}$ and $\ddot{x} = \frac{a\dot{y}^2}{(a^2 - y^2)^{\frac{3}{2}}}$. Substituting these values in the formula, we obtain the equation $y^2 \sqrt{a^2 - y^2} = \int \frac{a^2 y\dot{y}}{\sqrt{a^2 - y^2}}$. We easily obtain the fluent of the second member $= a^3 - a^2 \sqrt{a^2 - y^2}$, and $y = a \sqrt{-\frac{1}{2} + \sqrt{\frac{1}{2}}}$. Therefore if the radius of the hemisphere be one-half, the breadth of the dome must not exceed $\sqrt{-\frac{1}{2} + \sqrt{\frac{3}{4}}}$, or 0.786, and the height will be 618. The arch from the vertex is about 51° 49′, much more of the hemisphere cannot stand even, though aided by the cement, and by the friction of the coursing joints. This last circumstance, by giving connection to the upper parts, causes the whole to press more vertically on the course below, and this diminishes the outward thrust; but at the same time diminishes the mutual abutment of the vertical joints, which is a great cause of firmness in the vaulting. A Gothic dome, of which the upper part is a portion of a sphere not exceeding 45° from the vertex, and the lower part is concave outwards, will be very strong, and not ungraceful.

"Persuaded that what has been said on this subject convinces the reader that a vaulting, perfectly equilibrated throughout, is by no means the best form, provided that the base is secure from separating, we think it unnecessary to give the investigation of that form, which has a considerable intricacy, and shall merely give its dimensions. The thickness is supposed uniform. The numbers in the first column of the table express the portion of the axis counted from the vertex, and those of the second are the length of the ordinates.

AD	DB	AD	DB	AD	DB
0.4	100	610.4	1080	2990	1560
3.4	200	744.	1140.	3442	1600
11.4	300	904.	1200.	3972	1640
26.6	400	1100.	1260.	4432	1670
52.4	500	1336.	1320.	4952	1700
91.4	600	1522.	1360.	5336	1720
146.8	700	1738.	1400.	5756	1740
223.4	800	1984.	1440.	6214	1760
326.6	900	2270.	1480	6714	1780
465.4	1000	2602.	1520.	7260	1800

"The curve formed according to these dimensions will not appear very graceful, because there is an abrupt change in its curvature at a small distance from the vertex. If, however, the middle be occupied by a lantern of equal, or of smaller weight than the part, whose space it supplies, the whole will be elegant, and free from defect."

DOME, in *Chemistry*, is the upper-vaulted portion of several kinds of FURNACES, which see.

DOMENE, or DOMAINE, in *Geography*, a small town of France, in the department of the Isere, chief place of a canton, in the district of Grenoble, 6 miles E. of Grenoble, with a population of 1231 individuals. The canton has an extent of 200 kiliometres, 11 communes, and 8201 inhabitants.

DOMENGER, in *Middle Age Writers*, is sometimes used for damsel.

DOMENICO, ANIBALI, in *Biography*, an Italian singer in Handel's operas, who performed the second man's part in Siroe, when Conti was here, and Strada was the first woman. His voice was a contralto, the power and sweetness of which Handel gave him an opportunity of displaying in his first air, "Al par della mia sorte," by a "Messa di voce," or swell, at the beginning, but no peculiar taste, expression, or power of execution appear in his part; his bravura air in the second act, "Si Cadro," contains only common, and easy passages. We can only judge of a singer, whom we have never heard, by examining the score of the songs composed expressly for him or her. The abilities of Anibali, during his stay in England, seem to have made no deep impression, as we never remember him to have been mentioned by those who constantly attended the operas of those times, and were rapturists in speaking of the pleasure they had received from singers of the first class.

We found a music-book of one of Anibali's scholars at a stall in Middle-row, with graces to all the airs of Siroe, in his own hand-writing, which, for the time, were good.

DOMENZAIN, in *Geography*, a town of France, in the department of the Lower Pyrenées, and district of Mauleon: 7 miles N. N.W. of Mauleon.

DOMES-DAY, or DOOMS-DAY-*Book*, *Liber judiciarius vel censualis Angliæ*, the judicial book, or book of the survey of England: a most ancient record made in the time of William the Conqueror, by his order and with the advice of his parliament; upon a survey, or inquisition of the several counties, hundreds, tithings, &c. Sir H. Spelman calls it, "if not the most ancient, yet without controversy, the most venerable monument of Great Britain."

Its name is formed from the Saxon *dom*, doom, judgment, sentence, and *day*, which has the same force; so that domeday is no more than a reduplicate, importing judgment-judgment.

But some condemn this etymology as whimsical: and contend that if it was just, the Latin for domesday would be *dies judicii*; whereas, as appears above, it is styled "Liber judiciarius, vel censualis Angliæ." Bullet, in his Celtic Dictionary, hath the word *dom*, which he reads seur, seigneur, (and hence the Spanish word *don*,) as also the words *deya*, and *deia*, which he renders proclamation, advertisement. Doomsday, therefore, signifies the lord's, or king's proclamation, or advertisement, to the tenants who hold under him; and agrees well with great part of the contents of this famous survey. Observations on the Statutes, p. 190. note (*m*).

The drift, or design of the book, is to serve as a register, by which sentence may be given in the tenures of estates; and from which that noted question, whether lands be ancient

ancient demesne, or not, is still decided. (See DEMAIN.) Its contents are summed up in the following verses:

"Quid deberetur fisco, quæ, quanta tributa,
Nomine quid census, quæ vectigalia, quantum
Quisque teneretur feodali solvere jure,
Qui sunt exempti, vel quos angaria damnat,
Qui sunt vel glebæ servi, vel conditionis,
Quive manumissus patrono jure ligatur."

This book is still remaining, fair and legible, consisting of two volumes, a greater and a less; the greater comprehending all the counties of England, except Northumberland, Cumberland, Westmoreland, Durham, and part of Lancashire, which were never surveyed; and except Essex, Suffolk, and Norfolk, which are comprehended in the lesser volume, which concludes with these words: "Anno millesimo octogesimo sexto ab incarnatione Domini, vigesimo vero regis Wilhelmi, facta est ista descriptio non solum per hos tres comitatus, sed etiam alios."

It was begun in the year 1081, but not completed till the year 1087. For the execution of this great survey, some of the king's barons were sent commissioners into every shire, and juries summoned in each hundred, out of all orders of freemen, from barons down to the lowest farmers, who were sworn to inform the commissioners what was the name of each manor, who had held it in the time of Edward the Confessor, and who held it then; how many hides, how much wood, how much pasture, how much meadow-land it contained; how many ploughs were in the demesne part of it, and how many in the tenanted part; how many mills, how many fish-ponds, or fisheries belonged to it; what had been added to it, or taken away from it; what was the value of the whole, together, in the time of king Edward; what when granted by William; what at the time of this survey; and whether it might be improved, or advanced in its value. They were, likewise, to mention all the tenants, of every degree, and how much each of them had held, or did hold, at that time; and what was the number of the slaves. Nay, they were even to return a particular account of the live stock on each manor. These inquisitions, or verdicts, were first methodized in the county, and afterwards sent up into the king's exchequer. The lesser doomsday-book, containing the originals so returned from the three counties of Essex, Norfolk, and Suffolk, includes the live stock. The greater book was compiled, by the officers of the exchequer, from the other returns, with more brevity, and a total omission of this article, which gave much offence to the people; probably, because they apprehended, that the design of the king, in requiring such an account, was to make it a foundation for some new imposition. And this apprehension seems to have extended itself to the whole survey at that time. But whatever jealousy it might have excited, it certainly was a work of great benefit to the public; the knowledge it gave to the government of the state of the kingdom, being a most necessary ground-work for many improvements, with relation to agriculture, trade, and the increase of the people, in different parts of the country; as well as a rule to proceed by, in the levying of taxes. It was also of no small utility for the ascertaining of property, and for the speedy decision or prevention of law-suits. In this light it is considered by the author of the dialogue "De Scaccario," who speaks of it (l. i. c. 16.) as the completion of good policy and royal care for the advantage of his realm in William the Conqueror; and says, it was done to the intent, that every man should be satisfied with his own right, and not usurp with impunity what belonged to another. He likewise adds, that it was called "Domesday-book" by the English, because a sentence, arising from the evidence therein contained, could no more be appealed from, or eluded, than the final doom at the day of judgment. From this authority ascribed to it, we might be led to suppose, that the verdicts, on which the register had been grounded, were found, in general, to be faithful; notwithstanding the confession made by Ingulphus, abbot of Croyland, that, with respect to his abbey, the return was partial and false. For it does not appear that the design imputed to Ralph Flambard, as minister to William Rufus, of making another and more rigorous inquisition, was ever put in execution, or that any amendments were made in either of the books. It appears, that many lands are declared in these records to be of much greater value when this survey was made, than in the time of Edward the Confessor, and capable of being still very considerably improved by more cultivation. But, from other evidence, it appears, that the four northern counties were then, for the most part, in a waste and desolate condition; which, we may imagine, was one reason of their not being surveyed together with the others. And, indeed, it is surprising, that this defect was not afterwards supplied by a similar inquisition. (Littleton's Hist. Hen. II. vol. iii.) It is called "Liber judicialis," because a just and accurate description of the whole kingdom is contained therein; with the value of the several inheritances, &c.

Camden calls it "Gulielmi Librum censualem, king William's Tax-book."

This book was formerly kept under three different locks and keys; one in the custody of the treasurer, and the others of the two chamberlains of the exchequer. It is now deposited in the chapter-house at Westminster, where it may be consulted, on paying to the proper officers a fee of 6*s*. and 8*d*. for a search, and 4*d*. *per* line for a transcript.

Our ancestors had many dome-books. We are told by Ingulphus, that king Alfred made a like register with that of William the Conqueror. It was begun upon that prince's dividing his kingdom into counties, hundreds, tithings, &c. when an inquisition being taken of the several districts, it was digested into a register, called Domboc, *q. d.* the Judgment-book, and was reposited in the church of Winchester; whence it is also called the "Winchester-book," and "Rotulus Winton." It was compiled for the use of the court-baron, hundred, and county-court, the court-leet, and sheriff's tourn; tribunals, which he established, for the trial of all causes civil and criminal, in the very districts wherein the complaints arose; all of them subject, however, to be inspected, controlled, and kept within the bounds of the universal, or common law, by the king's own courts, which were then itinerant, being kept in the king's palace, and removing with his houshold in those royal progresses, which he continually made from one end of the kingdom to the other. This book is said to have been extant so late as the reign of king Edward IV., but is now unfortunately lost. It probably contained the principal maxims of common law, the penalties for misdemeanors, and the forms of judicial proceedings. And upon the model of this Dom-boc it is, that the Domesday of the Conqueror was formed.

That of king Alfred referred to the time of king Ethelred, and that of the Conqueror to the time of Edward the Confessor: the entries being thus made, "C. tenet rex Gulielmus in dominico, & valet ibi ducatæ, &c. T. R. E. valebat;" *q. d.* it is worth so much tempore regis Eduardi, in the time of king Edward.

There is a third Dom-boc, or Domes-day-book, in quarto, differing from the other in folio, rather in form than matter. It was made by order of the same conqueror, and seems to be the more ancient of the two.

A fourth book there is in the exchequer, called domesday; which, though a very large volume, is only an abridgment of the other two. It has abundance of pictures and gilt letters at the beginning, which refer to the time of Edward the Confessor. There is also a fifth book called Domes-day, and the same with the fourth, now mentioned.

DOMESTIC, from *domus*, house, a term of somewhat more extent than that of servant; the latter only signifying such as serve for wages, as footmen, lacquies, porters, &c., whereas domestic comprehends all who act under a man, compose his family, and live with him, or are supposed to live with him. Such are secretaries, chaplains, &c.

Sometimes domestic goes farther, being applied to the wife and children.

DOMESTIC *gown*, *toga domestica*. See TOGA.

DOMESTICUS, Δομεστικος, in *Antiquity*, was a particular officer in the court of the emperors of Constantinople.

Fabrot, in his glossary on Theophylax Simocatta, defines domesticus to be any person entrusted with the management of affairs of importance; a counsellor, "cujus fidei graviores alienjus curæ & solicitudines committuntur."

Others hold, that the Greeks called domestici those who at Rome were called comites; particularly, that they began to use the name *domesticus*, when that of count was become a name of dignity, and ceased to be the name of an officer in the prince's family.

Domestici, therefore, were such as were in the service of the prince, and assisted him in the administration of affairs; both those of his family, those of justice, and those of the church.

The grand DOMESTIC, *Megadomesticus*, called also absolutely the domesticus, served at the emperor's table, in quality of what we occidentals call *dapifer*. Others say he was rather what we call a *majordomo*.

DOMESTICUS *mensæ* did the office of grand seneschal, or steward.

DOMESTICUS *rei domesticæ*, acted as master of the houshold.

DOMESTICUS *scholarium*, or *legionum*, had the command of the reserved forces, called *scholæ palatinæ*, whose office was to execute the immediate orders of the emperor.

DOMESTICUS *murorum*, had the superintendance of all the fortifications.

DOMESTICUS *regionum*, that is, of the east and west, had the care of public causes, much like our attorney or solicitor-general.

DOMESTICUS *icanatorum*, or of the military cohorts.

There were diverse other officers of the army, who bore the appellation domesticus, which signified no more than commander or colonel. Thus, the domestic of the legion called optimates was the commander thereof.

DOMESTICUS *chori*, or *chanter*, whereof there were two in the church of Constantinople; one on the right side of the church, and the other on the left. They were also called protopsaltes.

Dom. Magri distinguishes three kinds of domestici in the church: "domestic of the patriarchal clergy; domestic of the imperial clergy; that is, master of the emperor's chapel; and domesticus despoinicus, or of the empress. There was another order of domestics, inferior to any of those above mentioned, and called patriarchal domestics.

DOMESTICUS was also the name of a body of forces in the Roman empire. Pancirollus takes them to have been the same with those called protectors; who had the chief guard of the emperor's person, in a degree above the prætorians; and who under the Christian emperors had the privilege to bear the grand standard of the cross.

They are supposed to have been 3500 before Justinian's time, who added 2000 more to the number. They were divided into several companies, or bands, which the Latins called scholæ, some whereof are said to have been instituted by Gordian. Some of them were cavalry and some infantry.

Their commander was called comes domesticorum.

DOMEVRE, in *Geography*, a very small town of France in the department of the Meurthe, chief place of a canton in the district of Toul. It has only 332, but the canton contains 10 289 inhabitants, dispersed in 29 communes on a territorial extent of 310 kiliometres.

DOMEVRE *sous Avière*, a town of France in the department of the Vosges, and district of Epinel; one league N. W. of Epinel.

DOMFRONT, a small town of France in the department of the Orne, chief place of a district, with a population of 1548 individuals. It is situated on a steep mountain in the midst of a forest near the river Varennes, 42 miles N. W. of Alençon and 171 W. of Paris. Long 58° 34′. Its canton comprises 11 communes and 13 226 inhabitants upon a territorial extent of 180 kiliometres.

As chief place of a district Domfront has a sub-prefect, a court of justice, a register-office, and a ranger. The soil of the district is bad, it produces only rye, oats, and apples, which are converted into cyder. There is also some grass land. The trade is chiefly confined to cyder, butter, and cattle.

The whole district comprises seven cantons, 100 communes, an extent of 1315 kiliometres, and a population of 110.526 individuals.

DOMICELLARY *canons*. See CANONS.

DOMICELLUS. See DAMSEL.

DOMIFYING, DOMIFICATION, in *Astrology* the dividing or distributing of the heavens into twelve houses; in order to erect a theme, or horoscope, by means of six great circles, called circles of position.

There are diverse ways of domifying, according to diverse authors. That of Regiomontanus, which is the most usual, makes the circle of position pass through the intersections of the meridian and horizon. Others make them pass through the poles of the world, or the equator; and others through the poles of the zodiac.

DOMINANT, *Fr.* The title given by the musicians of France to the 5th of a key, with a ♯ 3d, as a governing or leading note to a close on the key-note.

Sous dominant is the 5th below the key-note and with us the 4th. As these terms are not wanted in our musical technica nor in the Italian, we wish not to multiply terms of art, which convey no new or useful meaning. The 5th of a key being understood, and a 5th requiring no new language to express it. See FIFTH. Rameau generally gives the name of dominant to every note accompanied by the chord of the 7th, and distinguishes that to the 5th of a key by dominant tonique; but more agree in only calling that with a ♯ 3 dominant tonique. Other 5ths with a 7th they call fundamental. Dominant in canto-fermo implies the sound most frequently repeated.

DOMINATION, in *Theology*, the fourth order of angels, or blessed spirits, in the hierarchy; reckoning from the seraphim. See HIERARCHY, and SERAPH.

DOMINGO, ST., SAN DOMINGO, *Isla Espanola*, *Espanola*, or *Hispaniola*, in French *Saint Domingue*, and in the language of the natives *Hayti*, in *Geography*, one of the great Antilles, is the largest and most fertile of the West India islands. It is situated in the Atlantic ocean between the islands of Jamaica and Cuba on the west, and Porto Rico on the east, in the latitude of 18° 20′ N. and in 68° 40′ W. longitude from Greenwich. Its length from east to west is 800 kiliometres, or about 480 English miles. The breadth

varies from 60 to 100 and even 150 Engliſh miles, and it is about 1800 kilometres, or 1050 miles in circumference. Its ſuperficies is reckoned at 1432 ſquare miles, 69 to a degree, 882 of which conſtituted the Spaniſh part of St. Domingo till the treaty of Baſil (Baſle) of the fourth Thermidor third year of the French Republic (22d of July, 1795) when it was ceded by Spain to France.

This beautiful iſland was diſcovered by Chriſtopher Columbus, who landed at a ſmall bay which he called St. Nicholas, on the 6th day of December 1492. He named the iſland Eſpanola, or Little Spain, in honour of the country by whoſe king he was employed. The inhabitants appeared, ſays Robertſon, who has conſulted the beſt authorities, in the ſimple innocence of nature, entirely naked, their black hair, long and uncurled, floated upon their ſhoulders, or was bound in treſſes around their heads. They had no beards; every part of their bodies was perfectly ſmooth. Their complexion was of a duſky copper colour; their features were ſingular rather than diſagreeable; their aſpect gentle and timid; though not tall, they were well-ſhaped and active. Placed in a medium between ſavage life and the refinement of poliſhed ſociety, their induſtry exceeded the meaſure of their wants. They were governed by ſeven caziques, or kings, who reigned each over a different diviſion of the iſland, and, according to the report of Columbus to the Spaniſh monarch, they were the moſt unoffending, gentle, and benevolent of the human race. Sir Walter Raleigh ſuppoſed, that they were deſcended from the Arrowauk tribe of Guiana.

The Spaniards, on their firſt landing, were conſidered as ſupernatural beings. The inhabitants gladly exchanged their gold againſt bells, beads, or pins. They pointed to the Cibao mountains as the great repoſitory of the metal which their viſitors ſo ardently deſired.

Encouraged by the ſimplicity of the natives, and their fear of the inhabitants of the Caribbean iſlands, their enemies, Columbus reſolved to form a ſettlement on a ſpot which he conſidered as the original ſeat of paradiſe. He left thirty-eight Spaniards under the command of Diego de Arado in his colony, and ſailed for Spain on the 4th of January 1493.

Regardleſs of his inſtructions, the Spaniards, after his departure, gratified their licentious deſires at the expence of the natives to ſuch a degree, that the cazique of Cibao, exaſperated at their inſolence, cut off a part of the coloniſts, ſurrounded the remainder, and deſtroyed their fort.

Columbus, on his return to Hiſpaniola in the month of November of the ſame year, founded a new town in a large plain near a ſpacious bay. This town he named Iſabella, in honour of his patroneſs the queen of Caſtile. On the 24th of April 1494, he left his colony for the proſecution of new diſcoveries; but after an abſence of five months, he found his ſettlement once more on the brink of diſſolution. The continual attempts of the natives to rid themſelves of neighbours, whoſe voracity threatened their deſtruction, compelled Columbus to have recourſe to arms. Thrown into conſternation by the ſuperiority of European warfare, by the attack of twenty horſemen, and by the fierce onſet of an equal number of large dogs, the Indians yielded an eaſy victory.

To gratify the avarice of the Spaniſh court, Columbus, on completing the ſubjection of the iſland, impoſed a tribute on all the natives above the age of fourteen. This taxation cauſed an attempt to ſtarve the Spaniards. The inhabitants pulled up the roots of the vegetables which depended on their agricultural operations, and retiring to inacceſſible mountains, they fell the firſt victims to the famine which they intended for their oppreſſors.

In 1496, Columbus returned to Spain, leaving his brother Bartholomew as lieutenant-governor, and Francis Roldan as chief juſtice. During his abſence, his brother removed the colony to a more eligible ſtation on the oppoſite ſide of the iſland, where he founded a city which he dedicated to St. Domingo, in honour of the name of his father.

Roldan in the mean time excited rebellions among the Spaniards. It was to calm their diſcontents, that Columbus, on his return in 1498, allotted them lands in different parts of the iſland, and appointed the natives to cultivate theſe allotments for their new maſters. This taſk proved to the poor Indians an intolerable ſource of oppreſſion. Proviſions were made for working the mines and cultivating the country: but the plans of Columbus were miſrepreſented, and he himſelf was ſent in chains to Spain. (See Columbus.)

Francis de Bovadilla, the new governor, to render himſelf popular, gratified the avaricious inclinations of his countrymen. He numbered all the remaining Indians, and dividing them into claſſes, diſtributed them among the Spaniards, who ſent them to the mines, and impoſed on them ſuch a diſproportioned labour, as threatened their utter and ſpeedy extinction.

On his arrival in Spain, Columbus was inſtantly ſet at liberty, and Bovadilla diſgraced. Nicholas de Ovando replaced the latter, and brought to St. Domingo a moſt reſpectable armament, conſiſting of thirty-two ſhips with 2500 ſettlers. Bovadilla, with Roldan and his accomplices, were ordered to return to Spain.

In the mean time, Columbus obtained permiſſion in 1502 to make a fourth voyage of diſcovery to the eaſt: but having experienced ſome inconvenience from one of his veſſels, he altered his courſe and bore away for St. Domingo, with the hope of exchanging it againſt a ſhip of Ovando's fleet. He found indeed eighteen veſſels richly laden ready to depart for Europe: but was refuſed acceſs to the harbours of the country which he had diſcovered. (See Columbus.)

Under the government of Ovando, the natives of St. Domingo were relieved from compulſory toil: but without the aſſiſtance of the inhabitants, the Spaniards could not cultivate the ſoil nor work the mines. Many of the new ſettlers quitted the iſland, and great numbers died of diſorders incident to the climate.

Theſe circumſtances induced Ovando to make a new diſtribution of the Indians among the Spaniards, with the difference only, that the Indians were to be paid for their labour. He alſo endeavoured to turn the attention of his countrymen to the purſuits of agriculture, and having obtained from the Canary iſlands ſome ſlips of the ſugar cane, which throve exceedingly, he tempted them to form ſugar plantations. The colony flouriſhed, but the ſource of its proſperity was very nearly dried up. Fatigue, to which they were unequal, diſeaſes, famine, and deſpair, reduced the natives, in the ſpace of fifteen years, to ſo inconſiderable a number, that Ovando, to ſupply their diminution, decoyed forty thouſand of the inhabitants of the Lucay or Bahama iſlands into Hiſpaniola.

In the year 1509 Ovando was recalled to make room for Diego, the ſon of Columbus, whoſe arrival, however, effected no change in the condition of the unfortunate Indians. His government would have rendered the colony proſperous and happy, had he not been thwarted in ſeveral meaſures by his inferior officers. The power of making out the *repartimientos* of the natives was even taken from the governor and conferred upon Roderigo Albuquerque. This induced him to return to Spain.

Albuquerque ordered a new numeration of the natives in

1517. Although their number did not exceed 14,000, he yet put them up to sale, and by a consequent separation from the habitations to which they had been accustomed, and the imposition of additional labour for the indemnification of their purchasers, he completed the extinction of this unfortunate people, which Las Casas in vain endeavoured to prevent. Benzoni asserts that towards the middle of the sixteenth century, scarcely one hundred and fifty of the natives of St. Domingo remained alive.

In 1586, sir Francis Drake came before the island, pillaged the capital, destroyed one third part of it, and accepted of about 7000 *l.* sterling, as a ransom for the remainder.

The colonists, in the mean time, degenerated from the spirit and manners of their ancestors. Associating with their female slaves, they became a mixed colony, of which Spaniards formed a very small part. The mines were deserted; agriculture was neglected, and the cattle ran wild in the plains. The Spaniards became demi-savages, plunged in the extremes of sloth, living upon fruits and roots, in cottages without furniture, and most of them without clothes. The colony was reduced to the necessity of adopting pieces of leather as a circulating medium.

While Spain neglected St. Domingo, its vigilance was absurdly directed to prevent other powers participating in the produce of the island, or in the acquisition of any territory in the West Indies. But notwithstanding this care, the English and French, during a war with Spain, had become acquainted with the Windward islands, and having taken possession of the island of St. Christopher, on the same day, had divided it into two equal shares. They were soon attacked in their new settlement by the Spaniards, and those who were not either killed or taken, fled for refuge to the neighbouring islands. A small number retreated to the little barren isle of Tortuga, lying off the north-west coast of Hispaniola, and within a few leagues of Port de Paix.

By the middle of the seventeenth century these refugees in the island of Tortuga assumed an appearance as formidable as it was singular. (See BUCCANIERS, FREEBOOTERS, and FLIBUSTIERS.) They had gradually obtained notice under the appellation of Buccaniers, from the mode of curing animal food, which they procured by hunting the cattle with which the Spaniards had stocked St. Domingo.

Afraid of their more active neighbours, the indolent colonists determined to destroy all the bulls by a general chase. This had the effect of turning the attention of the Buccaniers to the more permanent pursuits of agriculture. They planted tobacco, and the most intrepid began predatory excursions on the neighbouring ocean. Several Spanish armaments were commissioned for their extirpation: but after having alternately lost and recovered Tortuga, the Buccaniers, mostly French, under a captain of their own choice and nation, ultimately retained it, and soon after obtained a firm footing in St. Domingo, almost at the same time when their English companions in arms possessed themselves of Jamaica.

Though separated from each other the English and French still continued to act in concert, the latter retiring after the conflict to St. Domingo to share their booty, and the former to Jamaica. They continued to increase in force and to depress the Spaniards, till at length a few successive defeats on the ocean turned their attention to agriculture. It was then that the infant colony of St. Domingo attracted the notice of the French government.

Bertrand Dogeron, a man of uncommon talents, probity, and fortitude, was deputed by France to form the planters, whose number did not exceed four hundred, into a more regular society. Although he had been unsuccessful in his own commercial enterprizes, he yet succeeded in civilizing the half barbarian colonists by the introduction of French women, by reconciling the idle to labour, by affording the principal encouragement to the planters, and by alluring new inhabitants to the island. At the end of four years, in 1669, the number of planters amounted to more than fifteen hundred.

The injudicious measures of the French West India company caused the inhabitants of St. Domingo to have recourse to arms in 1670. Tranquillity was restored at the price of a free trade to France, subject to a duty of five *per cent.* paid to the company by all ships on their arrival and departure.

The colony prospered under the benevolent regulations of Dogeron, but after his death, which happened in 1673, it languished under the oppressive monopoly of exclusive trading companies. Three years before his death the town of cape François had been founded by Gobin, a French Protestant, whom the persecutions of the bigotted Louis XIV. had driven to this distant asylum.

Several slaves having been taken from the English in the war of 1688, the inhabitants of St. Domingo began to turn their attention to the culture of the sugar cane. With this view they continued to increase their stock of negroes by every means in their power, and in 1694 taking advantage of the misfortunes which had befallen the English colony of Jamaica, they effected a landing in that island, and carried off a considerable number of negro slaves. The year following, the English, in their turn, attacked the settlement of cape François, which they plundered and reduced to ashes. It was, however, soon rebuilt on the same site.

By the peace of Ryswick, the French obtained the first regular cession of the western part of St. Domingo. In 1702, Port au Prince was made the seat of the government, but the town of the cape continued in every other respect the capital of the colony.

In proportion as the French flourished in St. Domingo, the Spaniards decayed. Their colony, which in the time of Herrera, counted 14,000 Castilians, besides a proportional number of other inhabitants, had, in 1717, only 18,410 individuals of every description; whilst, according to Raynal, the produce of the French colony, in 1720, amounted to 1,200,000 lb. of indigo, 1,400,000 lbs. of white sugar, and 21,000,000 lbs. of raw sugar.

From the year 1722, when the French colony of St. Domingo was freed from the yoke of exclusive trading companies, it rose gradually to the highest pitch of prosperity. In the year 1754, the amount of the various commodities of the colony was equal to 1,261,469 *l.* sterling, and the imports from the mother country amounted to 1,777,509 *l.* sterling. There were 14,000 white inhabitants, nearly 4000 free mulattoes, and upwards of 172,000 negroes; 599 sugar plantations, 3379 of indigo, 98,946 cocoa trees, 6,300,367 cotton plants, and near 22,000,000 cassia trees; 63,000 horses and mules, 93,000 heads of horned cattle, 6,000,000 banana trees; upwards of 1,000,000 plots of potatoes; 226,000 plots of yams; and near 3,000,000 trenches of manioc.

Even the Spanish government was excited to some degree of emulation. About the year 1757, a company was privileged at Barcelona, to attempt a re-establishment in the eastern part of the island; but it was only in 1765, when Charles III. opened a free trade to all the Windward islands, that Hispaniola, so long depressed by absurd regulations, recovered something of its former activity. During the five years preceding 1774, the custom-house duties were more than doubled.

The progress of the French, in the mean time, was extremely rapid. Their slaves increased to 206,000, and in 1767, they loaded 347 ships for France. But on the 3d of June, 1770, a dreadful earthquake levelled Port au

Prince with the ground. It was, however, rebuilt with additional convenience.

In 1776, a new line of demarcation was drawn between the Spanish and French part of St. Domingo, and the Spaniards opened a more liberal commerce with their neighbours. Yet their colony and their trade continued greatly inferior to the French. At the epoch of the French revolution, in 1789, the Spaniards had only four and twenty sugar works. They paid with raw sugar, hides, timber, and piastres, for the small number of cargoes they received from Europe. Besides 11,000 heads of cattle, they furnished the French part of St. Domingo with horses, mules, and some tobacco. Next to the ancient city of St. Domingo, their principal towns were Monte Christi, La Vega, St. Jago, Zeibo, St. Thomé, Azua, and Isabella.

At the time of its cession to France, the Spanish part of St. Domingo counted only 125,000 inhabitants, 110,000 of whom were free people, and 15,000 negro slaves. Land was at six French livres, or 5*s.* the arpent; and labour at two French livres, sixty-one centimes, or a little better than 2*s. per* day.

From 1776 till 1789, the prosperity of the French colony of St. Domingo was at its greatest height. It was divided into the northern, western, and southern provinces. The first extended about forty leagues along the northern coast, from the river Massacre to cape St. Nicholas, and contained, inclusive of the island of Tortuga, 26 parishes. The principal towns were cape François, fort Dauphin, Port de Paix, and cape St. Nicholas. The western province commenced at this cape, and terminated at cape Tiburon. It contained fourteen parishes; its chief towns were Port au Prince, St. Marc, Leogane, Petit-Goave, and Jérémie. The southern province occupied the remaining coast from cape Tiburon to l'Anse-à-Pitre, and contained ten parishes and two towns, Cayes and Jacmel.

The cultivated land in the French colony of St. Domingo amounted to 2,290 000 English acres, or 771,275 carreaux of French measurement, 350 feet on every side to the carreau. Mr. Barbé Marbois, in his "Compte rendu des finances de St. Domingue, en 1789," reckons the cultivated land at 570,210 carreaux only. There were 792 sugar plantations, 2810 coffee plantations, 705 cotton plantations, 3097 indigo plantations, 69 cacao plantations, and 173 distilleries of rum.

The produce of these different plantations, in 1788, consisted of 163,405,500lb. of sugar, 68,151,000lb. of coffee, 6,289,000lb. of cotton, 930,000lb. of indigo, 150,000lb. of cacao, 34,453,000lb. of syrup, worth in all, with some less important articles, 135,763,000 French livres. It was sent to France in 686 vessels of 199,122 tons. The goods imported into the colony from different ports of France, in 465 vessels of 138,624 tons, amounted to the value of 54,578,000 French livres.

Before the last revolution, the exportation from the whole island employed 1070 vessels, navigated by 7936 seamen.

The population, which in 1775, was of 32,600 white, consisted in 1788, according to Mr. Barbé Marbois, of 27,717 white, of whom there were 14,571 males, 4482 females, and 8664 children; of 405,564 negro slaves, of whom there were 174 971 males, 138,800 females, and 91,793 children; and of 21,808 free people of colour.

Of the whole island, the population, in 1801, is said to have amounted to 42,000 whites, 44,000 free people of colour, and 600,000 blacks.

At the cession of the Spanish part of St. Domingo to the French, the whole island was divided into five departments, of the south, of the west, of the north, of Samana, and of l'Inganne.

The department of the south was sub-divided into 25 cantons, *viz.* Leogane, Grand Goave, Petit Goave, Fond des Négres, l'Anse à veau, l'île de la Cayemite, Petit Trou, Jérémie, l'île à vache, Torbeck, Cayes du fond, Cavaillon, Saint Louis, Acquin, Beynet, Jacmel, Plimouth, Cap d'Anne Marie, Tiburon, Les Coteaux, Port Salut, Cayes de Jacmel, Paletrou, Neybe, Ile de Béate.

The department of the west was divided into 13 cantons, *viz.* Port au Prince, les Gonaïves, Saint Marc, Petite Riviere, Verrettes, Mirebalais, Banica, l'Arcahaye, Croix des bouquets, l'île de la Gonave, San Juan, Saint Thomé, Asua.

The department of the north was divided into 33 cantons, *viz.* Monte Christo, Laxavon, Ouanaminthe, fort Dauphin, Terrier Rouge, Trou, Vallière, Limonade, Grande Riviére, Sainte Susanne, Le quartier Morin, la Petite Anse, le Cap, la Plaine du Nord, l'Acul, le Limbé, le Port Margot, le Borgne, Plaisance, Petit Saint Louis, Tortuga, or l'île de la Tortua, Dondon La Marmelade Hinche, San Raphael, San Miguel, l'Altalaya, le Port de Paix, le Gros Morne, Jean Rabel, le Môle St. Nicholas, Bombarde, le Port à Piment.

The department of Samana was divided into five cantons, *viz.* San Yago, La Vega, Porto Plata, Cotin, Samana.

The department of l'Inganne was divided into ten cantons, *viz.* Santo Domingo, Monte Plata, Zeibo, Higney, Baya Guyana, Baya, Ile Sainte Catherine, San Lorenzo, Illegnos, Ile la Saône.

But France never enjoyed this accession of territory in her most important colony. Several years before the treaty of Basle, the spirit of revolt had broken out in the French part of St. Domingo, and in the year 1791, a most alarming insurrection of the negroes had deluged half of the northern province with blood. In two months upwards of 2000 white persons perished; 1200 families were reduced to indigence; 180 plantations of sugar, about 900 of coffee, cotton, and indigo, were destroyed, and the buildings consumed by fire. Destruction every where marked the progress of the blacks, and resistance, says Mr. Edwards, who was an eye witness of their ravages, was considered as unavailing and hopeless. From the northern province the rebellion spread to the west, where, it was, however, soon quelled by the concordat of the 12th of September.

The wavering conduct of the first national assembly of France, with respect to the abolition of the negro slavery; the decree of the legislative assembly, which acknowledged the political equality of the free negroes and people of colour with the whites; the appointment of three commissioners noted for the violence of their republican principles; and the arrival of a force of 8000 men in the month of September 1792, instead of restoring the peace of the colony, kept alive the flame of discontent, which raged with renovated fury in 1793, when the two remaining commissioners of the convention, Santhonax and Polverel, proclaimed the emancipation of all the slaves in the colony. On the 21st of June, Macaya, a leader of the blacks, entered cape Francois with upwards of 3000 slaves, and begun an indiscriminate slaughter.

Under these circumstances, some of the planters prevailed with the British government to take possession of St. Domingo. A small armament of about 870 rank and file, sent from Jamaica, took Jérémie and the mole of cape St. Nicholas. In the middle of January, 1794, the British troops entered Tiburon, and directed their views towards Port de Paix. The fort of l'Acul, in the vicinity of Leogane, was carried on the 19th of February; fort Bigotton, on

on the road from Leogane to Port au Prince, was taken on the 31st of May, and the town of Port au Prince surrendered on the 4th of June. But from this period the British power in St Domingo declined; the yellow fever manifested itself among the troops; 40 officers, and 600 rank and file fell victims to its ravages within two months after the surrender of port au Prince.

In the mean time the French commissioners, Santhonax and Polverel, returned to France. Rigaud, a mulatto, and a negro named Toussaint l'Ouverture, who headed the army of the blacks, re-captured Tiburon, Leogane, Jean Rabel, la Petite Riviere, and retained the whole of the northern province, except the Mole and fort Dauphin. In the month of May, 1795, sir Adam Williamson, governor of Jamaica, arrived at Port au Prince, as commander in chief of the British forces, but was soon succeeded in command by major-general Forbes.

A reinforcement of about 7000 British troops arrived at the Mole of St. Nicholas in May 1796; but a dreadful mortality impeded the progress of the British arms. The republicans commenced operations in every quarter round the capital, and at the very time when general Simcoe arrived at St. Domingo to recover the British character, the celebrated Toussaint l'Ouverture received the sanction of the command which he had long possessed, by being appointed general in chief of the armies in St. Domingo by the French government.

General Simcoe returned to England in August 1797, General Maitland, who arrived at Port au Prince in April 1798, withdrew the remainder of the English forces to Jérémie, and at last surrendered all the British possessions in St. Domingo, and evacuated the island.

At this time the force of Toussaint l'Ouverture, in the northern province, amounted to something less than 40,000 men, but in the year 1800 it had increased to more than double that number. The independence of St. Domingo was proclaimed on the first of July 1801.

But in the month of December 1801, an expedition sailed from France with a force of 20,000 men, commanded by general le Clerc, brother-in law to Bonaparte, the first consul of the French republic. They arrived in the bay of Samana, on the eastern coast of the island, on the 28th of the same month. But before they entered cape François the city was laid in ashes.

On the 17th of February 1802, general le Clerc commenced his campaign, and fought with varied success until the first of May, when hostilities ceased with generals Toussaint l'Ouverture and Christophe. During this treacherous truce the unfortunate Toussaint l'Ouverture was surprised in his plantation and conveyed a prisoner on board a French vessel with his wife and children. He lingered in a French dungeon till the month of April 1803, when death put a term to his unjust sufferings. But even the nature of his death must have been a torment inflicted by his persecutors, as the floor of the dungeon is reported to have been found actually covered with water.

The perfidy experienced by the great and benevolent leader of the blacks roused them to a renovated and more vigorous opposition. General Christophe rejoined the black forces under Dessalines. A number of new chiefs arose and numerous defections from the French army inspired the negroes with increased confidence. Those who had been incorporated with the French troops were exterminated with the most unheard of cruelty. The use of bloodhounds was even introduced against them. But contagious diseases seemed to punish these enormities.

By the middle of October 1802, fort Dauphin, Port de Paix, and several other important posts, were again completely lost to the French. Their general in chief, Victor Emanuel le Clerc, died in the night of the first of November. His successor, Rochambeau, continued the war with no better fortune until the beginning of the year 1803, when another treacherous cessation of arms gave place to new but secret cruelties.

During this armistice the blacks under Dessalines received daily fresh reinforcements. At its expiration they drove the French into the cape, and on the 30th of November, 1803 forced them to surrender and evacuate the island. To avoid being sunk with red-hot shot in the harbour, the French put themselves under the protection of an English squadron, then cruizing before the cape, which conveyed them prisoners to Jamaica. General Rochambeau was sent to England.

The independence of St. Domingo was proclaimed on the 29th of Nov. 1803, and to obliterate every remembrance of their former slavery, the chiefs, who had effected the freedom of the island, restored to it on the first of January, 1804, with its pristine simplicity of government, its ancient name of Hayti. In the beginning of May general Dessalines was invested with the government of the island for life, and on the 8th of September he assumed the title of emperor of Hayti, by the name of Jaques the First. His reign, however, was not of long duration. He fell in a conspiracy, and republican principles revived at his death, under the alternate command of generals Christophe and Petion. (See HAYTI.) (Marcus Rainsford's Black Empire of Hayti, 1805. Bryan Edwards's St. Domingo. Barré Marbois's Compte rendu des Finances de St. Dominique 1789. Page's Traité de l'Economie politique et de Commerce des Colonies, 1802. Lyonnet's Statistique de la partie Espagnole de St. Dominique, 1800. Herbin's Statistique de la France, vol. vii, 1803.)

DOMINGO, *St.*, a little walled town of Spain, in Old Castile, containing a church, an episcopal palace, two convents, an hospital, &c.; eight leagues west of Logrono, in a fertile plain, on the rivulet Oja.

DOMINGO, *St., Company of.* See COMPANY.

DOMINI, *Bull in Cœno.* See BULL.

DOMINIAL OFFICES. See OFFICE.

DOMINICA, ISLAND OF, in *Geography*, an island of the West Indies, situated between 15° 20′ and 15″ 45′ N. lat. and 61° 23′ and 61° 30′ W. long.; so called by Christopher Columbus, from the circumstance of its having been discovered by him on a Sunday, November 3, 1493. This island, as well as St. Vincent, and several other islands, were included in the earl of Carlisle's patent, dated June 2, 1627, and, therefore, attempts were made at different times to bring them under the English dominion. But these attempts proving ineffectual, it was stipulated between the English and French by the treaty of Aix-la-Chapelle, in 1748, that Dominica, St. Vincent, St. Lucia, and Tobago, should remain neutral, and that the ancient proprietors, the Charaibes, should be left in unmolested possession. But no sooner was the treaty of neutrality concluded, than both the English and French appeared to be dissatisfied with the arrangement which they had made. The Charaibes, however, were little regarded; for in the 9th article of the peace of Paris, in 1763, the three islands of Dominica, which, in 1759, had fallen by conquest under the English dominion, St. Vincent, and Tobago, were assigned to Great Britain, and St. Lucia to France; and the Charaibes were not mentioned in the whole transaction. Indeed they were reduced to a small remnant; for of the ancient, or as they were called by the English, the red Charaibes, not more than 100 families survived in 1763, and of all their ancient exten-

sive

five poſſeſſions, they retained only a mountainous diſtrict in the iſland of St. Vincent. Although Dominica previouſly to this period had been conſidered as a neutral iſland, many of the ſubjects of France had eſtabliſhed coffee plantations, and other ſettlements, in various parts of the country; and it reflects honour on the Britiſh adminiſtration, that theſe people were ſecured in their poſſeſſions, on condition of taking the oaths of allegiance to his Britannic majeſty, and paying a ſmall quit-rent. The cultivable lands, to the amount of 94,345 acres, comprehending one-half of the iſland, were ſold in aliotments from 50 to 100 acres, yielding the ſum of 312,092 *l.* 11*s.* 1*d.* ſterling money.

The French inhabitants are ſtill more numerous than the Engliſh, and poſſeſs the moſt valuable coffee-plantations, the produce of which has hitherto been found its moſt important ſtaple. They differ but little in manners, cuſtoms, and religion from the inhabitants of the other French iſlands in the Weſt Indies, and their prieſts have been appointed by ſuperiors in Martinico; to the government of which iſland, and to the laws of their own nation, they uſed to conſider themſelves to be amenable. At the commencement of the American war, the iſland of Dominica was in a flouriſhing ſituation. The port of Roſeau, or Charlotte's town, having been declared a free port by act of parliament, was reſorted to by trading veſſels from moſt parts of the foreign Weſt Indies, as well as from America. The French or Spaniards purchaſed many negroes there for the ſupply of their ſettlements, together with vaſt quantities of the merchandize and manufactures of Great Britain, for which payment was made chiefly in bullion, indigo, and cotton, and completed in mules and cattle. In 1778, the French, attracted by the fertility of the iſland, encouraged by its defenceleſs ſtate, and invited by ſome of their former fellow-ſubjects, prepared a naval and military armament againſt the iſland under the command of the marquis de Bouillé, governor of Martinico, who made himſelf maſter of it after an obſtinate reſiſtance. Dominica remained in the poſſeſſion of the French during five years and three months, and by the failure of its trade was reduced to great diſtreſs. But in January 1783, it was again reſtored to the government of England, the legiſlative authority was veſted in a governor, with an annual ſalary of 1200*l.* ſterling, beſides fees of office, a council of 12 gentlemen, and an aſſembly of 19 members.

Dominica contains 186,436 acres of land; and is divided into 10 parihes. Its capital is *Roſeau*, which ſee. The iſland is 29 miles in length, and may be reckoned 16 miles in breadth. It contains many high and rugged mountains, interſperſed with fine valliies, which generally appear to be fertile. Several of the mountains exhibit unextinguiſhed volcanoes, which frequently diſcharge vaſt quantities of burning ſulphur. From theſe mountains alſo iſſue ſprings of hot water, ſome of which are ſuppoſed to poſſeſs great virtue in tropical diſorders. In ſome places the water is ſaid to be hot enough to coagulate an egg. In the woods are innumerable ſwarms of bees, which live in the trees, and produce great quantities of wax and honey, equally good with any in Europe. The bee is ſaid to be the European ſpecies, which muſt have been tranſported hither; as the native bee of the Weſt Indies is a ſmaller ſpecies, without *ſtings*, and very different from the European. The iſland is well watered, having upwards of 30 fine rivers, beſides a great number of rivulets. The ſoil, in the greateſt part of the interior country, is a light brown-coloured mould, which appears to have been waſhed from the mountains. Towards the ſea-coaſts, and in many of the valliies, it is a deep, black, and rich native earth, and ſeems well adapted to the cultivation of all the articles of Weſt Indian produce. The under ſtratum is, in ſome parts, a yellow, or brick clay, in others a ſtiff terrace, but in moſt places it is very ſtony. The fertile land bears a ſmall proportion to the whole; there being no more than 50 ſugar plantations, which, one year with another, do not produce annually more than 3000 hogſheads of ſugar. Coffee ſeems to ſuit the ſoil better than ſugar; as there are more than 200 coffee-plantations, which, in favourable years, have produced three millions of pounds weight. A ſmall part of the lands is alſo applied to the cultivation of cacao, indigo, and ginger. The number of white inhabitants appeared, in 1788, to be 1236, of free negroes, &c. 445, and of ſlaves 14,967. Of the ancient natives, or charaibes, there are alſo from 20 to 30 families. Theſe are quiet and inoffenſive, ſpeak a language of their own, and a little French, but none of them underſtand Engliſh. They are of a clear copper colour, with long, ſleek, black hair; their perſons are ſhort, ſtout, and well made, but they diſfigure their faces, by flattening their foreheads in infancy. They live chiefly by fiſhing in the rivers and ſea, or by fowling in the woods, uſing their bows and arrows with wonderful dexterity. It is ſaid that they will kill the ſmalleſt bird with an arrow at a great diſtance, or transfix a fiſh at a conſiderable depth in the ſea. They diſplay alſo great ingenuity in making curiouſly wrought panniers, or baſkets, of ſilk graſs, or the leaves and barks of trees. Their race is now almoſt extinct. The exports of the iſland, from January the 5th, 1787, to Jan. 5th, 1788, were 71,302 cwt. of ſugar, 63,392 gallons of rum, 16,803 gallons of melaſſes, 1 194 cwt. of cacao, 18,149 cwt. of coffee, 11,250lbs. of indigo, 970,816lbs. of cotton, 161 cwt. of ginger, with miſcellaneous articles, ſuch as hides, dyeing woods, &c. to the value of 11,912*l.* 10*s.* 9*d.* Edwards's Weſt Indies, vol. i.

Dominica, *La*, or *Ohevahooa*, the largeſt of the Marqueſas iſlands, in the South Pacific Ocean, extending E. and W. 6 leagues; its breadth is unequal, but it is about 15 or 16 leagues in circuit. It is full of rugged hills, riſing in ridges directly from the ſea; which ridges are diſjoined by deep vallies, clothed with wood, as are the ſides of ſome of the hills; its aſpect is barren; nevertheleſs, it is inhabited. S. lat. 9° 44′ 30″. W. long. 139° 13′ at its weſt end. See Marqueſas.

Dominica, *La*, a town of the iſland of Cuba; 45 miles W. of Havanna.

DOMINICAL Letter, in *Chronology*, properly called Sunday Letter, one of the ſeven letters of the alphabet A B C D E F G, uſed in almanacs, ephemerides, &c. to denote the Sundays throughout the year.

The word is formed from *Dominica*, or *Dominicus dies*, Lord's day, Sunday.

The dominical letters were introduced into the calendar by the primitive Chriſtians, in lieu of the nundinal letters in the Roman calendar.

Theſe letters, we have obſerved, are ſeven: and that in a common year, the ſame letter ſhould mark all the Sundays will eaſily appear; inaſmuch as all the Sundays are ſeven days apart, and the ſame letter only returns in every ſeventh place. But in the biſſextile, or leap year, the caſe is otherwiſe, as we have already ſtated and explained under the article Cycle *of the Sun*, to which the reader is referred.

To find the Dominical letter of any given year. Seek the cycle of the ſun for that year, as directed under Cycle *of the Sun;* and the dominical letter is found correſponding to it in the table annexed to that article; where the method of finding the dominical letter for any year, of any century, is explained. When there are two, the propoſed year is biſ-

ſextile;

fextile; and the first obtains to the end of February; and the last for the rest of the year.

Thus, the year 1809 being the 26th of the cycle, the letter in the table corresponding to it is A.

The dominical letter may be found universally for any year of any century, by the following canon:

"Divide the centuries by four; and twice what does remain
Take from six; and then add to the number you gain
The odd years and their fourth; which dividing by seven,
What is left take from seven, and the letter is given."

Thus, for the year 1809, if the number of centuries, 18, be divided by 4, we shall have a remainder of 2, and twice 2 or 4, taken from six, leaves 2; to which add 9 of the odd years, and 2 their fourth part, we shall have the sum 2 + 9 + 2 = 13, and 13, divided by 7, leaves the remainder 6, which, taken from 7, gives 1, or A, the dominical letter required. It is evident, that four Gregorian centuries, containing three centesimal common years, which remove the letter two forward, and one centesimal leap-year, which removes it one forward, will complete a revolution of the letter. Thus, the dominical letter of 1600 is A; of 1700 C; of 1800 E; of 1900 G; of 2000 A, &c. Therefore A, the sixth letter backward from G, is the dominical letter of a bissextile centesimal year; and, as the first common centesimal year brings the letter two forward from A, or two less than six backward from G, the remainder, after dividing the centuries by 4, must be doubled; and so we shall have 6 − 2 = 4 to be added to the odd years, and their 4th, in the second common century; and 6 − 4, or 2, must be added in the third, and 0 in the 4th, because the Gregorian bissextile recurs, and the number of centuries may be divided by 4, without leaving any remainder.

By the reformation of the calendar under pope Gregory, the order of the dominical letters was again disturbed in the Gregorian year; for the year 1582, which, at the beginning, had G for its dominical letter: by the retrenchment of ten days after the 4th of October, came to have C for its dominical letter; by which means the dominical letter of the ancient Julian calendar is four places before that of the Gregorian; the letter A in the former answering to D in the latter. When the dominical letter is known, the day of the week corresponding to any day of the month may be easily found by the following canon:

"At Dover Dwells George Brown Esquire,
Good Christopher Finch And David Fryer."

These words correspond to the 12 months of the year, and the first letter of each word marks in the order of the dominical letters the first day of each month; whence any other day may be easily found. *E. G.* Let it be required to find on what day of the week Christmas day, or the 25th of December, falls in the year 1808, the dominical, or Sunday letter, of which is B. Fryer answers to December, and the first day is F, *i. e.* B being Sunday, it is Thursday, and, therefore, Christmas day, or the 25th, is Sunday.

Dominical, in *Church History*. The council of Auxerre, held in 578, decrees, that women communicate with their dominical. Some authors contend, that this dominical was a linen cloth, wherein they received the species; as not being allowed to receive them in the bare hand. Others will have it a kind of veil wherewith they covered the head. The most probable account is, that it was a sort of linen cloth, or handkerchief, wherein they received, and preserved the eucharist, in times of persecution, to be taken on occasion at home. This appears to have been the case by the practice of the first Christians, and by Tertullian's book "Ad Uxorem."

Dominical was also formerly used in the same sense with homily.

DOMINICANS, an order of religious, called in some places Jacobins, in others Predicants, or Preaching Friars, and in others *Fratres majores*, by way of opposition to the Franciscans, who called themselves *Fratres minores*. See Jacobins, &c.

The Dominicans take their name from the founder Dominic de Guzman, a Spanish gentleman, born in 1170, at Calaroga, in Old Castile. He was first canon and archdeacon of Osma; and afterwards preached with great zeal and vehemence against the Albigenses in Languedoc, where he laid the first foundation of his order. It was approved of in 1215, by Innocent III. and confirmed in 1216, by a bull of Honorius III. under the title of St. Augustin; to which Dominic added several austere precepts and observances, obliging the brethren to take a vow of absolute poverty, and to abandon entirely all their revenues and possessions; and also the title of "Preaching Friars," because public instruction was the main end of their institution.

The first convent was founded at Tholouse by the bishop thereof, and Simon de Montfort. Two years afterwards they had another at Paris, near the bishop's house; and some time after, *viz.* in 1218, a third in the rue St. Jaques, St. James's-street, whence the denomination of Jacobins.

Just before his death, Dominic sent Gilbert de Fresney, with twelve of the brethren, into England, where they founded their first monastery at Oxford, in the year 1221, and soon after another at London. In the year 1276, the mayor and aldermen of the city of London gave them two whole streets by the river Thames, where they erected a very commodious convent, whence that place is still called Black Friars, from the name by which the Dominicans were called in England.

St. Dominic, at first, only took the habit of the regular canons, that is, a black cassock, and rochet; but this he quitted in 1219, for that which they now wear, which, it is pretended, was shewn by the blessed Virgin herself to the beatified Renaud d'Orleans.

This order is diffused throughout the whole known world. It has forty five provinces under the general, who resides at Rome; and twelve particular congregations, or reforms, governed by vicars-general.

They reckon three popes of this order, above sixty cardinals, several patriarchs, a hundred and fifty archbishops, and about eight hundred bishops; beside masters of the sacred palace, whose office has been constantly discharged by a religious of this order, ever since St. Dominic, who held it under Honorius III. in 1218.

The Dominicans are also inquisitors in many places. For a further account of Dominic and the Dominicans; see Inquisition.

Of all the monastic orders, none enjoyed a higher degree of power and authority than the Dominican friars, whose credit was great and their influence universal. Nor will this appear surprizing, when we consider that they filled very eminent stations in the church, presided every where over the terrible tribunal of the inquisition, and had the care of souls, with the function of confessors in all the courts of Europe, which circumstance, in those times of ignorance and superstition, manifestly tended to put most of the European princes in their power.

But the measures they used, in order to maintain and extend their authority, were so perfidious and cruel, that their influence began to decline towards the beginning of the sixteenth

teenth century. The tragic ſtory of Jetzer, conducted at Bern in 1509, for determining the uninteresting diſpute between them and the Franciſcans, relating to the immaculate conception, will reflect indelible infamy on this order. (See an account of it in Burnet's Travels through France, Italy, Germany, and Switzerland, p. 31. or Moſheim's Eccl. Hiſt. vol. iv. p. 19.) They were indeed perpetually employed in ſtigmatizing with the opprobrious name of hereſy numbers of learned and pious men; in encroaching upon the rights and properties of others, to augment their poſſeſſions; and in laying the moſt iniquitous ſnares and ſtratagems for the deſtruction of their adverſaries. They were the principal counſellors, by whoſe inſtigation and advice Leo X. was determined to the public condemnation of Luther. The papal ſee never had more active and uſeful abettors than this order and that of the Jeſuits.

The dogmata of the Dominicans are uſually oppoſite to thoſe of the Franciſcans.

They concurred with the Jeſuits in maintaining, that the ſacraments have in themſelves an *inſtrumental* and *official* power, by virtue of which they work in the ſoul (independently of its previous preparation or propenſities) a diſpoſition to receive the divine grace; and this is what is commonly called the *opus operatum* of the ſacraments. Thus, according to their doctrine, neither knowledge, wiſdom, humility, faith, nor devotion, are neceſſary to the efficacy of the ſacraments, whoſe victorious energy nothing but a *mortal ſin* can reſiſt.

There are alſo nuns, or ſiſters of this order, called in ſome places "Preaching Siſters." Theſe are even more ancient than the friars; St. Dominic having founded a ſociety of religious maids, at Prouilles, ſome years before the inſtitution of his order of men; *viz.* in 1206.

There is a third order of the Dominicans, both for men and women.

DOMINION. See PROPERTY and DOMINIUM.

DOMINIS, MARK ANTHONY DE, in *Biography*, a learned Italian prelate, who flouriſhed towards the cloſe of the ſixteenth, and in the ſeventeenth centuries, was deſcended from a family of rank at Arba, a town in Dalmatia. He finiſhed his education at Padua, where he made much proficiency in the different branches of learning. He connected himſelf with the ſociety of the Jeſuits, by whom he was employed as a profeſſor in polite literature, philoſophy, and mathematics. In this important truſt he acquired the higheſt reputation, but finding the duties of his office more laborious than pleaſant, he determined, after twenty years' application, to retire. He was, upon quitting the ſociety, nominated to the biſhopric of Segni, and afterwards to the archbiſhopric of Spalato. In the latter high ſtation, he conſecrated all his talents to the ſervice of his benefactors, the ſenate of Venice, whom he defended with much learning and reſolution, in a diſpute which they had with pope Paul V. who had iſſued an interdict againſt the republic. The inquiſition eſpouſed the cauſe of the pope, but fortunately for Dominis he was out of their reach, and replied to their cenſures without heſitation or fear. His ardent mind was now led to examine the doctrines, the diſcipline, and rights of the church; the reſult was, an entire ſeparation from the papal communion. He openly joined the proteſtants, but was very deſirous of uniting the two churches, and reſolved to withdraw into ſome country in which he might with ſafety mature and publiſh his plans for the purpoſe. He accordingly reſigned his archbiſhopric in favour of a near relation, and ſpent ſome time at Venice for the ſake of the ſociety of father Paul. He came to England in the year 1616, where he was received with reſpect by all ranks, and preached and wrote againſt the church of Rome, with the zeal and ardour of a new convert. He almoſt immediately upon his arrival publiſhed a long letter, addreſſed to all the biſhops of the Chriſtian church, explaining the reaſons which had compelled him to quit his dioceſe. Between the years 1617 and 1620, he publiſhed his great work which he had been long in preparing, and which he hoped would ſtrike a fatal blow at the foundations of the papal power and dominion. This work was entitled, "M. Ant. de Dominis de Republica Eccleſiaſtica," Libri x. in three volumes folio.

He is ſuppoſed to have had a principal concern in the publication of father Paul's hiſtory of the council of Trent, which appeared at London in the year 1619. In England he acquired ſome preferment: was made maſter of the Savoy, and dean of Windſor. Theſe honours and the emoluments attached to them, did not anſwer the expectations which he had formed of the liberality of the Engliſh to a convert, ſo diſtinguiſhed as himſelf, to the proteſtant faith. Diſappointment, or a deſire to return to his native country, induced him to accept of the invitation ſent him in the name of pope Gregory XV. to return to Rome. In 1622, in that city, he renounced the proteſtant faith, abjured all his errors, and aſked pardon in a public conſiſtory for the apoſtacy of which he had been guilty. After this, he made a ſtill more public expoſition of his conduct in a treatiſe entitled, "M. A. de Dominis Archiepiſcopus Spalatenſis ſui reditus ex Anglia conſilium exponit."

By ſuch unmanly conceſſions, which were truly unworthy of a man of ſuperior talents, he was at firſt well received at Rome. This was not ſufficient; he hoped to be admitted to the pope's confidence, which as he could not obtain, and he felt, when too late, that he muſt perpetually remain, notwithſtanding his profeſſions, an object of ſuſpicion, he began to entertain thoughts of coming a ſecond time to England, and of uniting himſelf a ſecond time with the proteſtants. Letters to this effect were intercepted; and De Dominis was inſtantly, at the order of the pope, arreſted and committed a cloſe priſoner to the caſtle of St. Angelo, where he died in 1625, in the 64th year of his age, not without ſuſpicion of poiſon. Some time after his death his body was dug from the grave in which it had been depoſited, and burnt, together with his writings, by a decree of the inquiſition.

De Dominis was author of a work in optics, which obtained the applauſe of the illuſtrious ſir I. Newton, and which is entitled "De Radiis Viſus & Lucis in Vitris perſpectivis et Iride Tractatus." Our great philoſopher complimented the author of this tract ſo far as to declare, that he was the firſt perſon who had explained the phenomena of the colours of the rainbow. Moreri.

DOMINIS, in *Geography*, a group of ſmall iſlands in the Eaſt-Indian ocean, lying off the eaſtern part of *Lingen*, which ſee.

DOMINIUM, DOMINION, in the *Civil Law*, denotes the abſolute power, or property, of a thing, to uſe or diſpoſe of it how we pleaſe.

Directum dominium is the right alone of dominium: and dominium utile, the profit redounding from it. The wife retains the dominium directum of her jointure, and the dominium utile paſſes to her huſband. With reſpect to ſignory, he who pays rent, has the dominium utile of the lands; and the lord he pays it to, the dominium directum.

DOMINIUM, *Dominion*, or *Domaine*, in our *Ancient Cuſtoms*, denotes a rent due to the lord, where the property is not his.

DOMINORUM, AFFIDATIO. See AFFIDATIO.

DOMINUS, or LORD, in *Roman Antiquity*, was expreſ-

five, according to its primitive signification, not of the authority of a prince over his subjects, or of a commander over his soldiers, but of the despotic power of a master over his domestic slaves. Thus Pliny (in Panegyr. c. 3. 55. &c.) speaks of dominus with execration, as synonymous to tyrant, and opposite to prince. Considered in this odious light, it had been rejected with abhorrence by the first Cæsars. Their resistance, however, in process of time, became more feeble, and the name less odious; till at length the style of *our lord* and *emperor* was not only bestowed by flattery, but was regularly admitted into the laws and public monuments. Diocleſian and Maximian usurped even the titles, if not the attributes, of the divinity, and transmitted them to their successors.

Dominus, in *Ancient Times*, a title prefixed to a name, usually to denote the person either a knight or clergyman. See Vice-dominus.

Though the title was sometimes also given to a gentleman not dubbed; especially if he were lord of a manor. See Dom, Gentleman, and Sire.

In Holland, the title dominus is still retained, to distinguish a minister of the reformed church.

Recto quando Dominus *remisit* See Recto.

DOMITIAN, (Titus Flavius Domitianus,) in *Biography*, Roman emperor, was the second son of Vespasian, and born at Rome. October the 24th, A. D. 51. At the close of the reign of Vitellius, and when he was reduced to the necessity of abdicating the empire, Domitian was with his uncle Sabinus, and retired with him into the capitol. When the capitol was besieged and set on fire by the soldiers of Vitellius, Sabinus was taken prisoner, and soon put to death; but Domitian concealed himself in an apartment of the temple, where he remained till the tumult subsided, and then made his escape to the house of a friend. In memory of this deliverance he afterwards erected two monuments; the one, in the life-time of his father, which was a small chapel in honour of Jupiter the preserver, on the spot where he had been concealed, with an altar, and an inscription on the marble, expressing the event that had befallen him; the other was a magnificent temple, built after his accession to the empire, and dedicated to the "Guardian Jupiter," in which he placed a statue of that god holding him in his arms. Upon the tragical death of Vitellius, A. D. 69, Domitian was proclaimed Cæsar, and in the following year he obtained the prætorship, together with the power of consul. When he first took his seat in the senate, he spoke modestly of himself and of his youth. The comeliness of his person added to the graces of his diction; and as his true character was not then known, his blushes were interpreted as a token of the meekness of his temper. Some of his first acts were conciliatory and popular; but he soon threw off the veil that disguised him, and pursued a course of licentiousness and debauchery, which occasioned great uneasiness to his father Vespasian. Addicted to the most infamous pleasures, he corrupted married women, and forced away Domitia, the wife of Elius Lamia, and daughter of Corbulo, and having first kept her as his mistress, he afterwards married her. Ambitious as he was dissolute, he attempted to usurp every kind of authority; and in the most lavish manner he gave away, in one day, upwards of twenty considerable posts in the city and provinces; which made Vespasian say to him, in one of his letters, "I thank you for not having yet sent me a successor, and for your kindness in vouchsafing to let me enjoy the empire." Domitian, jealous of the rising fame which his brother Titus had acquired in the Jewish war, expressed his desire of taking the command against Civilis in Gaul: but Mucian, who at this time possessed the chief power at Rome, wished to divert him from his purpose, fearing lest the precipitance and ardour of his youth, in the conduct of a large army, might induce him to listen to pernicious counsels, and to form projects injurious to the peace and welfare of the state. Mucian, however, was under a necessity of acquiescing, and accordingly he accompanied the young prince to Gaul: but receiving intelligence before they had passed the Alps, of the prosperous exploits of Cerialis, the Roman commander, Mucian dissuaded Domitian from prosecuting his journey, and prevailed with him to remain at Lyons. Here he brooded over the seditious projects which he had formed, and determined, if possible, to accomplish them: he dispatched private emissaries to Cerialis, in order to gain information whether that general was disposed to surrender, in his favour, the command of the army. What were his secret views it is impossible to say; whether he wished to make war against his father, or to form a party against his brother, the event does not ascertain; for Cerialis returned no answer to his proposals, but considered them as childish fancies. Thus disappointed, he resolved to dissemble; and carried his false modesty so far as to renounce the exercise of the prerogatives due to his rank, to retire for the sake of study, and even to write verses, which received the fulsome adulation of the poets of his time, and the commendation even of the judicious Quintilian, although he had no previous taste for poetry, and afterwards held it in great contempt. Thus, however, he endeavoured to mask his ambition, and to avoid giving umbrage to his brother, whose mild and open temper he charged with hypocrisy, and whose virtues he disregarded, and would not even allow to exist.

When Vespasian returned from the East to take possession of the empire, Domitian was the only person who did not partake of the general joy on this occasion, and he alone was unfavourably received in the interview which he had with his father at Beneventum. Vespasian was well apprised of his disposition and conduct, and reposed no confidence in him during his whole reign. Domitian, however, accompanied his father and brother in their triumph, on account of the successful issue of the Jewish war, A. D. 71. Upon the death of Vespasian, this ambitious prince manifested a disposition to dispute, or at least, to share, the empire with his brother, who was unanimously acknowledged his father's successor, both by the senate and army. With this view he thought of doubling the gratification to the troops, which Titus had given them; and he also pretended, that his father's will had been altered, and that it was his intention that his two sons should inherit the empire jointly; for which suggestion there was not the least foundation. His intrigues were continued, and he proceeded so far as secretly to solicit the armies to revolt. Titus, however, though not unapprised of his hostilities, took no measures for securing his person; nor did he desist from treating him with civility and kindness. He made him his colleague in the consulship; and from the first day of his accession to the empire, always declared to him, that, as he had no male issue, he looked upon him as his successor to the empire. When they were alone, he frequently conjured him, even with tears, to second his endeavours, and to return him affection for his kindness. Some have said, that Domitian hastened the death of his brother by poison; a charge, indeed, which is not warranted by the circumstances of Titus's death. (See Titus.) Although, through life, he had been the object of Domitian's envy and hatred, so that he never missed any opportunity which occurred of censuring and reviling him, he caused him, after his death, to be ranked among the gods.

Immediately upon the death of Titus, A. D. 81, Domitian,

tian, who was then 30 years of age, was proclaimed emperor; and having attained this eminence, his character soon began to be developed. For some time, however, he restrained the indulgence of his worst passions, and contented himself with puerile displays of vanity and ostentation. He began his career with accepting all those titles of honour, which other emperors had been generally accustomed to defer till they had done something that seemed to merit them. He did not scruple to declare, in full senate, that the supreme power, to which he had attained, was merely a restitution, on the part of his father and brother, of his right, and which he had condescended to permit them to enjoy; and he caused himself to be appointed consul for ten years to come; so that, adding these to the seven consulships which he had enjoyed under Vespasian and Titus, he prided himself on having been consul 17 times, which was an honour never possessed by any Roman, either before or after him. Instead of 12 lictors he had 24; and after he had once triumphed, he always presided in the senate in his triumphal dress. On the various edifices which he caused to be built, instead of those that had been destroyed by fire, he had his own name inscribed, without the least mention of their first founders; and he filled the world, as Dion Cassius says, with his statues, nor would he suffer any to be erected to him in the capitol, which were not of gold, or at least silver, and of a certain height. In every street and corner of Rome he built triumphal arches, as monuments of his pretended victories. Although the Germans had every where repulsed and defeated him, he assumed the surname of Germanicus, and he gave it likewise to the month of September, in which he ascended the imperial throne; and he ordered October, the month in which he was born, to be called Domitianus, after his own name. He caused himself to be proclaimed "Imperator," or victorious general, 22 times during the course of his reign, though he was almost always shamefully defeated. Not satisfied with the title of Lord and Master, which Augustus and Tiberius had rejected with a kind of horror, he added to it that of God; and this impious style was observed through his whole reign. At the commencement of his reign, notwithstanding all these displays of consummate vanity and arrogance, he performed some acts of humanity and generosity. He restrained the powers of the magistrates of the city and provinces within due bounds; he administered justice with integrity, and severely punished those judges who took bribes; and he issued several laudable edicts for the reformation of manners, though his own private conduct was very unconformable to his public decrees. His treatment of the astrologers was equally inconsistent; for, though he firmly believed in their delusive arts, he passed an edict by which they were all banished from Rome. He suppressed defamatory libels, regulated the police of the theatres, and forbade pantomimes to appear on the public stage. He was for a considerable time an enemy to every kind of rapine and extortion; he insisted on his officers abstaining from all sordid gains; he declined accepting estates that were left him by those who had children of their own; and he discouraged calumniators and informers, alleging, that "the prince who does not punish informers, countenances and encourages them." With a change of circumstances, however, the conduct of Domitian changed. Fond of magnificence and shew, he raised the means of gratifying his ruling passion by tyrannical exactions, and on the most frivolous pretences confiscated the estates of the living and the dead. Incurring boundless expence by building, by theatrical shews and entertainments, and in various other ways, he had recourse to unwarrantable means in order to provide himself with the necessary supply for defraying these charges.

Domitian, in the second year of his reign, made an unprovoked attack on the Catti, a people of Germany, and laid waste their borders; but he was intimidated by a report that they were collecting together their forces, and hastily retreated. On his return to Rome, however, he claimed the honours of a triumph, and hired persons to personate German prisoners. Other instances might be adduced, in order to prove that his ruling passion was vanity; and in the progress of his reign this vanity appeared to be blended with timidity and cruelty, so that in his general conduct and distinguishing character he was one of the most detestable tyrants that ruled the Roman world. Resembling Caligula in his madness, he declared himself a god, and caused temples to be erected to his honour, and divine worship to be paid him. He was fond of flattery, and he found among the poets of his time too many who were disposed to offer him this incense; and, among others, the licentious Martial frequently addressed him as his "dominus deusque," lord and god. His jealousy was always excited by merit and popularity; and those whom he dreaded or declined to put to death, he deprived of posts of honour and command, as was the case with Agricola. One of the most considerable among the public events of his reign was his war with the Dacians (see Dacia,) which, though terminated by a dishonourable peace and treaty, afforded him occasion for a new triumph, and for assuming the surname of Dacicus. In his warlike expeditions, he was commonly carried with effeminate luxury in a litter; and such were his exactions and pillages in his marches, that his presence was dreaded no less than that of the enemy. Jealous of subordinate commanders, and licentious in his own conduct, he enervated discipline, and encouraged licentiousness in his armies. At Rome his chief occupation was the celebration of games and solemn festivals. By anticipating the established period, he assumed the honour of celebrating the secular games. He also instituted a variety of other new games, such as the gymnastic, musical, and equestrian; or rather revived those which had been instituted by Nero, and which were abolished at his death. These games he consecrated to Jupiter Capitolinus. (See Capitoline *Games.*)

In his amphitheatrical shews he was both profuse and cruel. Having caused to be dug an immense lake near the Tiber, he exhibited a sea-fight, in which the ships were so numerous that they formed almost two complete fleets; and during this exhibition, when a heavy rain fell, he would not suffer any of the spectators to withdraw, so that many died in consequence of the cold, which they took on this occasion. The diversions which he appointed often lasted through the whole night; and he exhibited combats of gladiators, and fights of wild beasts, by moonlight, or by the help of torches; and even females ran races and fought in the circus, like gladiators. Savage by nature, his cruelty was cherished by suspicion and distrust; and he often used to say, alluding to an expression of Demosthenes, "that distrust is the people's safeguard against tyrants, and the tyrant's safeguard against all." He is said to have taken an inhuman pleasure in the groans and tears of suffering men. With his cruelty he blended the most refined dissimulation; so that he was never more to be dreaded than when he affected to appear most mild and merciful. The moderation which he assumed emboldened the senators to request him to pass an act for disabling the emperor from putting any member of their body to death, by virtue only of his military power. Domitian, however, hated the senate, and refused to grant them this privilege: and in the exercise of the prerogative he retained, so consonant as it was to his own nature, he put to death several illustrious senators on no other ground than that of their having become the unfortunate objects of his

his suspicion and jealousy. Nor were even the common people exempt from his insatiable vengeance. Acts of cruelty afforded him so much pleasure, that he was glad to find or to feign opportunities for indulging his savage disposition. Accordingly, conceiving that the punishing of a vestal, according to the ancient laws, that is, burying her alive, would give lustre to his reign, he ordered Cornelia, chief of the vestals, to be the devoted victim. As he advanced in years, his cruelty increased; and in the 11th year of his reign a circumstance occurred, which was the rebellion of L. Antonius, who commanded the army on the Upper Rhine, that roused into exercise all the most ferocious passions of his nature. The rebellion was suppressed, and Antonius was slain; and yet he indulged a groundless suspicion that many persons were concerned in it, and determined to make them the victims of his wanton severity. On this occasion, and about this time, some of the most virtuous and dignified persons in Rome were selected as sacrifices. The number of those who were put to death is not known; but among them were Helvidius Priscus, Herennius Senecio, and Arulænus Rusticus, three of the best and most illustrious senators who then lived. As these eminent persons were philosophers of the Stoic school, their condemnation was followed by a decree of the senate, which banished all philosophers from Rome and Italy. Domitian, says Tacitus, could not bear to see the least trace of honour and virtue; but drove from him all that professed and taught the study of wisdom and the liberal arts. Some of these philosophers fled to the farthest parts of Gaul; others to the deserts of Lybia and Scythia; and others again renounced the profession, that exposed them to such danger, and conformed to the manners of the times.

Among the fugitives were Dio Chrysostom, Pontius Telesinus, Epictetus, and Artemidorus. With philosophy, Domitian banished the liberal arts; and even eloquence was reduced to silence. This savage tyrant, confounding Christianity with Judaism, and feigning some defalcation in the tributes due by his exactions to the imperial treasury, filled the measure of his crimes by the persecution of the Christians. Another reason for this persecution is also assigned; which was, his fear that some of the posterity of David remained, and that at one period or other they would excite the Jews, whom he did not distinguish from the Christians, to rebel. This persecution took place A. D. 95, and continued till the emperor's death. (See PERSECUTION.) Some have said that, at this time, St. John was thrown into a caldron of boiling oil (see JOHN); but it is more certain, that Flavius Clemens, a cousin of Domitian, who had been his partner in the consulship, suffered death. The senate was at this time reduced to a state of absolute slavery: nor could the members of it dare to complain under the severity they suffered, nor remonstrate against any of the decrees, or sentences of condemnation, which the emperor proposed. "Under Domitian," says Tacitus, (Vit. Agricol.) "it was the principal part of our wretchedness to behold and to be beheld; when our sighs were registered; and that stern countenance, with its settled redness, his defence against shame, was employed in noting the paleness of so many bystanders."

In his own family, at length, his tyranny was felt, and excited enemies against him; and a conspiracy was formed against him under his own roof, and among his officers and freedmen, at the head of whom was Domitia, for whom he had, at various times, manifested great attachment and aversion. Suspecting that some design was meditating against him, and apprehending real danger more from the surmises of his own guilty and gloomy soul, than from any of those astrological predictions and warnings, which he is said to have regarded, he became very cautious and circumspect with regard to his own safety. But the plot was too deeply laid, and his destiny was fixed. As he was going to bathe, before dinner, his chamberlain, Parthenius, introduced to him Stephanus, steward of Domitilla, his niece, and wife of Clemens, under pretence of having some important business to communicate. Stephanus, having his arm in a sling, as if he had been hurt, concealed a dagger; and, after presenting a memorial to the emperor, and whilst he was reading it, he plunged the dagger in his belly. Domitian had strength enough remaining to seize the assassin and throw him upon the ground; and calling for his sword, which was placed under his pillow, the scabbard only remained. Whilst they were still struggling, the other conspirators entered, and, with seven different stabs, dispatched the tyrant. Some officers of his guard were alarmed, and entered, too late to save his life, though they killed Stephanus. Domitian's death took place Sept 18th A. D. 96, when he was 44 years, 10 months, and 26 days old, and after he had reigned 15 years and 5 days. His body was privately buried by his nurse, named Phyllis; and she afterwards carried his ashes privately to the Flavian family, where she mixed them with those of Titus's daughter Julia, whom she had also taken care of in her infancy. In him terminated the race of emperors of the Flavian family. The senate, who detested and dreaded him whilst he lived, rejoiced in his death. As soon as it was known, the senators ran in crowds to their place of assembly, and expressed their abhorrence of his memory with the bitterest invectives. They wished to have his body dragged with ignominy to the "Gemoniæ;" they ordered all the pictures, busts, statues, and other representations of him to be demolished; his name to be struck out of the Roman annals, and all public monuments; from several of which, that are still remaining, we find, that the decree of the senate was actually executed. The soldiers, whose affections he had studiously gained by his liberalities and complaisance, were the only persons who regretted his death, and who wished to avenge it upon his assassins. Suetonius. Dion Cassius. Tacitus. Crevier.

DOMITIANA STATIO, in *Ancient Geography*, a port of the Italian sea, in Etruria, marked in the Itinerary of Antonine, near the river Almiana.

DOMITIOPOLIS, a town of Asia, in Cilicia. Ptolemy.

DOMITZ, or DOEMITZ in *Geography*, a small town of Germany, in the duchy of Mecklenburg-Schwerin, near the Elbe, with an ancient castle; 60 miles S. of Schwerin, and 24 of Grabow.

DOMMAIGNE, a town of France, in the department of the Ille and Vilaine, and district of Vitré; 7 miles W.S.W. of Vitré.

DOMMALAIN, a town of France, in the department of the Ille and Vilaine, and district of La Guerche; one league N. of La Guerche.

DOMMART LES PONTHIEU, a town of France, in the department of the Somme, and district of Doulens; 4 leagues N.W. of Amiens.

DOMME, MONS DOMÆ, a small town of France, in the department of the Dordogne, chief place of a canton, in the district of Sarlat, situated on a hill, near the river Dordogne; 6 miles S.E. of Sarlat. The town contains 1398, and the canton 12,465 inhabitants, dispersed in 18 communes, on a territorial extent of 242 kilometres and a half.

DOMMEL, a river of the kingdom of Holland, in the department of Brabant, which has its source in France, in the

the department of the Ourthe, passes by Bois-le-Duc, joins the river Aa, a little below that town, and falls into the Meuse, near Crevecœur.

DOMMITZSCH, a small town of the kingdom of Saxony, in the circle of Meissen, or Misnia, near the Elbe, not far from Torgau. It has about 1000 inhabitants, chiefly employed in navigating the Elbe, and in agricultural pursuits. It was one of the commanderies of the Teutonic order in the bailiwick of Saxony.

DOMNAU, a small town of the kingdom of Prussia, in the province of Natangen, a subdivision of Eastern Prussia. It was built in the year 1400; but there are, close to the town, ruins of ancient fortifications, from which, it is supposed, that it had originally a strong castle.

DOMNUS, or Donus, in *Biography*, was born at Rome, and raised to the high office of pope in the year 676. He died in less than two years, during which time nothing of any great importance occurred, excepting the final subjugation of the church of Ravenna to that of Rome, after a long struggle in maintenance of its independence.

Domnus, or Donus, a second pope of this name, was also born in Rome, and succeeded to the papal chair on the death of pope Benedict VI. in the year 974. His reign was of very short duration, not being extended to a year. Nothing is recorded of him worthy of praise or blame. Moreri.

DOMO D'OSCELLO, or Dossola, in *Geography*, a town of Piedmont, in the valley of Ossola, defended by a fortress; 51 miles N.W. of Milan, and 70 N.N.E. of Turin. N. lat. 46°. E. long. 8° 2′.

DOMO Reparanda, in *Law*, a writ that lies for one against his neighbour, by the fall of whose house he fears damage to his own: (Reg. of Writs, fol. 153,) in which case the civilians have the action *de damno infecto*.

DOMPAIRE, in *Geography*, a small town of France, in the department of the Vosges, chief place of a canton, in the district of Mirecourt, with a population of 626 individuals; 12 miles N.E. of Darney, and 18 N.W. of Remiremont. The canton has 30 communes, 8466 inhabitants, and a territorial extent of 202¼ kiliometres.

Dompaire was anciently the residence of the kings of Austrasia; and, in less remote times, that of the dukes of Lorraine.

DOMPIERRE, a small town of France, in the department of the Allier, district of Moulins. It has 1158 inhabitants, and is the chief place of a canton, which in 9 communes, and upon a territorial extent of 355 kiliometres, has only a population of 7260 individuals.—Also, a small town of France, in the department of the Lower Charente; 6 miles N.E. of La Rochelle. There are besides several villages of that name in France.

DOM-REMY, a small town of France, in the department of the Meuse, not far from the little river Vaire, which, below this place, falls into the Meuse; 6 miles N. of Neuf Château, and 9 S. of Vaucouleurs. It has been surnamed *La Pucelle*, for having been the native place of the celebrated Joan d'Arc, better known by the French name of *La Pucelle d'Orleans*, the Maid of Orléans.

DOMRIANKA, a town of Russia, in the government of Perm; 40 miles N. of Perm.

DOMUS Conversorum. See Conversos.

Domus *Dei*, a name anciently applied to many hospitals.

DON, in *Geography*, called *Tuna* by the Tartars and *Tanaïs* by the ancients, who considered it as the boundary between Europe and Asia, is one of the largest rivers of Europe, and the second of those which fall into the Palus Mæotis, or sea of Asoph, and through it into the Euxine. It has its source not far from Tula, in the government of Rezan in the Ivanofskoe lake. It still divides the most eastern part of Russia in Europe from Asia, and in its course towards the east approaches so near the Volga, that the czar Peter I. had undertaken to form a communication between them, by means of a canal, which is reported to be again in contemplation under the present emperor Alexander. The course of the Don, exclusive of its turnings and windings, is computed at 1000 versts. It flows for the most part through a flat country, covered with forests of pines and oaks. Its bed is generally sand, marle, and lime; it has many sand banks and small islands. In its course through the governments of Rezan, Tambof, Voronetz, and Ekatarinoslaf, it takes up nearly three hundred rivers and streamlets, the principal of which are the Voronetz, the Khoper, the Donetz, and the Manitsh.

The Don is liable to violent inundations. Its water is reckoned not very wholesome, being turbid and chalky; yet it abounds in fish. Below Voronetz, the Don commonly freezes about November, but the ice goes off in the beginning of February.

The Steppe of the Don and Volga comprizes the whole space between the Don, the Volga, and the Cuban, but is more generally known by the name of *Kuman Steppe* (which see.) Tooke's View of the Russian Empire.

Don is the name of a small river in Yorkshire, England, and of another which rises in the mountains of Cuisgarff, Scotland. The latter, after passing by Kintore, disembogues its waters into the German ocean, and is navigable for small vessels a considerable way from its mouth. Several very valuable salmon weirs are formed on this river.

Don, a river of America, in the East Riding of the county of York, in Upper Canada, which discharges itself into York harbour.

Don, or *Dun River*, in the West Riding of Yorkshire. This river is navigable from its efflux into the York Ouse river at Goole bridge, to Attercliff, two miles below Sheffield; it serves for the export of coals, iron, and iron ware from the great run of coal strata. (See Canal.) The lower part of this river is through level fens, above which it is embanked, and the warping of lands in its neighbourhood is practised as on the Trent river.

Don *Christopher's Cove*, a cove on the north side of the island of Jamaica, having Anna's bay on the W., and Mammee bay on the S. E.; remarkable for having afforded shelter to the discoverer of America during a storm, in 1503, and for being the site of the old town of Sevilla de Nueva. N. lat. 18° 58′. W. long. 77° 1′.

DONABURG. See Dunaburg.

DONAGHADEE, a port town of the county of Down, Ireland. It is a seaport on the north-east side of the Ardes, and nearly opposite to port Patrick in Scotland, from which it is distant about 25 miles. Its quay is made of large stones, in form of a crescent, without any cement, and is 128 yards in length, and about 21 or 22 feet broad, besides a breast wall of the same kind of stones about six feet broad. The town consists of two principal streets besides cross lanes, one open and exposed to the sea, and the other at the back of it, which is well paved. This is the place from which the packets, which take the northern mail, sail to port Patrick, and from it is a considerable exportation of horses and horned cattle to Scotland. Donaghadee is 94½ Irish miles N. from Dublin. Long. 5° 26′ W. Lat. 54° 37′ N.

DONAIECZ, a river of Poland, which runs into the Vistula; 25 miles below Cracow.

DONARIA, among the *Ancients*, in its primary signification,

fication, was taken for the places where the oblations offered to the gods were kept; but afterwards was used to denote the offerings themselves; and sometimes, though improperly, the temples.

DONAT, Saint, in *Geography*, is a small town of France, in the department of the Drome, chief place of a canton in the district of Valence, 9 miles N. W. of Romans. It has 1595 inhabitants. The canton comprizes nine communes and a population of 4773 individuals upon a territorial extent of 107½ kiliometres.—Also, a fort of Holland, near Helvoet-sluice.

DONATELLO, or Donato, in *Biography*, one of the principal revivers of sculpture in Italy, was descended from humble origin at Florence, and born in the year 1383. He learned design under Lorenzo de Bicci, and by his assiduous application became an excellent sculptor, and a master of perspective and architecture. Abandoning the old dry manner, he was the first who gave his works the grace and freedom of the productions of ancient Greece and Rome. His talents and performances soon attracted the notice of the great Cosmo de Medici, who employed him on a tomb for pope John XXIII., and in other works, both public and private. Such was the high estimation in which he was held by Cosmo, that he availed himself of his taste and judgment in forming those grand collections, which gave celebrity to Florence as the parent of modern art. Amongst his performances in that city are his Judith and Holofernes in bronze, his Annunciation, his St. George and St. Mark, and his Zuccone. To his St. Mark, Michael Angelo is said to have addressed the question, "Marco, perche non mi parli?" "Mark, why do you not speak to me?" His equestrian statue of bronze at Padua, to the honour of their general Gallamalata, is admirable and worthy of being compared with the best antiques. Conscious of the excellence of his performances, he exclaimed to a Genoese merchant, who had bespoke a head, and estimated its value by the number of days which it had employed the artist, "this man better knows how to bargain for bears than for statues:—he shall not have my head;" and then dashed it to pieces. Nevertheless, no man less regarded money than Donatello. Upon his return to Florence, Cosmo, at his death, recommended him to his son, who gave him an estate; but in a little while he begged his benefactor to take it again, as he did not like the trouble of it. The gift was returned, and a weekly pension of the same value assigned to the artist. He had no notion of hoarding; but it is said that he deposited what he received in a basket, suspended from a cieling, from which his friends and work-people might supply themselves at their pleasure. He died in 1466, at the age of 83, and was buried in the church of St. Lorenzo, near his friend Cosmo, that, as he expressed himself, "his soul having been with him when living, their bodies might be near each other when dead" He left a son, named "Simon," who adopted his manner and acquired reputation. Tiraboschi. Roscoe's Lorenzo de Medici. Gen. Biog.

DONATIA, in *Botany*, (so named by Forster, in memory of Vitaliano Donati, a native of Padua, appointed professor of Botany at Turin, and sent by his sovereign on a botanical expedition into Asia Minor, but he died on his voyage. He published at Venice in 1750, a small folio with plates, entitled, *Della Storia Naturale Marina dell' Adriatico*, to which his friend Seller subjoined the botanical history of a plant, named after him *Vitaliana*, since justly referred to *Primula*.) Forst. Gen. 5. t. 5. Schreb. 787. Willd. Sp. Pl. v. 1. 491. Mart. Mill. Dict. v. 2. Juss. 300. Class and order, *Triandria Trigynia*. Nat. Ord. *Caryophylleæ*, Juss.

Gen. Ch. *Cal.* Perianth of three awl-shaped, short, distant leaves. *Cor.* Petals nine, or rather from eight to ten, linear-oblong, twice the length of the calyx, spreading. *Stam.* Filaments three, awl-shaped, the length of the calyx; anthers roundish, two lobed. *Pist.* Germen superior; styles three, thread shaped, somewhat longer than the stamens; stigmas bluntish. *Peric.* unknown.

Ess. Ch. Calyx of three leaves. Corolla of many petals.

1. D. *fascicularis*. (Polycarpon magellanicum; Linn. Suppl. 115.) is the only species. A native of moist rocky places in Terra del Fuego. It forms tufts like a moss or mountain Saxifrage, the *stems* being, mostly simple, densely clothed with imbricated, permanent, thick, smooth, lanceolate, obtuse, entire *leaves*. *Flowers* terminal, sessile, solitary, white. Forster did not see the fruit, nor is our specimen, gathered by him, sufficient to throw any light upon the subject. The younger Linnæus referred this plant to the genus *Polycarpon*, surely without any thing in its habit or character to justify the measure, yet Dr. George Forster submitted to his judgment, and published it as such in the Goettingen Commentaries, v. 9. 23. t. 3. mentioning at the same time the opinion of Sparrmann, that it really constituted a distinct genus.

DONATIANA, in *Ancient Geography*, an episcopal town of Greece, in Epirus.

DONATION, Donatio, an act or contract, whereby a man transfers to another, either the property or the use, of the whole, or a part of his effects, as a free gift.

A donation, to be valid and complete, supposes a capacity both in the donor, and the donee; and requires consent, acceptance and delivery, and by the French law registry also. See Gift.

Donation *mortis causa*, in *Law*, a disposition of property made by a person in his last sickness, who apprehending his dissolution near, delivers or causes to be delivered to another, the possession of any personal goods, (including bonds, and bills drawn on his banker,) to keep in case of his decease. If the donor dies, this gift needs not the assent of his executor; but it shall not prevail against creditors; and it is accompanied with this implied trust, that, if the donor lives, the property shall revert to himself, being only given in contemplation of death, or *mortis causa*. (Prec. Chanc. 269. 1 P. Wms. 406, 441. 3 P. Wms. 357.) This method of donation seems to have been conveyed to us from the civil lawyers, (Inst. 2. 7. 1. Ff. l. 39. t. 6.) who borrowed it from the Greeks. Odyss. lib. xvii. ver. 78. and Euripides, Alcestes, ver. 1020. See Blackst. Comm. vol. ii. p. 514.

DONATISTS, in *Ecclesiastical History*, ancient schismatics in Africa, so denominated from their leader Donatus.

As in the faction of the Donatists there were two eminent persons of the name of Donatus, the one a Numidian, and bishop of Casæ Nigræ, and the other who succeeded Majorinus, bishop of Carthage, as leader of this party, and who, on account of his learning and virtue, was called by his sect, Donatus the Great; it has been a question, from which of these the sect derived its name? Probably they were thus denominated from both.

They had their origin in the year 311, when, in the room of Mensurius, who died in that year, on his return to Rome, Cæcilian was elected bishop of Carthage, and consecrated without the concurrence of the Numidian bishops, by those of Africa alone; whom the people refused to acknowledge, and to whom they opposed Majorinus; who, accordingly, was ordained by Donatus, bishop of Casæ Nigræ. They were condemned, in a council held at Rome, two years after their separation; and afterwards in another at Arles in the year following; and again at Milan, before Constantine the Great, in 316, who deprived them of their churches in Africa,

Africa, and ſent their ſeditious biſhops into baniſhment, and puniſhed ſome of them with death. This treatment occaſioned violent commotions and tumults in Africa, the ſect of the Donatiſts being there both numerous and powerful. Their cauſe was ſupported by a confederacy of deſperate ruffians called *Circumcelliones*, (which ſee,) who filled Africa with ſlaughter and rapine. Conſtantine having tried various methods for conciliating them without effect, at length aboliſhed, by the advice of the governors of Africa, the laws that had been enacted againſt the Donatiſts, and allowed the people full liberty of adhering to the party they liked the beſt. Their cauſe was eſpouſed by another Donatus, called the Great, the principal biſhop of that ſect, who, with a number of his followers, was exiled by order of Conſtans. Many of them were puniſhed with great ſeverity. However, after the acceſſion of Julian to the throne in 362, they were permitted to return, and reſtored to their former liberty. Gratian publiſhed ſeveral edicts againſt them; and in 377 deprived them of their churches, and prohibited all their aſſemblies. But notwithſtanding the ſeverities they ſuffered, it appears that they had a very conſiderable number of churches towards the cloſe of this century, which were ſerved by no leſs than 400 biſhops; but at this time they began to decline, on account of a ſchiſm among themſelves, occaſioned by the election of two biſhops, in the room of Parmenian, the ſucceſſor of Donatus; one party elected Primian, and were called Primianiſts, and another Maximian, and were called Maximianiſts. The decline was alſo precipitated by the zealous oppoſition of St. Auguſtin, and by the violent meaſures which were purſued againſt them, by order of the emperor Honorius, at the ſolicitation of two councils held at Carthage; the one in 404, and the other in 411. Many of them were fined, their biſhops were baniſhed, and ſome put to death. This ſect revived and multiplied under the protection of the Vandals, who invaded Africa in 427, and took poſſeſſion of this province; but it ſunk again under new ſeverities, when their empire was overturned in 534. Nevertheleſs they remained in a ſeparate body till the cloſe of this century, when Gregory, the Roman pontiff, uſed various methods for ſuppreſſing them; his zeal ſucceeded, and there are few traces to be found of the Donatiſts after this period. They were diſtinguiſhed by other appellations; as Circumcelliones Montenſes, or Mountaineers, Campites, Rupites, &c. They held three councils, or conciliabules; one at Cirta in Numidia, and two at Carthage.

The errors of the Donatiſts, beſides their ſchiſm, were, 1. That baptiſm conferred out of the church, that is, out of their ſect, was null; and accordingly they rebaptized thoſe who joined their party from other churches, and re-ordained their miniſters. 2. That their's was the only true, pure, and holy church; all the reſt of the churches they held as proſtitute, and fallen.

Donatus ſeems likewiſe to have given into the doctrine of the Arians, with whom he was cloſely allied; and accordingly, St. Epiphanius, Theodoret, and ſome others, accuſed the Donatiſts of Arianiſm; and it is probable that the charge was well founded, becauſe they were patronized by the Vandals, who were of theſe ſentiments. But St. Auguſtine, ep. 185. to count Boniface, and Hær. 69. affirms, that the Donatiſts, in this point, kept clear of the errors of their leader.

DONATIVE, Donativum, a preſent made to any perſon; called alſo *gratuity*.

The Romans made large donatives to their ſoldiers. Julia Pia, wife of the emperor Severus, is called, on certain medals, MATER CASTRORVM, becauſe of the care ſhe took of the ſoldiery, by interpoſing for the augmentation of their donatives, &c.

Donative was properly a gift made to the ſoldiery; as congiarius was that made to the people.

Salmaſius, in his notes to Lampridius, in his Life of Heliogabalus, mentioning a donative that emperor gave of three pieces of gold *per* head, obſerves, that this was the common and legitimate rate of a donative. Caſaubon, in his notes on the Life of Pertinax by Capitolinus, obſerves, that Pertinax made a promiſe of three thouſand denarii to each ſoldier; which amounts to upwards of ninety-ſeven pounds ſterling. The ſame author writes, that the legal donative was twenty thouſand denarii; and that it was not cuſtomary to give leſs, eſpecially to the prætorian ſoldiers; that the centurions had double, and the tribunes, &c. more in proportion.

Donative, in the *Canon Law*, a benefice given, and collated to a perſon, by the founder, or patron; without either preſentation, inſtitution, or induction by the ordinary; ſo called becauſe they began only by the foundation and erection of the *donor*. If chapels founded by laymen be not approved by the dioceſan, and, as it is called, *ſpiritualized*, they are not accounted proper benefices; neither can they be conferred by the biſhop, but remain to the pious diſpoſition of the founders; ſo that the founders, and their heirs, may give ſuch chapels without the biſhop.

Gwin obſerves, that the king might of ancient time found a free chapel, and exempt it from the juriſdiction of the dioceſan; ſo may he, by letters patent, give liberty to a common perſon to found ſuch a chapel, and make it donative, not preſentable; and the chaplain, or beneficiary, ſhall be deprivable by the founder or his heir, and not by the biſhop. And this ſeems to be the original of donatives in England. See Advowson.

When the king founds a church, &c. *donative*, it is of courſe exempted from the ordinary's juriſdiction, though no particular exemption be mentioned, and the lord chancellor ſhall viſit the ſame; and where the king grants a licence to any common perſon to found a church or chapel, it may be donative, and exempted from the juriſdiction of the biſhop, ſo as to be viſited by the founder, &c. (Co. Littl. 134.2 Rol. Abr. 230.) The reſignation of a donative muſt be to the donor or patron, and not to the ordinary; and donatives are not only free from all ordinary juriſdiction, but the patron and incumbent may charge the glebe to bind the ſucceſſor, and if the clerk is diſturbed, the patron may bring *quare impedit*, &c. Alſo the patron of a donative may take the profits thereof when it is vacant. (Co. Litt. 344. Cro. Jac. 63.)

Donatives are within the ſtatute againſt ſimony; and if they have cure of ſouls, within that againſt pluralities. If the patron of a donative doth not nominate a clerk, there can be no lapſe thereof, unleſs it be ſpecially provided for in the foundation; but the biſhop may compel him to do it by ſpiritual cenſures. But if it be augmented by queen Anne's bounty, it will lapſe like other preſentative livings. 1 Geo. I. ſtat. 2. cap. 10. The ordinary cannot viſit a donative, and therefore it is free from procuration, and the incumbent is exempted from attendance at viſitations.

No perſon is capable of a donative, unleſs he be a prieſt lawfully ordained, &c. (Yelv. 61. ſtat. 14 Car. II. c. 4. 1 Litt. 488.) There may be a donative of the king's gift with cure of ſouls, as the church of the Tower of London is. A parochial church may be donative, and exempt from the ordinary's juriſdiction. (Godolph. 262.) The church of St. Mary-le-Bow in Middleſex is donative, and the

incumbent being cited into the ſpiritual court, to take a licence from the biſhop to preach, pretending that it was a chapel and that the parſon was a ſtipendiary, it was ruled in the king's bench, that it was a donative; and if the biſhop viſit, the court of B. R. will grant a prohibition. (1 Mod. 90. 1 Nelſ. Abr. 676.) If a patron of a donative doth once preſent his clerk to the ordinary, and the clerk is admitted, inſtituted, and inducted, then the donative ceaſeth, and it becomes a church preſentative. (Co. Litt. 344.) But when a donative is created by letters patent, by which lands are ſettled upon the parſon and his ſucceſſors, and he is to come in by the donation of the king, and his ſucceſſors; in this caſe, though there may be a preſentation to the donative, and the incumbent come in by inſtitution and induction, yet that will not deſtroy the donative. (2 Salk. 541.)

All biſhoprics in ancient time were donative by the king. (Rep. 75.) Again, where the biſhop has a gift of the benefice, it is properly called a donative, becauſe he cannot preſent to himſelf.

Donatives have two peculiar properties, one, that the preſentation does not devolve to the king as in other livings, when the incumbent is made a biſhop. (Ca. Parl. 184.) The other is, that a donative is within the ſtatute of pluralities, if it be the *firſt* living; but if the donative is the ſecond benefice taken without a diſpenſation, the firſt would not be void, for the words of the ſtatute are *inſtituted and inducted* to any other, which are not applicable to donatives. (1 Woodd. 330.) And therefore it ſeems that, if donatives are taken laſt, they may be held with any other preferment.

DONATO, Bernardino, in *Biography*, a learned Italian, was born at Zano in the Veroneſe. The exact time of his birth and death are not aſcertained. He flouriſhed in the ſixteenth century, and was greatly celebrated as a tranſlator. His verſion of the Demonſtratio Evangelica of Euſebius has been ſeveral times reprinted. He tranſlated the works of Galen, Ariſtotle, Xenophon, and of ſome of the early eccleſiaſtical writers. As an author, he publiſhed a Latin dialogue on the difference between the philoſophy of Ariſtotle and that of Plato. A Latin grammar is alſo aſcribed to him, which was printed at Venice in 1529. Moreri.

Donato, Girolamo, a patrician of conſiderable rank at Venice, who was both a ſtateſman and man of letters. The exact time of his birth is not known, but it is ſuppoſed to have been about 1454. As a literary man, he wrote an apology for the pope's ſupremacy againſt the Greek church, and a letter to cardinal Caraffa upon the ſame ſubject. He drew up a long and forcible apology for the Venetians againſt Charles VIII, king of France, and tranſlated into Latin ſome of the works of Chryſoſtom, and other Greek authors. He was confeſſedly one of the moſt learned men of the age. He died in 1511: as a ſtateſman, he was eminent for probity and talents, and was employed by his country in various important and very difficult negociations. Moreri.

Donato, Baldassave, a muſical compoſer of Naples, who publiſhed at Venice, in 1555, "Canzone Villaneſche alla Napolitana," in very good counterpoint of four parts. In theſe little national ſongs there is generally more humour in the words, and more air and vivacity in the melody, than in any other ſongs, equally ancient, that we have ſeen. They ſeem to have been ſung about the ſtreets, in parts, as the words of ſeveral imply. In one of them, a ſinging-maſter ſpeaks, who offers to teach the Guidonian hand, or gamut, in an hour; and in one of the following, the ſyllables *ut, re, mi, fa*, &c. are ingeniouſly applied in moſt of the parts, to ſuch ſounds as require them, in ſolmiſation.

DONATUS, Ælius, flouriſhed in the time of Conſtantine, and was one of the preceptors of St. Jerom. He was a commentator upon the works of Virgil and Terence. He compoſed ſome grammatical pieces which are ſtill remaining.

DONAUESCHINGEN, or Doneschingen, in *Geography*, a ſmall town of Germany, in Suabia, is the principal reſidence of the princes of Furſtenberg, in the court yard of whoſe palace the Danube, in German the Donau, takes its riſe. Some ſmall ſprings bubbling from the ground, form a baſon of about thirty feet ſquare, and from this baſon iſſues the mighty Danube, which, in its origin, is only a little brook.

DONAVRTZ, a town of Hungary, 16 miles N. N. W. of Palatza.

DONAUSTAFF, a town of Germany, in the circle of Bavaria, and biſhopric of Ratiſbon, on the Danube; 6 miles E. of Ratiſbon.

DONAWERTH, Donawert, in Latin *Donaverda Danubii inſula*, is a ſmall town of Bavaria, on the northern ſhore of the Danube, 30 miles N. of Augſburg, and 45 N. E. of Ulm. It is on the borders of Suabia, and was anciently a free imperial city. In 1805, it was occupied by the French under marſhal Soult, who reſtored the bridge which the Auſtrians had deſtroyed.

DONAX, in *Botany*, (δόναξ. a *reed*, *arrow*, or *pipe*,) is retained by Linnæus as the ſpecific name of the great reed of the ſouth of Europe, *Arundo Donax*, ſuppoſed to be the δόναξ of Dioſcorides. See Arundo.

Donax, Loureiro Cochinch. 11, is applied by that author to the *Arundoſtrum* of Rumph. Amboin. v 4. 22. t. 7. which Loureiro ſuppoſes a new genus; the characters of *Maranta*, to which it appears to belong, not having been clearly defined when he wrote.

DONAX, in *Conchology*, a genus of bivalves, the animal of which is conſidered as a Tethys. Theſe have the anterior part very obtuſe, and the margin in general crenulated; the hinge is furniſhed with two teeth, and a ſingle marginal one placed rather behind. Some ſpecies are deſtitute of this marginal tooth, others have two, or ſometimes even three.

Species.

Scortum. Shell triangular-heart-ſhaped, with a flat frontal margin. Linn. &c.

The colour of this ſhell is cinereous, mixed with violet; within ſnowy, at the hinge violet; marginal teeth double in each valve, with an intermediate cavity. Inhabits the Indian ocean.

Pubescens. Shell ciliated with ſpines on the anterior margin. Linn.

Native of the Indian ocean. The outſide of this ſhell is whitiſh with fine decuſſating ſtriæ; the anterior margin flat with an ovate gape, and behind the beaks an ovate oblong depreſſion. Inſide as in the former.

Rugosa. Shell wrinkled and gibbous before; margin crenated. Linn. *Peman*, Adanſon.

A ſmall ſpecies found in the Mediterranean, Atlantic, and American ſeas; the colours various and uſually diſpoſed in bands on the outſide, within violet and white. This kind has no marginal tooth.

Striata. Shell ſtriated, with denticulated margin; anterior part obtuſe. Knorr.

Inhabits the ſouthern ſeas of Europe. The colour is white, and the ſhell in general is rather gibbous.

Trunculus.

Trunculus. Shell at the anterior part smooth, with ernated margins; with violet. Linn. Donov. Brit. Shells, &c.

Found in plenty on many of the sea coasts of Europe; the ground colour is most commonly whitish or tinged with yellow, and marked in the direction of the striæ from the beaks downwards, with broader or narrower stripes, or lines of rich purple. Length about three quarters of an inch.

Denticulata. Shell at the anterior part very obtuse; lips transversely wrinkled, finely striated longitudinally, and denticulated at the margin. Gmel. Donov. Brit. Shells, &c.

Very abundant in the European and American seas, and is rather larger than the last. This shell is wedge-formed, and is in general whitish, streaked or striped with brown or purple from the beaks to the margin.

Cuneata. Shell wedge-shaped, the margins very entire. Chemn, &c.

Inhabits Tranquebar, and measures about an inch in length. The species varies from yellow to rufous, and has the margin violet; the anterior part transversely wrinkled in front, with perpendicular lines crossing the wrinkles; colour within violet and white.

Faba. Shell gibbous, very finely striated transversely, spotted with yellow; tip of the beak, and band at the margin blueish, the former intercepted with a white ray. Chemn. Native place unknown.

Scripta. Shell ovate compressed, smooth, marked with purple waved lines, margins crenulated. Linn.

Inhabits the coast of Malabar, and resembles the last, but is thinner; the outside is elegantly painted with angular reddish or brown lines, and the hinge somewhat resembles that of a Venus.

Muricata. Shell ovate, with muricated striæ, the margin denticulated. Linn.

Native of the Indian sea. This shell is gibbous and of a reddish colour, with the frontal margin gaping, and ending each side in a compressed tooth.

Irus. Shell oval, with transverse waved erect striate membranaceous wrinkles or foliations. Gualt. Donov. Brit. Shells, &c.

Inhabits the Mediterranean, and is usually found buried in clay on the sea-shore. Its size is that of a small kidney bean.

Lævigata. Shell obtuse before, obsoletely striated at the sides, yellowish green within, and violet at the beaks; margin very entire; hinge without marginal teeth. Chemn.

Native of Tranquebar, the length from the beak to the margin about an inch and a half, and its breadth two inches and a quarter; margin near the beak somewhat incumbent. This is a rare species.

Spinosa. Shell snowy, within blueish; posterior part smooth and perpendicularly striated; anterior part truncated, and very finely cancellated; the angles spinous. Chemn.

A very scarce species found in Tranquebar.

Incarnata. Shell carnation; anterior part truncated, wrinkled and marked with reticulated striæ; posterior part cuneated and furrowed with fine perpendicular striæ. Chemn.

Inhabits Tranquebar. Shell sometimes banded with yellowish.

Argentea. Shell oval smooth, olive-green, within silvery; margin with more elevated acute teeth near the hinge. Gualt.

Bicolor. Shell ovate, with elevated striæ crossing a few transverse lines; rufous with a white ray each side. Gualt.

The native place of this and the preceding species is unknown.

Radiata. Shell brown with hyaline spots; the outside with crowded arched transverse striæ; inside with perpendicular ones; the anterior part wrinkled. Schroet.

Inhabits Tranquebar. Length about an inch; the anterior part not very obtuse, and marked with two white rays; posterior part rounded with a white border.

Straminea. Shell with very thin perpendicular striæ crossing the transverse ribs on the forepart; straw colour with darker transverse bands; margin tawny, and very entire behind. Schroet.

Less than the last. Within flesh colour, towards the rim violet. Native country unknown.

Candida. Shell entirely white, with a few thin arched transverse striæ, turned obliquely towards the rim; hinge with three oblique middle teeth; margin very entire. Schroet.

Native of Tranquebar. This shell is thin, brittle, and about an inch in length.

DONAZ, in *Geography*, a small town of France, in the department of Doire, which was formerly a part of Piedmont in Italy. It is the chief place of a canton in the district of Aoste, and has a population of 1097 individuals. The canton contains 5410 inhabitants, dispersed in six communes.

DONCASTER, a large, respectable, and ancient town in the West Riding of Yorkshire, England, was a Roman station, and, according to some authors, was the place where the province of Maxima Cæsariensis commenced. It was called by Nennius *Caer-Daun*; by Antoninus, *Danum*; in the Saxon annals it is written *Dona Cercen*; and in the first charter granted to the town by king Richard I. it is called *Danecastre*. The ancient Itineraries concur in inserting Doncaster as a Roman station, and a Roman votive altar of exquisite workmanship discovered in this town in 1781, infallibly proves, by its sculpture and inscription, the truth of the assertion and fact. This altar, which was found in digging a cellar in St. Sepulchre's gate, is considered as the third of the kind ever discovered in any part of the world: one of the other two having been found at Binchester in the county of Durham, and the other at Ribchester in Lancashire. In the history of Doncaster the most remarkable events were—the destruction of the town by lightning about the year 759, when, Camden says, "it was so buried in its own ruins, that it has hardly yet recovered itself." The battle of Towton-field, in this vicinity, took place on Palm Sunday 1460, between the armies of the contending houses of York and Lancaster, when nearly 37,000 men were left dead on the field, a greater number than is supposed to have been slain in any battle in this kingdom. And of Aske's rebellion in 1536, this town and its vicinity were the principal scenes.

Doncaster has obtained a variety of charters from successive kings from Richard I. to James II. The corporation is composed of a mayor, recorder, town-clerk, twelve aldermen, and twenty-four common council men. The revenue of the corporation amounts to nearly 6000*l. per annum*; which is chiefly expended for the comfort and emolument of the inhabitants; by large contributions to all charitable institutions; by ready assistance to the poor in times of scarcity; by the erection of elegant edifices for public amusement; and by defraying the expences of lighting and paving the streets, and the conveyance of river water: so that the inhabitants enjoy privileges rarely to be found in any

country town. Doncaſter has never been, what is uſually called, a trading town: it was formerly, in ſome degree, noted for knitted ſtockings; and of late ſome attempts have been made to eſtabliſh manufactories of various kinds, but without ſucceſs. The ſhopkeepers and mechanics chiefly depend for ſupport on the perſons of fortune in the town and neighbourhood, on the corporation, and on travellers, of whom, it being on the great road from London to Edinburgh, there is a conſtant ſucceſſion paſſing through the town. The houſes in Doncaſter are in general well built; the High-ſtreet, in particular, which is about a mile in length, is, for length, width, and beauty, allowed to be the beſt on the great northern road. The church (for there is but one, which in ſuch a conſiderable town is rather ſingular) is a large handſome ſtructure. It ſtands on the area of the old caſtle, which, with the lordſhip, was in the poſſeſſion of Nigell de Foſſard, at the time of the conqueſt; and was probably built of the old materials of the caſtle: but the preciſe period of its erection it is now difficult to aſcertain. In a recent repair of the church a ſtone was taken out of the wall at the eaſt end, on which was the date 1071: whence it may be inferred that the eaſtern part was built at that time: but the ſeveral joinings in the ſtone work clearly denote that one part was built at a different time from the other. The preſent elegant tower is of a later date, and from the peculiar ſpecies of its architecture appears to have been erected in the reign of Henry III., a period when many of our preſent churches derive their origin. The font, in which children are yet baptized, is of free ſtone, and was made in the reign of Edward the Confeſſor, it bearing date 1061. The principal public buildings of the town are, the manſion houſe, the town-hall, a grammar-ſchool, St. Thomas's hoſpital, erected and endowed by Thomas Ellis in 1588, a diſpenſary, a workhouſe, a theatre, and four meeting-houſes or chapels for diſſenters of different denominations. Horſe races are held here in September: a grand ſtand has been built by the corporation for the accommodation of the company who reſort to this town on that occaſion. Doncaſter is ſituated 158 miles N. from London; has a well ſupplied market on Saturdays, and two annual fairs; was returned to parliament in 1801, as containing 1186 houſes, and 5697 inhabitants, of whom 1043 were employed in various trades and manufactures, particularly in ſpinning wool and cotton. Over the river Don, on which the town is ſeated, are two handſome bridges; in the vicinity of which were formerly two convents of White and Grey Friars. Miler's Hiſtory of Doncaſter, 4to. 1804.

DONCHERY, a ſmall but neat town of France, in the department of the Ardenne, near the river Meuſe, 3 miles W. of Sedan.

DONDANGA, a town of the duchy of Courland, 24 miles N. E. of Piltyn.

DONDE, James De, ſurnamed the *Aggregator*, on account of the large number of compoſitions he contrived for the cure of various diſeaſes, in *Biography*, was of a reſpectable family at Padua, and was himſelf in great repute for his profeſſional abilities. He flouriſhed about the middle of the fourteenth century. His principal work is called "Promptuarium Medicinæ, in quo non ſolum facultates ſimplicium et compoſitorum Medicam. declarantur, verum etiam, quæ, quibuſvis Morbis medicamenta ſint accomodata, ex veteribus Medicis monſtrantur," printed 1481, but written, as we learn from the preface, in 1355. It is principally, as the title informs us, taken from the works of the ancient phyſicians: and to tranſlate, or tranſcribe, from the works of the ancients, was the principal labour of the literati of that age. Donde alſo became famous for his ſkill in the mathematics; and in mechanics he contrived a clock, which not only ſhewed the hours of the day and night, but the paſſage of the ſun through the twelve ſigns of the zodiac, the place of the moon, &c.; but this, on good authority, is ſaid to have been the performance of his ſon, who acquired conſiderable reputation for his philoſophical acumen; that made by the father was more ſimply conſtructed. Donde taught the art of obtaining the ſalt from the waters of Abano; about one pound of ſalt from a thouſand pounds of water. His account of the method of obtaining it was printed at Venice, with his "Treatiſe de fluxu, et refluxu Maris," in 1571. He left two ſons, John, who, beſides inheriting his father's talents for mechanical purſuits, was well inſtructed in every other branch of literature. Petrarch, with whom he was cloſely connected, left him a legacy to purchaſe a ring, to be worn in memory of him. The other ſon, Gabriel, practiſed medicine with great ſucceſs at Venice, where he is ſaid to have acquired an ample fortune. Haller Bib. Eloy. Dict. Hiſt. General Biog.

DONDON, in *Geography*, one of the thirty-three cantons of the department of the North, in the iſland of St. Domingo, in the Weſt Indies, now Hayti.

DONDRE Head, the moſt ſouthern point of the iſland of Ceylon, about 4 miles from Matura; called by the natives Dewullum, Dewunder Head, or Divinoor. Within half a mile of this point ſtands a Cingleſe temple of a circular ſhape, about 150 feet in circumference, and 12 feet high. From the centre riſes a bell ſhaped ſpire, with a ſmall cone on a ſquare pedeſtal, the whole about 30 feet high. The Cingleſe repair hither daily to perform their devotions. A granite pillar, to receive a lamp, is placed at the front of the temple, which is mostly cut out of ſolid rock. This temple contains a figure of Buddou, and in the ſhrine is ſaid to be buried one of the teeth of the ſacred elephant. Cloſe to the coaſt is a building deſigned for the uſe of devotees, who perform their laſt abluſion in the ſea. This building is encircled by rows of pillars of granite, about 10 feet high. Beyond this is the inner portal of an Hindoo temple, conſiſting of two upright ſtones ſupporting a croſs one, all covered on one ſide with ornaments, ſimilar to thoſe on the Coromandel coaſt. To the left are the ruins of more temples. "On narrowly inveſtigating theſe remains of antiquity," ſays Perceval (Account of the Iſland of Ceylon, p. 155.), "and comparing them with the religion and works made in the preſent and laſt centuries by the Ceylonese, they do not appear to belong originally to the preſent inhabitants of Ceylon, but altogether correſpond with the opinions and workmanſhip of the Hindoos." Cingleſe temples appear to have been erected at a much later period, on the ſites of thoſe originally conſtructed by the Hindoos. Dondre head lies in N. lat. 5° 51′. E. long. 80° 11′.

DONDUCCI, Gio Andrea, called Il Manteletta, from the trade of his father, who was a pall-maker, in *Biography* a painter of hiſtory and landſcape, was a Bologneſe, and born in 1575. Inclined to painting by a powerful propenſity of nature, he became a diſciple of Caracci; and acquired diſtinguiſhed reputation by a great ſpirit of deſign, in which he imitated Parmigiano, and a native facility, which enabled him to colour much canvas in a little time. In his firſt performances he diſregarded drawing, and contrived to catch the eye by ſurrounding a ſplendid centre with impenetrable darkneſs, which abſorbed every trace of outline. His ſucceſs in this way is ſaid to have encouraged thoſe painters called "Tenebroſi," ſhell painters, who became numerous in the Venetian and Lombard ſchools. But failing to change his manner as he grew older, light, no longer

longer ſupported by obſcurity, ſerved only to expoſe his weakneſs; and the miracles of St. Domenico, in the church of that ſaint, which had been conſidered as his maſterpieces, became by alteration the meaneſt of his works. The ſame diverſity of manner, ſays M. Fuſeli, is obſervable in his ſmaller pictures. Thoſe of the firſt, ſuch as the miracle of the Manna, in the Spado palace, are as highly valuable as his landſcapes, which in many galleries would be taken for the works of Caracci, were they not diſcriminated by that original ſhade that ſtamps the genuine ſtyle of Mantelletta. Pilkington's Dict. by Fuſeli.

DONE SUR, *grant and render*, in *Law*, a double fine, comprehending the fine "ſur cognizance de droit comme ceo," and the fine "ſur conceſſit," which may be uſed to create particular limitations of eſtates. See FINE

DONEGAL, in *Geography*, the name of a county in the province of Uiſter, Ireland, ſituated in the north-weſt extremity of the iſland, and bounded on the eaſt by Londonderry and Tyrone, on the ſouth by Fermanagh and Leitrim, and on the weſt and north by the Atlantic ocean. It was formerly called *Tyrconnel*, and was a ſeparate principality, the chieftains of which were very powerful, even as late as the time of queen Elizabeth. It extends 57 Iriſh miles (72 Engliſh) from north to ſouth; and 40 Iriſh miles (51 Engliſh) from eaſt to weſt. It contains 679,550 acres, or 1061 ſquare miles, Iriſh meaſure; which are equal to 1,091,736 Engliſh acres, or 1704 ſquare Engliſh miles. The number of houſes, in 1790, was 23,521, which at ſix to a houſe, would give a population of about 140,000, which is very trifling for ſuch an extent of country. The number of pariſhes is only forty-two, in which are forty-ſix churches: they are in the dioceſes of Raphoe and Derry. The only members which are returned to the imperial parliament, are the two repreſentatives of the county. Donegal is a very rugged country, in many places rendered leſs habitable by bogs, and almoſt every where rough with mountains. It is not, however, deſtitute of good land in the vallies between theſe rocky maſſes, and along the banks of many rivers. To enumerate the mountains of this county would be as difficult as it would be uſeleſs. The principal cluſters are the Sieble-league mountains, which occupy the peninſula weſt of Killybegs, and form part of a chain extending round the weſt to Lough Foyle; and the Barneſmore mountains adjoining the county of Tyrone, on the north of Lough Derg, which are connected with the mountains of Fermanagh. The champaign country is chiefly between Ballyſhannon and Donegal, and the tract adjoining the county of Tyrone. Agriculture is in the former of theſe at a very low ebb, and the natural advantages are by no means improved. Near Ballyſhannon there is an extenſive tract of limeſtone, with a thin ſurface of light brown gravelly ſoil, though in the reclaimed parts the ſoil is deep and rich. The eaſtern part adjoining Tyrone, comprehending ſixteen or ſeventeen miles long, by eight or nine broad, is the moſt improved part of the county; being thickly inhabited, and the ſoil being tolerably good for potatoes, oats, barley, and flax. The mineral treaſures of this mountainous diſtrict are probably great, but are yet very little known. The mountains near the ſea are moſtly granite, but they are interſected occaſionally by limeſtone and ſlate. Lead ore, in ſome places appearing very rich, is found in great abundance, and ſome mines have been worked, but not with ſpirit or to advantage. Iron ore and manganeſe are alſo found in many places, and there are ſome indications of coal. Silicious ſand, found near Sheephaven, is carried to Belfaſt for the glaſs manufactory, and is found to be of excellent quality for this purpoſe. It may be added here that the linen manufacture extends to this county. In the peninſula of Iniſhowen, and the parts adjoining Derry and Tyrone, and alſo about Ballyſhannon, cloth is woven; and yarn is ſpun in every part of it. A great deal of flax is imported at Derry, as the county does not raiſe enough for its own manufacture. The principal rivers of this county are the Fin, the Dale, the Erne, the Gutbarra, and the Swilly. The Fin riſes in a lake at no great diſtance from the ocean, and croſſing from weſt to eaſt, meets the Derg near Lifford, and thence under the name of Foyle, flows into Lough Foyle. The Dale purſuing a ſimilar courſe, flows into the Foyle a few miles north of Lifford. The Erne diſcharges the waters of Lough Erne into the bay of Donegal, a little below Ballyſhannon. Though its courſe is ſhorter, it is of conſiderable breadth, but the navigation is impeded by ſeveral rocks in the bed of the river. The Gutbarra is alſo noted for its extraordinary breadth and depth, in proportion to the ſhortneſs of its courſe, which extends ſcarcely twenty miles from its ſource to the ocean. The Swilly is only remarkable for giving name to a great lough or inlet of the ſea, which forms the weſtern boundary of the peninſula of Iniſhowen. Lough Swilly runs ſixteen miles into the land, but never exceeds ſix, whilſt it is ſeldom more than two miles in breadth. Though a ſafe harbour, it is little frequented. The harbour of Mubray has not even a village on its ſhores. The country on the north weſtern coaſt appears to be not only very barren but to have ſuffered from a change of climate. The effects of drifting ſands are very ſtriking. The peninſula of Hornhead, in 1787, contained veſtiges of enclaſures ſo ſmall and ſo numerous, as to mark the reſidence of a number of families in a ſpot which then exhibited nothing but

"A deſert, ſalt and bare,
"The haunt of ſeals and orcs and ſea-mew's clang."

About a century ago an elegant edifice, according to the taſte of that age, was built on the peninſula between the harbours of Sheephaven and Mubray, which in 1794 ſtood "like Tadmor of the eaſt, the ſolitary wonder of a ſurrounding deſert." The gardens are totally denuded of trees and ſhrubs by the fury of the weſtern winds: their walls, unable to ſuſtain the maſs of overbearing ſands, have ſunk before the accumulated preſſure, and overthrown in numberleſs places, have given free paſſage to this reſtleſs enemy of all fertility. The courts, the flights of ſteps, the terraces, are all involved in equal ruin; and their limits only diſcoverable by tops of embattled walls, viſible amid hills of ſand. The manſion itſelf, yielding to the unconquerable fury of the tempeſt, approaches faſt to deſtruction: the freighted whirlwind, howling inceſſantly through every avenue and crevice, bears along with it its drifted burden, which has already filled the lower apartments of the building, and begins now to riſe above the once elevated threſhold. Fields, fences, villages, involved in common deſolation, are reduced to one undiſtinguiſhable ſcene of ſterile uniformity, and twelve hundred acres of land are ſaid thus to have been buried, within a ſhort period, in irrecoverable ruin. This account was given by a man of integrity and obſervation, the late Rev. Dr. W. Hamilton, author of the account of Antrim, whoſe premature death, in conſequence of the rebellion, was a conſiderable loſs to his country. There is a curious phenomenon near Hornhead, which may alſo deſerve notice. By decompoſition of part of the rock, the waves have perforated a cave many yards in diameter, which extends about ſixty feet into a rock, making part of the main land, and nearly horizontal with the level of the ſea at high and low water marks. When the wind blows due

due north, and the tide is half in, this perforation, called *M'Swine's Gun*, is feen to fpout fea water far higher than the eye can reach, into the air, whilft the noife can be heard at the diftance of 20 or 30 miles. On the weftern coaft, between the river Caydore and the ocean, lies a tract of country called the *Roffes*, part of which is very marfhy. Oppofite to this tract is a large cluftcr of iflands, called the north ifles of Arran, on one of which the town of Rutland was built, with parliamentary aid for carrying on the herring-fifhery. (See RUTLAND.) On the fouth are the harbours of Kilybegs and Donegal, which are of little confequence. There is no town of importance from its fize or manufactures in the county. Liffard, which is on the borders of the county of Tyrone, and within a mile of Strabane, feems to have been fixed upon merely to accommodate the judges and barriflers, to the great inconvenience of the inhabitants. Donegal was one of the counties forfeited to the crown in the beginning of the reign of James I., and which were colonized by that monarch. Beaufort's Memoir. A. Young's Tour in Ireland. Statiftical Survey of Donegal. Hamilton on Irifh Tranfactions, vol. 6.

DONEGAL, a fmall poft and market town in the county of Donegal, Ireland, which ftands on a fine bay, but is a place of little trade. It was formerly a borough, but loft its privilege of being refpefted in parliament by the union. It is 112 miles N.W. of Dublin. Long. 7° 57′ W. Lat. 54° 39′ N.

DONEGAL, the name of three townfhips of America, in the ftate of Pennfylvania; one in Lancafter county, containing 2476, one in Weftmoreland county, containing 1411, and one in Wafhington county, containing 1762 inhabitants.

DONEMARIE, or DONNEMARIE, a fmall town of France, in the department of Seine and Marne, chief place of a canton, in the diftrict of Provins; nine miles S.W. of Provins, with a population of 1250 individuals. The canton has a territorial extent of 187½ kilometres, and contains 21 communes and 9627 inhabitants.

DONESCHINGEN. See DONAUESCHINGEN.

DONERAILE, a poft town of the county of Cork, Ireland, and before the union a borough, fending two members to parliament. It is a fmall town, and in no way remarkable. Spenfer, the poet, refided at Kilcolemen caftle, in its neighbourhood. It is 21 miles N. from Cork, and 126 miles S.W. from Dublin. W. long. 8° 34′. N. lat. 52° 13′.

DONETZ, the moft confiderable of thofe rivers in eaftern Ruffia, which fall into the Don. It has its fource in the government of Kurfk, flows as far as the Caucafus through a fertile and very populous country; is navigable from the Ifum, and has nearly the fame water and the fame kinds of fifh with the Don. Tooke's View of the Ruffian Empire.

DONETZK, a town of Ruffia, and one of the fourteen diftricts of Catherineuflaf, or Ecaterineuflaf; fituated on the river Donetz. N. lat. 48° 30′. E. long. 38° 29′.

DONGA, a diftrict of Abyffinia, faid to be the fource of the Bahr-el-Abiad. It is the refidence of a chief or king of an idolatrous nation. The country is very mountainous, and in the fpot where the river rifes, are faid to be 40 diftinct hills, which are called Kumri. From them a great number of fprings iffue, which uniting into one great channel, form the Bahr-el-Abiad. The people of Bergoo go thither fometimes to feize captives, but no trade fubfifts between them and the natives. The people are quite naked, black, and idolaters. The place is faid to be 20 days removal from the confines of Bornou, the whole road thither being mountainous. From Donga to Shilluk is a diftance of 30 days.

DONGES, a town of France, in the department of the Lower Seine; feven leagues W.N.W. of Nantes.

DONGO. See ANGOLA.

DONGOLA, the chief town of a diftrict of the fame name, and the capital of Nubia, in Africa; fituated on the eaftern bank of the Nile, in N. lat. 19° 30′. E. long. 32°.

DONGON, in *Natural Hiftory*, a name given by the people of the Philippine iflands to a peculiar fpecies of crane, which has a large body like a goofe, and a fhorter neck than the common kind; it has a long and very broad beak, and is of a grey colour; they have, befides this, another fpecies of crane, which they call tipul or tihol; as remarkable for the length of its neck and legs, as this for the breadth of its beak. This tipul can ftand erect, and look over a tall man's head.

DONI, ANTON FRANCISCO, in *Biography*, an Italian mufician and poet of the middle of the 16th century, author of a book, entitled "Dialoghi della Mufica," which was publifhed at Venice 1544. It is now among the *libri rari*; we have never feen it, except in the library of Padre Martini, where we tranfcribed a confiderable part of it. The author, a whimfical and eccentric character, tinctured with buffoonery, was not only a practical mufician and compofer by profeffion, but connected and in correfpondence with the principal writers and artifts of his time. His "Libraria" muft have been an ufeful publication when it firft appeared; as it not only contains a catalogue and character of all the Italian books then in print, but of all the MSS. that he had feen, with a lift of the academies then fubfifting, their inftitution, mottoe, and employment; but what rendered this little work particularly ufeful to our inquiries after early mufical publications, is the catalogue it contains of all the mufic which had been publifhed at Venice fince the invention of printing.

This author publifhed a collection of his letters, and the anfwers to them; and a wild fatirical rhapfody, which he calls "La Zucca," or the Pumpkin.

In all his writings, of which he gives a lift of more than twenty, he afpires at fingularity, and the reputation of a comical fellow; in the firft he generally fucceeds, and if he fail in the fecond, it is not for want of great and conftant efforts to become fo.

At the beginning of his "Dialogue on Mufic," this author gives a lift of compofers then living at Venice, amounting to feventeen, of whom feven are Netherlanders; the reft chiefly Italian. In the courfe of the dialogue, compofitions by moft of them are performed. In the firft converfation the interlocutors are Michele, Hoftie, Bargo, and Grullone, all performers, who fing madrigals and fongs by Claudio Veggio and Vincenzo Ruffo. In the fecond converfation, inftruments are joined to the voices: Anton. da Lucca firft playing a voluntary on the lute, "Fa cofe divine;" then Buzzino, il violone; Lod. Boffo, S. G. Battifta, Pre Michele, Pre Bartolomeo, and Doni himfelf, play on viols; thefe all perform in pieces of Riccio da Padua, Girolamo Parabofco, Berchem, Archadelt, &c. Here Doni fpeaks with triumph and exultation of the fuperior ftate of mufic in his time, compared with that of any former period: for, fays he, "there are muficians now, who, if Jofquin were to return to this world, would make him cross himfelf. In former times people ufed to dance with their hands in their pockets; and if one could give another a fall, he was thought a wit, and a dextrous fellow. Yfach (Henry Ifaac, 'detto Arrigo Tedefco), then fet the fongs, and was thought a maftcr; at prefent he would hardly be a fchoolboy."

"Hannibal," fays Capt. Bluff, "was a very pretty fellow in thofe days, it muft be granted.—But alas, fir!

were he alive now, he would be nothing, nothing in the earth."

Apostolo Zeno, in his notes on the "Bibl. della Eloq. Ital." of Fontanini, seems to give a very just character of this whimsical writer, when he says, "Il Doni solito sempre tener dubbioso il lettore ne' moi fantastici scritti tra la verità e la falsita, falche non si scuopre quando da seno, e quando da burla egli parli," to. ii. p. 180. edit. de Venezia, 1743. "It is so much the practice of Doni, in all his fantastical writings, to blend truth with falsehood, that the reader is unable to discover when he is ludicrous, or when serious."

Doni, John Babtista, a Florentine nobleman, who flourished in the last century, spent the greatest part of his life in the study and defence of ancient music. His writings and opinions were very much respected by the learned, though but little attended to by practical musicians; on which account most of his treatises, which are very numerous, are filled with complaints of the ignorance and degeneracy of the moderns, with respect to every branch of music, both in theory and practice.

It is no uncommon thing for philosophers, mathematicians, and men of letters, absorbed in mere speculation, to condemn in their closets, unheard and unseen, the productions and performances of practical musicians; who in their turn, contemn whatever theory suggests as visionary, and inadmissible in practice, without giving themselves the trouble to consider, or even to read, the principles upon which an hypothesis may be founded.

It seems as if theory and practice were ever to be at strife; for the man of science, who *never hears music*, and the musician, who *never reads books*, must be equally averse to each other, and unlikely to be brought to a right understanding.

That Doni was but little acquainted with the music which delighted the ears of his cotemporaries, appears in many parts of his works; and as to his belief that the ancients knew and practised counterpoint, and that their music was superior to the modern in every particular, it seems to have been founded upon no better grounds than that of his predecessors, Gaffurio and Zarlino: but if it was such as Doni has imagined, and given in example, the ears of mankind, to have been delighted with it, must have been differently constructed formerly, from those of the present times, which are pleased with modern harmony.

This writer seems full of inconsistencies, with respect to ancient counterpoint. He is unwilling that the Greeks and Romans should be deprived of it; and yet, in speaking of its use among the moderns, he calls it "nemico della musica." His reasons for allowing it to the ancients are chiefly drawn, from their vocal notes being different from the instrumental; from the early invention of the hydraulic, and other organs; from the numerous strings upon some of their instruments; and from a striking passage in Plutarch, which he thinks decisive, as it proves, that though the most ancient musicians used but few strings, yet these were tuned in consonance, and disposed with as much art as in our instruments at present.

Doni left behind him at his death, about 1650, many printed works upon ancient music, as "Compend. del. Trat. de' Generi e de' Modi della Musica. De præstant â Musicæ Veteris," and particularly his "Discorso sopra le Consonanze," with a great number of unfinished essays and tracts relative to that subject, and the titles of many more. Few men had indeed considered the subject with greater attention. He saw the difficulties, though he was unable to solve them. The titles of his chapters, as well as many of those of father Mersennus, and others, are often the most interesting and seducing imaginable. But they are false lights, which like *ignes fatui*, lead us into new and greater obscurity; or like those specimens of fruit brought from the "Land of Promise," which those in whom they excited the strongest desire, never lived to see.

The treatises which he published both in Latin and Italian on the music of the Greeks, being well written in point of language, obtained him the favour and eulogies of men of the highest class in literature. He has been much extolled by Heinsius, Gassendi, Pietro della Valle, and others. Apostolo Zeno, in his learned notes to the Biblioteca Italiana of Fontanini, speaks of him in the following terms. "We had reason to hope, that the works of Doni would have completed our knowledge of the musical system of the ancients; as he united in himself a vast erudition, a profound knowledge in the Greek language, in mathematics, in the theory of modern music, in poetry, and history, with access to all the precious MSS. and treasures of antiquity."

He invented an instrument which he denominated the "Lyra Barberini," or "Amphichordon," which he has described in an express treatise, but we hear of it no where else. He was a declared foe to learned music, particularly vocal in fugue, where the several performers are uttering different words at the same time, which certainly manifest good taste, and enlarged views, with respect to theatrical music and the improvement of the musical drama or opera; but his objections to modern music, and proposals of reform, not only manifest his ignorance of the laws of harmony, but a bad ear, as he recommends such wild, impracticable and intolerable expedients of improvement, as no ear well constructed, however uncultivated, can bear.

In 1763, signior Bandini, librarian to the ci-devant grand duke of Tuscany, published, in 2 vols. folio, not only the musical tracts of Doni which had appeared during his life, but others that were found among his MS. papers after his decease, some finished, some unfinished, and the mere titles of others which he had in meditation.

DONI, in *Ancient Geography*, a river of Greece, in Molossia, a country of Epirus.

DONJEUX, in *Geography*, a small town of France, in the department of the Upper Marne, chief place of a canton, in the district of Wassy, with only 361 inhabitants: but the canton comprises a population of 6265 individuals, dispersed in 19 communes, upon a territorial extent of 217½ kiliometres.

DONJOHN, in *Fortification*, generally denotes a large strong tower, or redoubt, of a fortress, where the garrison may retreat in case of necessity, and capitulate with greater advantage. See Dungeon.

DONJON, Le, the *Dungeon*, in *Geography*, which, during the short existence of the French republic, was called *Le Val Libre*, the Free Valley, or Valley of Liberty, in opposition to its original name, is a small town of France, in the department of the Allier, chief place of a canton, in the district of La Palisse; 12 miles W. of Digoin, 27 miles S.E. of Moulins, and 240 S. of Paris. It contains 1421 individuals, and the canton, which has an extent of 312½ kiliometres, and 13 communes, reckons 10,068 inhabitants.

DONIS Conditionalibus, *statute de*, in *Law*, is the statute of Westminster 2. *viz.* 13 Edw. I. cap. 1. which revived in some sort the ancient feodal restraints, that were originally laid on alienations, by enacting, that from thenceforth the will of the donor be observed; that the tenements so given, to a man, and the heirs of his body, should, at all events, go to the issue, if there were any; or, if none, should revert to the donor. Blackst. Com. vol. ii. p. 112.

DONKEY, in *Agriculture*, a term often used to signify a dampish, or wettish, state of the atmosphere.

DONKOF, or Dankof, in *Geography*, a town of Ruſſia, and one of the 12 diſtricts of the government of Reſan, ſituated on the Don, near its ſource; 60 miles S. of Reſan, and 480 S.S.E. of Peterſburgh.

DONKY, in *Rural Economy*, a name often provincially applied to the aſs.

DON Martinde Majoria, in *Geography*, a cluſter of iſlands in the Great South Sea. S. lat. 18° 36′. E. long. 179° 52′ from Paris. The inhabitants, who are numerous, live in eaſe and plenty. Cocoa, banana, and bread-trees, potatoes, and other eatable roots, grow ſpontaneouſly in great abundance. They cultivate their grounds, weave cloth from the bark of certain ſhrubs, and are decently cloth'd. They are hoſpitable and friendly, have apparently no kind of religion, and are great thieves.

DONNDORF, a ſmall town of the kingdom of Saxony, in the circle of Thuringia; 12 miles from Sangerhauſen, with an ancient convent, which, in the year 1561, was converted into a free-ſchool for twelve boys.

DONNE, John, D.D. in *Biography*, who excelled as a poet and divine, was born in London 1573. He ſtudied at Oxford at a very early period, and was eſteemed a prodigy of abilities. Here he remained three years, and then paſſed the ſame period at Cambridge. He next ſettled at Lincoln's Inn, with a view of ſtudying the law: this did not accord with his views, and he exchanged the law for divinity. Having been educated a Catholic, he was reſolved to try his religious creed by the teſts of reaſon and ſcripture. The reſult of this examination was a firm perſuaſion of the truth of Proteſtantiſm. He now ſeems to have embarked in more active life, and attended the earl of Eſſex in his naval expeditions: he then ſpent ſome years in Italy and Spain, and upon his return became ſecretary to lord chancellor Egerton, and continued in that employment five years, when he was diſmiſſed for having contracted a clandeſtine marriage with the chancellor's niece. The newly married couple had to ſtruggle with many and grievous difficulties, till a relation, ſir Francis Wooley, afforded them a houſe in Surrey, where Donne applied with the greateſt earneſtneſs to the ſtudy of the civil and canon law. At this period, he was earneſtly ſolicited to enter the church, but feeling himſelf not properly qualified, he declined the propoſal, notwithſtanding his circumſtances were extremely narrow. He afterwards came to London, and was admitted into the houſe of ſir Robert Drury, whom, in 1612, he accompanied to Paris: on his return, many of the nobility urged the king, (James I.) to confer ſome civil employment upon him, but the monarch had determined he ſhould, if poſſible, be induſted into the church. Donne had already drawn up a treatiſe at the requeſt of James, concerning the oaths of allegiance and ſupremacy required from the Roman Catholics, and now he compliſd with the wiſh of the ſovereign, and was ordained deacon and prieſt, and, almoſt immediately, was appointed one of the king's chaplains; and likewiſe preſented with the degree of D.D. by the univerſity of Cambridge. So generally was he beloved, and highly eſteemed by people of rank and influence, that he received offers of fourteen benefices in the courſe of the firſt year after he entered into orders: but, preferring London, he was made preacher of Lincoln's Inn. He had not long ſettled in the metropolis before he loſt his wife, who left him with ſeven young children. In 1619, he accompanied the earl of Doncaſter on an embaſſy to the German princes; and upon his return, the king conferred upon him the deanery of St. Paul's, with which he held the living of St. Dunſtan in the Weſt. He was choſen prolocutor of the convocation in 1623-4, and about the ſame time appointed to preach ſome occaſional ſermons at Paul's croſs, and other places. A dangerous illneſs led him to compoſe a book, entitled, "Devotions upon emergent Occaſions," in which much fervour and ſerioſuneſs are expreſſed. He recovered, and lived in good health till he was ſeized with a fever in 1630, after which he never more enjoyed a ſtrong conſtitution. He felt that his end was approaching, and prepared to meet it with reſignation and tranquillity, though not without ſome peculiarities that belonged to his character. Having cauſed himſelf to be wrapt up in a winding-ſheet, like a dead body, and ſtanding with his eyes ſhut, and with ſo much of the ſheet put aſide as might diſcover his thin and death-like face, he cauſed a ſkilful painter to take his picture, which was placed by his bed-ſide, and there remained as his conſtant remembrancer to the hour of his death. During Lent, 1631, he preached in his turn at court, and his diſcourſe on this occaſion was termed by the houſhold "the doctor's own funeral ſermon." He died March 31ſt of the ſame year, and was buried in St. Paul's cathedral. Dr. Donne was an Engliſh poet, but his works are now little known; he may, however, be regarded among thoſe who wrote Latin verſe with elegance. A collection was publiſhed in 1633, entitled, "Faſciculus Poematum, et Epigrammatum Miſcellaneorum," which contains a book of epigrams by him. Of his proſe works, the moſt remarkable is that entitled "Biathanatos, or a Declaration of that Paradox, or Theſis, that Self-Homicide is not ſo naturally a Sin, that it may not be otherwiſe." It does not appear that he intended this work for the public eye, but it found its way to the preſs after his death. He wrote "Eſſays on Divinity;" "Sermons," &c. 3 vols. fol. Biog. Brit.

DONNEMARIE, in *Geography*. See Donnemarie.

DONNERBERG, a mountain of Bohemia, ſuppoſed to be the higheſt in that country.

DONNERSMARK, a town of Hungary; ſeven miles N. N. W. of Kapſdorf.

DONNINGTON, or Donington, is a ſmall market town of Lincolnſhire, England. It is ſeated in that part of the county called the Fens, acroſs which a new road, named Bridgend-cauſeway, has been made to facilitate the communication between this town and that of Folkingham. Previous to this improvement, the place was ſcarcely acceſſible in bad weather. A free ſchool was erected here and endowed in 1718, by Thomas Cowley, eſq. who bequeathed all his eſtates to be applied to the poor of each pariſh, in which his poſſeſſions were ſituate: in this diviſion, the poor of Donnington acquired 400 *l. per annum*. In digging for foundations behind the ſchool-houſe, a vault was diſcovered, four feet ſquare, conſtructed of hewn ſtone, and containing an urn filled with red earth. Amongſt the ruins of ſome ancient buildings, ſome glazed earthen veſſels were found, ſuppoſed to be ſpecimens of pottery very early manufactured at Bolingbroke. Donnington is diſtant 106 miles N. from London: has a market on Saturdays, and two annual fairs. The living is a vicarage. In the return to parliament in 1801, the number of houſes in this town was 216, inhabited by 1321 perſons, of whom many are employed in the cultivation of hemp, which is carried on to a conſiderable extent for the ſupply of the London market. Beauties of England and Wales, vol. ix.

DONNOE, a ſmall iſland in the North ſea, near the coaſt of Norway. N. lat. 66° 5′. E. long. 17° 14′.

DONON, one of the mountains called Voſges, in the department of the Voſges, in France, in the diſtrict of St. Dié. It is remarkable for its iron mine; and at its foot is the ſource of a ſmall river called La Plaine.

DONOR, in *Law*, he who gives lands or tenements, to another,

another, in tail. As donee, is he to whom the same are given.

DONSHAL, in *Geography*, a town of Egypt; 10 miles N. W. of Faoue.

DONSKAIA, a fortress of Russia, in the government of Caucasus; 116 miles W. N. W. of Ekaterinograd.

DONUCA, in *Ancient Geography*, a very high mountain of Tarace, mentioned by Livy, and called *Dunax* by Strabo.

DONUSA, an island of the Icarian sea, one of the Sporades. It lay S. W. of Icaria, W. of Patmos, and E. of Mycone. The marble obtained from this island was green. Virgil and Mela call it *Donysa*, and it is now known by the name of *Donussa*.

DONZENAC, in *Geography*. a small town of France, in the department of the Correze, chief place of a canton, in the district of Brives, with a population of 2012 individuals, and situated six miles N. of Brives. The canton has an extent of 165 kiliometres, seven communes, and 9973 inhabitants.

DONZERE, a small town of France, on the Rhône, in the department of the Drôme, south of Montelimart.

DONZY, in Latin *Domiciacum*, a small town of France, in the department of the Nievre, chief place of a canton, in the district of Cosne, situated on the river Nonain, nine miles E. of Cosne, and 27 miles N. of Nevers. It contains 3600 inhabitants. The canton has 10 communes, upon a territorial extent of 282 kiliometres and a half, with a population of 10,327 individuals.—Also, a small town of France, in the department of the Loire, six miles E. of Feurs.

DOOAB, a tract of fertile land in Hindoostan, formed by the Ganges and Jumnah rivers, belonging to the nabob of Oude: dooab, or doabah, signifying any tract of land formed by the approximation and junction of two rivers.

DOOBANT LAKE, lies in the west part of N. America, S. E. of the head of Chesterfield inlet, in New South Wales: it is about 60 or 70 miles long, and 20 or 30 broad. N. lat. 63° 5′. W. long. 100° 30′.

DOOLS, a term used in several parts of the kingdom for balks or slips of pasture, left between the furrows of ploughed lands.

DOON, in *Geography*, a river of Scotland, which has its rise from loch Doon, on the confines between Galloway and Carrick, and running northerly passes the ancient village of Dalmellington, in its progress takes a N. W. direction, and discharges itself into the Frith of Clyde about three miles from Ayr.

DOON, or *Down*, a province of Hindoostan, which occupies the space at the foot of the mountains that extend from the Ganges to the Jumnah, in length 20 cosses, or $2\frac{3}{4}$ British miles each. The Dooab in this place is about 40 or 41 geographical miles in breadth, but it becomes wider farther towards the south.

DOOR, in *Masonry*, is the aperture for the entrance into a building, or through a partition for passing from one apartment to another. The apertures of doors are regulated by the size of a man, so that they are seldom less then two feet nine inches in width by six feet six inches in height, except in confined situations, where utility is beyond every other consideration. Doors of entrance vary in their dimensions according to the height of the story, or according to the magnitude of the building, in which they are placed. In private houses four feet may be the greatest width, and in most cases three feet will be sufficient, except under the circumstances as stated in the following.

A good proportion of doors, is that in which their dimensions are in the ratio of three to seven in small doors, and one to two in large doors. In the entrance doors of public edifices, where there is a frequent ingress and egress of people, and often crowded, their width may be from six to twelve feet. Inside doors should, in some measure, be regulated by the height of the stories: this, however, has its limit, as there is a certain dimension which ought not to be exceeded; for the difficulty of shutting the door will be increased by its weight; therefore doors for private edifices, which are intended to be shut with one closure, should never exceed three feet six inches in breadth. In palaces, and in noblemen's houses, where much company resort, all the doors are frequently thrown open. These may be made much larger than those of inferior edifices; the width may therefore be from four to six feet. In modern houses it is common to have a large door for throwing two rooms into one. In such cases, the proportion of the aperture will often be of a less height than that of twice the breadth, as the doors in the same story are generally one height throughout. The lintels of doors should range with those of the windows, and their breadth should never be less than that of the windows. In the fourth book of Vitruvius, rules are laid down for Doric, Ionic, and Attic doors, all of which have their apertures narrower at the top than at the bottom, in conformity to the apertures which are to be seen in the ruins of ancient Greek and Roman edifices, as in the temple of Minerva Polias at Athens, and the temple of Vesta at Tivoli. Doors of this form have the property of shutting themselves; this perhaps occasioned their introduction. In modern times they may be employed with advantage in rising from a floor in the act of opening to clear a carpet. They have been introduced by a few modern architects, particularly Mr. Soane, in the bank of England.

With regard to the situation of the principal entrance, it is evident that the door should be in the middle, as it will not only constitute better symmetry, but will communicate more readily with all other parts of the building. The doors of principal rooms should at least be two feet distant from the wall, if possible, that furniture may be placed close to the door side of the room.

The apertures of exterior doors, placed in blank arcades, are generally placed at the same height as the springing of the arch; or if they have dressings, the top of the dressing, whether it be the architrave or cornice, is generally placed on the same level with the impost.

The most common method of adorning the aperture of a door is with an architrave surrounding it, or with a cornice surmounting the architrave, or with a complete entablature; sometimes consoles are introduced flanking the architrave jambs, and sustaining the ends of the cornice. Sometimes the architrave jambs are flanked with pilasters of the orders or of some analogical form: in this case the projections of their bases and capitals are always less than that of the surrounding architrave, and then the architrave over the capitals of the pilasters is the same with that of the head of the door. Sometimes the door is adorned with one of the five orders. The entrance doors of the grand houses are frequently adorned with porticoes in the manner of Grecian temples.

DOOR, in *Joinery*, is the wooden closure or closures which shut or open the communication at pleasure.

Doors are either framed, battened, or ledged.

Framed doors are employed in all descriptions of buildings; they are made either single, or folding, or double margin, or in double doors. All framed doors consist of styles, rails, and pannels. Most single framed doors have munnions besides the other parts of the framing. The framing is the part which is put together by mortise and tenon, and includes all the parts except the pannels. The styles are the vertical parts of the framing upon the margins; the rails are the horizontal parts of the framing, tenoned into the styles. The munnions are

are parts of the framing tenoned into the rails. Folding doors are those which are made in two breadths, and consequently have four styles, one pair to each part. Double margin doors are those made to imitate folding doors, and have a vertical piece running up the middle called the staff style, made in form of the two middle styles of folding doors when shut. Double doors are those which close the breadth of the aperture in two different places, in order to keep the apartment warm. Doors are generally framed in rectangular compartments: however lozenges, circles, ellipses, and other fanciful forms, are sometimes indulged. Framed doors are either square or moulded. Square framing is only used in common houses. The mouldings used in doors are of a variety of forms, some altogether within the framing, and some made to project beyond it. The mouldings and form of the pannels of the door generally regulate the framing of the shutters and the joinery of the windows. When doors are made double margin or folding, the whole of the other doors on the floor must be so also, if the symmetry is intended to be preserved. This happens in consequence of the apartments having a communication with each other.

Batten door, is one constructed of a board glued together of a size equal to the dimensions of the aperture: then styles, rails, and munnions made of battens, with proper mouldings, are fixed to the surface: so that the whole has the appearance of a framed door, though in reality it is not. This kind of door is said to be either single or double, accordingly as it is battened on one or both sides. Batten doors were much used in former times, but now they are seldom employed, except in Gothic work, where all the vertical joints may be hid by the munnions of the framing, which are bolted through, to a reticulated framing on the back; the boards forming the panneling should not be glued together, as the framing bolted together will be abundantly strong. Batten doors are employed in this kind of work with advantage. The large gates and doors of our ancient British edifices are made in this manner. It is certainly, however, a very ineligible method, to imitate the framing of Grecian or Roman doors, particularly where no bolts are employed: for it is evident, that a door made in this manner, however well seasoned the stuff may be, is liable to be affected by dry and damp weather, and much more so must this be the case, when the parts of which it is composed are made of unseasoned stuff.

The materials of which doors are constructed are either metal or wood. The ancients constructed the doors of their temples frequently of gold, silver, bronze, and ivory. We use iron doors in apartments where treasure or other valuable things are deposited. Doors of common houses, and most frequently in good houses, are made of deal. In noblemen's houses they are often made of mahogany, either solid or veneered. Doors of the pointed style are frequently made of wainscote.

Doors are sometimes made double, in order to keep the apartments warm.

Fig. 1. *Plate* A B, a door made in the ancient manner, shewing only munnions on the front.

Figs. 2 and 3, different methods of reticulating the back of *fig.* 1. The munnions of *fig.* 2. are crossed obliquely, in order to give strength; a method sometimes used when the upper part is fixed and the lower part made to open. In *fig.* 3, the reticulations are at right angles in the lower part; and the bars of the upper part cross the munnions diagonally. This manner is sometimes used when the whole half door opens at once.

Fig. 4. No 1. shews the reticulations to a large scale, with the manner of dovetailing the transverse pieces into the styles.

Fig 4. No. 2. part of the section of a door. The transverse pieces are notched half their thicknesses into the munnions, and firmly bolted with screw bolts or rivetted ends.

Fig 5. No. 1. a door first put together with styles and rails; the styles are made thick in order to receive boarding upon each side, which finishes flush with the styles. *Fig.* 5. No. 2. the same door boarded and bolted. The core is filled in tightly with diagonal pieces, as shewn at No. 1.

An account of modern doors will be seen in the article JOINERY.

DOOR, *scenography of a.* See SCENOGRAPHY.

DOORS, *architrave.* See ARCHITRAVE.

DOOR, is sometimes applied to the gates of locks or sluices.

DOPONEN, in *Geography*, a town of Prussian Lithuania; 4 miles S. S. E. of Stallupunen.

DOPPELMAIER, JOHN GABRIEL, in *Biography*, a celebrated mathematician at Nuremberg, was born in 1667, in that city, where his father was a merchant. Having obtained the elements of learning, he studied the law at Altdorf in 1696, and, at the same time, attended the lectures of the celebrated professor Sturm on philosophy and the mathematics. The first disputation he maintained was in 1698, "De Sole:" and in the following year he maintained another, "De Visione sensu nobilissimo, ex camerae obscurae illustrata." He then went to Halle, and in a few years his strong attachment to philosophy and the mathematics induced him to quit the pursuit of the law altogether, that he might devote his whole time to the sciences. In connection with these, he studied the English and other modern languages; and in the spring of 1701, he visited Leyden, and during his stay there exercised himself in the art of polishing optical glasses, and in practical astronomy. From Leyden he proceeded to Rotterdam, and thence to England, where he formed an acquaintance with the most celebrated mathematicians of the age, and particularly with Mr. Flamstead, the astronomer royal at Greenwich, and the doctors Wallis and Gregory at Oxford. In 1702, he returned to his native city, and in 1704 was elected professor of mathematics in the college of Nuremberg, the duties of which office he performed forty years with much credit and reputation. In 1715, he was admitted into the Imperial Academy of the Searchers into Nature, under the name of Conon, and a similar honour was conferred upon him by the Academy of Sciences at Berlin. He was likewise elected a fellow of the Royal Society of London; and in 1741 the Imperial Academy of Petersburgh sent him a diploma of associate. Towards the close of life, he attracted great notice by his electrical experiments, which then engaged the attention of the whole philosophical world. He died on the 1st of December 1750. His works are numerous and respectable; they are all connected with the sciences which were the delight of his life. Gen. Biog.

DOR, the English name for the common black beetle. Some also apply it to the dusty beetle, that flies about hedges in the evening. See SCARABÆUS.

DORA, in *Botany*, is the Arabian name of a large species of *Holcus*, the Milium arundinaceum, plano albuque semine; Bauh. Pin. 26, figured in Rauwolf, t. 198, which by the Mantissa altera of Linnæus, p. 500, seems what he finally determined to be his *H. Sorghum*, and it agrees with the specimen in his herbarium. S.

DORA, or DOR, according to its eastern name, in *Ancient Geography*, a town of Phœnicia, situated in a kind of peninsula at the pass where mount Carmel commences, according to

to Artemidorus cited by Steph. Byz., who adds that it was at first inhabited by the Phœnicians, who established themselves in this plain, on account of the fish which furnishes the purple dye. This town was 11 miles S. of Sycaminas, according to Jerome, who says that it was left altogether desolate, and that its ancient magnificence could only be conjectured from its ruins. According to Joshua it subsisted under the name of Dor before the Israelites entered into the land of Canaan. Joshua having conquered it and killed its king, gave it to the half tribe of Manasseh, on this side of Jordan. (Josh. xii. 23. xvii. 11.) Dora became subject to the kings of Egypt, the successors of Alexander. Antiochus Epiphanes took it, after having gained a victory over the troops of Ptolemy Philometor, king of Egypt, according to Polybius (l. v.) It was one of the towns possessed by the Jews when Pompey entered Syria; and when this whole country was reduced into a Roman province, Pompey gave it the privilege of independence in the year of Rome 690.

Dora, an island of the Persian gulph, according to Strabo. —Also, a fountain placed by Pliny in Arabia Felix.

DORAB, in *Ichthyology*, a species of *Clupea*, which see.

DORAC, or Durac, in *Ancient Geography*, a town of Africa, mentioned by Ptolemy, and placed by him in 31° 15′ lat.; the ruins of which are visible on the summit of the mountain called Dédez.

Dorac, in *Geography*, a town of Persia, in the province of Chusistan: 75 miles S. of Susa.

DORADO, in *Astronomy*, a southern constellation, not visible in our latitude; it is also called Xiphias. The stars of this constellation, in Sharp's Catalogue, are six.

Dorado, in *Geography*, a name given by the Dutch to a part of the chain of mountains of Parima in S. America, signifying mountain of gold. It is composed of bright micaceous schistus, which has given similar reputation to a small island in the lake of Parima.

Dorado, in *Ichthyology*, the name of a large sea-fish, called by the Brazilians, *guaracapema*; the Coryphæna *equiselis*, which see.

DORÆNA, in *Botany*, Thunb. Nov. Pl. Gen. fasc. 3. 59. Fl. Jap. 6. Schreb. 108. Willd. Sp. Pl. v. 1. 812. Juss. 420. Mart. Mill. Dict. v. 2. Class and order, *Pentandria Monogynia*. Nat. Ord. uncertain; Juss.

Gen. Ch. *Cal.* Perianth of one leaf, five-cleft, shorter than the corolla; its segments ovate, concave, smooth. *Cor.* of one petal, wheel-shaped, somewhat cylindrical; its limb in five ovate, obtuse, upright segments. *Stam.* Filaments five, extremely short, inserted into the tube of the corolla; anthers oblong, nearly square, included in the tube. *Pist.* Germen superior, conical, smooth; style thread-shaped, the length of the corolla; stigma abrupt, notched. *Peric.* Capsule ovate, acute, smooth, the size of a pepper-corn, of one valve and one cell, with many seeds. Thunb.

Ess. Ch. Capsule superior, of one cell, with many seeds. Corolla five-cleft. Stigma cloven.

1. D. *japonica*. (Tufukaki, Fitatsi, or Senrjo, of the Japanese.) A shrub, native of Japan, about six feet high, with alternate, round, smooth, ash coloured, spreading *branches*. *Leaves* alternate, stalked, spreading, oblong, pointed, distantly and slightly serrated, ribbed, smooth, about a finger's length. *Foot-stalks* an inch long, semicylindrical, furrowed above, smooth. *Flowers* minute, white, in axillary clusters scarcely an inch long. Such is Thunberg's account, from which alone we have any knowledge of this plant. We have never seen even a dried specimen, nor is there any figure of it extant.

DORAN, in *Geography*, a very ancient town of Arabia, in that part of the country of Yemen, which comprehends the Imam's dominions, situated on the declivity of a mountain, not far from the roads between Sana and Damar, and the residence of several Imams. The district is under the government of a particular schiech, as is also Djebbel Scherki, a great mountain in its vicinity. N. lat. 14° 55′. E. long. 44° 4′.

DORANA, or Darano, in *Ancient Geography*, a town of Asia, in Galatia. Itin. Antonin.

DORAT, or Daurat, John in *Biography*, a man of letters, was born of an ancient family in the Limosin, about the beginning of the sixteenth century. He studied at Paris, where he obtained so high a reputation for learning, that he was made royal professor of the Greek language. He had many scholars who became very distinguished for application and talents. He was in high favour with Charles IX, who took much pleasure in conversing with him, but he never obtained much of the royal patronage, and passed the latter part of his life in great poverty. He was a most ready writer of verses, which issued from his pen on almost every occasion, yet he obtained a considerable share of reputation by his earlier productions, and acquired the title of royal poet, and it is to the disgrace of his sovereign, that he obtained nothing more substantial than the title. He was highly esteemed as a critic, and was supposed to excel in explaining the sense of obscure ancient authors. He died in 1588, having completed his eightieth year. He had been twice married, the second time when he was very old, to a handsome young woman; being censured for the inequality of the connection, he replied that it was better to die by a bright than by a rusty sword. Moreri. Bayle.

Dorat, in *Geography*, a small town of France, in the department of the Upper Vienne, chief place of a canton, in the district of Bellac, with a population of 3096 individuals. It is situated on the river Scurre, 30 miles N. of Limoges, and nine miles N. of Bellac. The extent of the canton is 335 kilometres; it comprizes 14 communes, and 11,436 inhabitants.

DORATH, in *Ancient Geography*, a town of Africa, in Mauritania Tingitana.

DORBETA, a town of Asia, in Mesopotamia, on the bank of the Tigris.

DORCAS, in *Zoology*, a species of *Antelope* (which see,) called also Capra *Dorcas*, *hircus* Africanus, or Gazella Africana, Tzebi of the Bible, and Barbary Antelope, has its horns, which are about 12 inches long, and surrounded by about 13 prominent rings, bent in form of a lyre; the upper parts of the body reddish brown, the under parts and buttocks white, and both divided by a dusky line along the sides, the knees furnished with a long brush or tuft of hair, the tail short, covered with long blackish hairs and white underneath. This animal, which inhabits Barbary, Egypt, Arabia, and Syria, is about half the size of a fallow-deer; and is supposed by Gmelin to be the dischon of Moses; perhaps the animal mentioned by Solomon, and named in our version, roe of the mountains. It goes in large flocks, is easily tamed, though naturally very timid, and its flesh is reckoned excellent food.

DORCHESTER, in *Geography*, the county, and principal town of Dorsetshire, England, is a place of remote antiquity, and its history is replete with interest. It was a Roman station of considerable extent, and from the vestiges of the Romans in and near it was a principal settlement of that people in Britain. Its Roman name, Durnovaria, or, the passage of the river, is of British extraction. Richard of Cirencester calls it respectively by this name, and that of Durinnum; but Antoninus by the former only. Ptolemy calls it Dunium, which some copies erroneously read Durnium,

rium. Both are probably only corruptions from Durirum. Dunim meant, according to Mr. Baxter, Maiden-caſtle, (the name of a large encampment in the vicinity;) and Durnovaria, the town. This is, however, againſt the expreſs teſtimony of Ptolemy, who calls Dunium the town of the Durotriges. Theſe, therefore, are only different names aſſigned to the ſame place in different ages. Dorcheſter was by the Saxons called Dorneceaſter, from the Britiſh Dwr, and the Saxon Cheſter, a corruption from the Roman Caſtrum, a camp or town: hence the Latin name Dorceſtria, in ancient records, and the modern name Dorcheſter, is clearly derived. In the Itineraries of Antoninus and Richard of Cirencefter, Dorcheſter appears as a Roman ſtation; and, indeed, the ancient walls, the Via-Iceniana, on which it ſtands, the ſeveral vicinal roads that iſſue hence, coins, and other pieces of antiquity found here, Maiden-caſtle, the amphitheatre, and camp at Poundbury, near it, ſhew it to have been then a place of great importance. It was fortified by the Romans with a wall and foſs, which extended quite round it, and two exterior ramparts to the ſouth and weſt, which are ſtill viſible; though they are in many places levelled by the plough. The high ground on the north rendered any advanced works there unneceſſary. On the weſt ſide part of the old Roman wall was ſtanding till the ſummer of 1802; this was ſix feet thick, and in ſome places twelve feet high. The foundation was laid on the ſolid chalk, and the wall formed of rag-ſtones, laid ſide by ſide, in an oblique direction, and then covered over with very ſtrong mortar. The next courſe was generally carried the contrary way, and occaſionally three horizontal ones for binding; much flint was alſo uſed. Conſiderably more of the wall remained within memory, and ſome of the foundations appear in other places; on the eaſt a ſmall lane is built upon it, and the ditch filled up; though it is ſtill called the walls. Great part of the remains was levelled or deſtroyed in making the walks round the town. About the year 1764, eighty-five feet of the wall were pulled down, and only ſeventy-ſeven left ſtanding. The area incloſed by the walls was about eighty acres. Numerous Roman coins of the different metals, formerly called by the vulgar Dorn's pennies, have been dug up in different parts of Dorcheſter; and in 1750, a gold ring, half an inch thick, valued at 3*l.* 17*s.* 6*d.*, was diſcovered in the river Frome. But the moſt perfect and curious relic of antiquity, was a bronze image of a Roman Mercury, ſeated on a fragment of a rock, about four inches and a half high, diſcovered in the back garden of the principal free-ſchool; and a large fragment of a teſſelated pavement. Dorcheſter was of conſiderable importance under the Saxons, and had, from Athelſtan, the grant of two mints; a privilege he only extended to cities and walled towns. In 1003, Sweyn, king of Denmark, having landed in Cornwall, to revenge the maſſacre of his countrymen, after ravaging that county and Devon, directed his march to this town, which he beſieged, and burnt, and afterwards threw down the walls, probably for the obſtinate defence they enabled the beſieged to make. Camden mentions many of the burying-places, or tumuli, of theſe Danes, as being ſcattered round the town. The deva ſtation they committed appears from the Domeſday book, which ſtates that, in the time of Edward the Confeſſor, "there were 172 houſes, which defended themſelves for all the kings ſervices, but which were then reduced to eighty-eight, a 100 having been totally demoliſhed from the time of Hugh, the high ſheriff." In the year 1595 Dorcheſter was viſited by the plague, which proved ſo deſtructive, that the living were not ſufficient to bury the dead. In Auguſt 1613, the town was partly deſtroyed by a fire, which conſumed 300 houſes, and the two churches of the Holy Trinity and All Saints; the loſs was eſtimated at 200,000 *l.* Another conflagration, of which no particulars are recorded, is ſaid to have happened in 1662. Dorcheſter is recorded, by the hiſtorian of the civil wars, as having been particularly diſaffected to the royal cauſe, more ſo than any place in England. He terms it "the magazine whence the other places were ſupplied with the principles of rebellion; and a ſeat of great malignity." It was one of the firſt towns fortified againſt the king; and though neither ſtrong by nature, nor hardly capable of being made ſo by art, theſe diſadvantages were ſuppoſed to be more than counterbalanced by the ſpirit and obſtinacy of its inhabitants. In the time of Edward III. the government of this town was veſted in bailiffs and burgeſſes. James I. increaſed the number of burgeſſes to fifteen, with permiſſion to chuſe a recorder and other officers. By Charles I. it was incorporated under a mayor, two bailiffs, ſix aldermen, ſix capital burgeſſes, a governor, and twenty-four common-councilmen. This borough has returned members to parliament ever ſince 23 Edw. I. The right of election was formerly claimed by the inhabitants paying ſcot and lot; but this right has, by a late determination, been adjudged to be equally veſted in non-reſidents, provided they are poſſeſſed of real eſtates within the borough, and have paid the church and poor rates. The electors are at preſent about two hundred; the mayor is the returning officer.

Dorcheſter is delightfully ſituated on an aſcent above the river Frome, which bounds it on the north ſide; on the ſouth and weſt it opens on pleaſant downs, intermixed with corn fields. The town forms an irregular ſquare; though in former times, as appears from obſervation, it moſt probably made a complete one. It conſiſts principally of three ſpacious ſtreets, which join each other about the middle; theſe, with others ſubordinate, are well paved, and, in general, adorned with handſome buildings of brick and ſtone. Thoſe of moſt eminence are, the three churches of St. Peter, Trinity, and All-Saints; the town-hall, the county-hall, and the new-gaol. St. Peter's church is a large handſome ſtructure, ſtanding near the centre of the town, and conſiſting of a chancel, nave, and ſide aiſles; the tower, which riſes to the height of ninety feet, is ornamented with pinnacles and battlements. Though only a chapel of eaſe to the Holy Trinity, this is eſteemed the principal church in the town. It contains a few monuments commemorative of diſtinguiſhed perſons, and ſome inſcriptions, curious on account of their antiquity. The town-hall is ſituated at a ſmall diſtance from St. Peter's church. It was erected by the corporation in the year 1791, and is a ſpacious and handſome edifice, having a market place under it; and behind it, two rows of convenient ſhops for the uſe of the town butchers. The ſhire-hall is a plain neat building, having a front of Portland-ſtone, and a pediment in the centre. The courts are well contrived, and commodiouſly fitted up; and the building is appropriately ſuited to the purpoſes for which it was erected. The new-gaol is on the north ſide of the town: the old one, being ſmall and inconvenient, was ſold by auction for 1220 *l.* In the preſent ſtructure are united the county-gaol, penitentiary-houſe, and houſe of correction. The plan adopted is that recommended by Mr. Howard. The expence of the erection was 16,179*l.* 10*s.* 6*d.* This edifice, in its external appearance, is handſome and characteriſtic; and the interior poſſeſſes every convenience appropriate to its deſtination. The buildings conſiſt of a lodge, keeper's houſe, chapel, debtors' day rooms, female fines, and female debtors' rooms, viſiting rooms for male debtors, fines, felons' infirmaries, &c., and of four wings, detached

detached from, but communicating with, the centre building on each ſtory, by means of caſt iron bridges from the ſeveral galleries. There are ſeparate ſleeping cells for eighty-eight priſoners, which are diſtributed in the ſeveral buildings; and two airy dormitories for male debtors, each containing four beds, to be uſed in caſe the number exceeds that which can be accommodated in the debtors' wing; beſides four cells for condemned priſoners, four over theſe perfectly dark, yet airy, for the refractory; and ſix reception cells, which are fitted up in the lodge. The diſtribution is ſuch, that not only the male priſoners are ſeparated from the female, and the felons from the debtors, &c. but thoſe of each deſcription are ſubdivided into claſſes; and for each claſs, by means of diſtinct ſtaircaſes, ſeparate ſubdiviſions are appropriated, with courts, work-rooms, &c., to each. The female fines, and female debtors, have each a commodious room, with every poſſible convenience, over the male debtor's dormitories, and under the two infirmaries, ſeparate and detached from every part of the building, except the keeper's houſe and court, to which they have acceſs through the chapel.

The environs of Dorcheſter are extremely pleaſant; being almoſt ſurrounded by agreeable walks planted with rows of limes and ſycamores; the view of the town, with the tower of St. Peter's church, and that of Fordington, a neighbouring village, appear on every quarter with advantage. Dorcheſter is ſituated 120 miles S.W. from London; has weekly markets on Wedneſday and Saturday, with four annual fairs; and was returned to parliament in 1801, as containing 353 houſes and 2042 inhabitants.

The vicinity of Dorcheſter preſents ſeveral objects of hiſtorical reſearch, and highly intereſting to the curious enquirer. "Theſe extended plains," remarks Mr. Gilpin, in his obſervations on the weſtern parts of England, "however deſolate they now appear, have once been buſy ſcenes: the antiquary finds rich employment among them for his curioſity. To follow him in queſt of every heaving hillock, and to hear a diſcuſſion of conjectures about the traces of a Daniſh or a Roman mattock, where the eye of common obſervation perceives no traces at all, might be tedious, but he ſhews us ſeveral fragments of antiquity on theſe plains, which are truly curious; and convinces us that few places in England have been more conſiderable in Roman times than Dorcheſter. Poundbury and Maiden-caſtle are both extraordinary remains of Roman ſtations. Numberleſs tumuli alſo are thrown up over the downs: theſe were antiquities even in the times of the Romans themſelves. But the moſt valuable fragment on theſe plains is a Roman amphitheatre, which retains its complete form to this day." This ſtructure, allowed to be the moſt perfect of its kind remaining in England, was firſt publicly noticed by ſir Chriſtopher Wren, who had obſerved it in his journies to the Iſle of Portland. It was afterwards examined by the indefatigable Dr. Stukeley, who inſerted a particular deſcription of it, with five engravings, in his "Itinerarium Curioſum:" but his relation is in ſeveral places more fanciful than juſt. This amphitheatre, which has acquired, from its component parts, the name of Maumbury, is ſituated on a plain in the open fields, about a quarter of a mile ſouth-weſt from Dorcheſter, cloſe by the Roman road which runs thence to Weymouth. It is raiſed upon, and was probably framed of, ſolid chalk, cemented by mortar made of burnt chalk, and covered with turf. It is computed to conſiſt of about an acre of ground; and by an accurate admeaſurement it was found that the greateſt perpendicular height of the rampart, above the level of the arena, was 30 feet; the external longeſt diameter 343 feet 6 inches; the external ſhorteſt diameter 339 feet 6 inches; the internal longeſt diameter 218 feet; the internal ſhorteſt diameter 163 feet 6 inches. The number of ſpectators which it was capable of accommodating is computed to be 12,960. Poundbury camp is ſituated about half a mile weſt of Dorcheſter, on the bank of the river Frome, having a very abrupt deſcent on that ſide. The breadth of the area is 147 paces, and its length 378: towards the middle, the ground is conſiderably elevated; and near the ſouth ſide is a barrow, which Dr. Stukeley imagined to be Celtic, and extant before the camp was made. This gentleman was induced, from the ſituation, ſize, and form, of this fortification, ſo much reſembling that near Ameſbury in Wiltſhire, to ſuppoſe that it was made by Veſpaſian, when employed in the conqueſt of the Belgæ. But Camden, Speed, and ſome other antiquaries, aſcribe it to the Danes, who beſieged Dorcheſter under king Sweyn. Maiden-caſtle, one of the ſtrongeſt and moſt extenſive encampments in England, occupies the entire apex of a hill, about one mile ſouth-weſt of Dorcheſter, to which garriſon, in the time of the Romans, this is ſuppoſed to have been the caſtra æſtiva, or ſummer ſtation. Its form is an irregular ellipſis, ſurrounded by treble ditches and ramparts; the former are of prodigious depth; and the latter extremely high and ſteep. The entrances to the eaſt and weſt are ſtrengthened by additional works; the ends of the ramparts lapping over each other, and rendering the outlets very winding and intricate. The inner rampart includes an area of about 44 acres, and is nearly a mile and a quarter in circumference. The area is divided into two parts by a low ditch and bank, extending from north to ſouth; and near the ſouth ſide, where the ramparts are low, there appears to have been another entrance. Here alſo is the mouth of a cave, or ſubterraneous paſſage, ſaid, by tradition, to be of conſiderable length, though it is now choaked up and impaſſable. The whole extent of the works is 1194 yards by 544; of the area 760 yards by 275. This great and commanding fortreſs, though commonly ſuppoſed to be a Roman work, is, by Mr. King, aſcribed to the Britons. This gentleman has given a particular deſcription of it in his "Munimenta Antiqua," vol. i. "Beauties of England and Wales," vol. iv. "Hutchins's Hiſtory of Dorſetſhire," 2 vols. folio.

Dorchester, a county of America, in the ſtate of Maryland, lying on the E. ſide of Cheſapeak bay, and on the S. ſide of Choptank river, which ſeparates it from Talbot county. On its coaſt are ſeveral iſlands, the chief of which, from the mouth of Hudſon's river, are, James, Taylor's, Barren, Hooper's, and Goldſborough's, the laſt lying between Hungary river and Fiſhing bay. The length of the county from E. to W. is about 33 miles, and its breadth from N. to S. 27 miles. The number of its inhabitants is 12,346, of whom 4566 are ſlaves. The lands in the northern parts are ſomewhat elevated, but in the ſouthern parts low and marſhy, particularly along Fiſhing-bay, and up its waters Tranſquaking, Blackwater, and Fearim creek, and along Hungary river, an arm of the Cheſapeak. The produce is chiefly wheat, corn, and lumber. Its chief town is Cambridge. Morſe.

Dorchester, a townſhip of America, in Grafton county, New Hampſhire, incorporated in 1761, and containing 349 inhabitants. It lies N. E. of Dartmouth college about 17 miles.—Alſo, an ancient and thriving town in Norfolk county, Maſſachuſetts, ſettled as early as 1630. It is 2 miles S. by E. diſtant from Boſton, and is now about 6 miles long, and 3½ broad. Its chief manufactures are paper, chocolate, ſnuff, leather, and ſhoes. It has a handſome church, and contains 2347 inhabitants. The N. E. point of

of the peninſula, called "Dorchester-neck," approaches within half a mile of Caſtle iſland, and its N. W. point within half a mile of the S. part of Boſton.—Alſo, a town in Cumberland county, New Jerſey, lying on the E. ſide of Morris river, about 5 miles from its mouth in the bay, and 17 eaſtward of Fairfield.—Alſo, a ſmall town of Charleſton diſtrict, South Carolina, on the N. E. bank of Aſhley river, 18 miles W. N. W. of Charleſton city. This place was ſettled and named in the year 1760, by a colony from Dorchester and its vicinity, in Maſſachuſetts; and ſome of its inhabitants, about the year 1750, left it, and ſettled midway, in Georgia. Morſe.

DORCHESTER *Mount*, a ridge of mountains in America, running through the county of Lincoln, in Upper Canada, parallel to Ontario, and ſuppoſed to be a ſpur of the Alleghany.

DORCHESTER *Township* lies in the county of Norfolk, Upper Canada, W. of and adjoining to Dereham, fronting the river Thames.

DORDOGNE, La, in Latin *Dordonia*, is a conſiderable river of France, which has its ſource in the eaſt, in the department of the Cantal, at the foot of a mountain called *le Mont d'Or*, and is properly formed of two ſtreamlets, the Dore and the Dogne, from which it derives its name. The Dordogne flows firſt towards the north, then towards the weſt, and afterwards to the ſouth, as far as Bort; from thence it takes a ſouth weſt direction as far as Beaulieu, and it is only to the north of Rocamadour that it begins to purſue a ſteady courſe weſtwards, when it paſſes by Souillac, St. Cyprien, Limeuil, la Linde, Bergerac, where it receives the river Vezere, St. Foy, Genſac, Caſtillon, Branne, Libourne, to the right of which it receives the river Pille, and then flows to Bourg ſur Gironde, and laſtly diſcharges itſelf at Bec d'Ambez into the river Garonne, which, after having taken up the Dordogne, is called the Gironde.

The Dordogne is navigable ſome time before it reaches Libourne, where its navigation is ſtill more facilitated by the tide. It gives its name to a department, and divides the department of the Correze from thoſe of the Puy-de-Dôme and the Cantal.

DORDOGNE, *The department of the*, is the ſecond department of the ſeventh region, or ſouth-weſt part of France, which compriſes nine departments, and is alſo known by the appellation of the Region of the Garonne. It derives its name from the river Dordogne, which runs through it in its ſouthern part from eaſt to weſt, and is compoſed of that part of the former province of Guienne which was called Périgord. Its chief place is Périgueux.

The department of the Dordogne is bounded on the north-eaſt by the department of the Upper Vienne, on the eaſt by that of the Correze, on the ſouth-eaſt by that of the Lot, on the ſouth by that of Lot and Garonne, on the ſouth-weſt by that of the Gironde, on the weſt by that of the Lower Charente, and on the north-weſt by the department of the Charente.

The principal rivers of this department are the Dordogne and the Ille; the leſſer ones are the Houe, the Upper Vezere, the Bandiat, the Dronne, the Vezere, and the Céon. Its climate is ſalubrious, but rather cold, on account of the mountains by which this department is ſurrounded. There are, however, ſome extenſive plains, and very fine valleys. The ſoil is generally ſtony. Corn is grown on the banks of the Ille and of the Dordogne; but the reſt of the department is without it; to ſupply the want of wheat, the inhabitants live moſtly upon chetnuts, which grow in abundance, and which ſerve as food for both the country people and their cattle. Some cantons produce wine, others a little rye, barley, truffles, walnuts, &c. There are ſome good meadows and a few graziers: but the induſtry of the country people is chiefly directed towards the rearing of poultry. The turkeys of the Périgord are famous all over France.

Agriculture has made little progreſs in the department of the Dordogne; ſcarcely one-third of the ground is cultivated. Moſt of the land wants draining, and artificial meadows would be of immenſe benefit: but the antiquated prejudices of the inhabitants reſiſt every ſort of improvement. There are many extenſive foreſts, but moſt of them in a ſtate of decay. Game is abundant.

There are ſome iron mines in the department of the Dordogne which yield excellent iron; it is uſed in the cannon founderies, and the guns which are made of it are reckoned nearly as good as braſs cannons. This department has alſo ſeveral mineral ſprings. The principal articles of trade are poultry, pigs, cattle, chetnuts, brandy, timber, iron, knitted hoſiery, earthen-ware, and paper.

The territorial extent of the department of the Dordogne is 8982 kiliometres and a half, or 1,135,322 arpens, equal to 451 ſquare leagues. The foreſts occupy 133,339 arpens. Its population amounts to 410,350 individuals, or about 910 inhabitants *per* ſquare league. The principal towns are Perigueux, Nontron, Excideuil, Sarlat, Monpaſier, Bergerac, Muſſidan, and Riberac. It is divided into five diſtricts; *viz.* Nontron, Perigueux, Sarlat, Bergerac, and Riberac; 47 cantons, and 642 communes. The average contribution of every individual to the expences of the ſtate amounts to ſeven livres, 77 centimes, 10 enzièmes, or nearly 6*s.* 6*d.* ſterling. (Herbin. Statiſtique de la France.)

DORDOMANA, in *Ancient Geography*, a town of Aſia, in Parthia. Ptolemy.

DORDRECHT, Dortrecht, or *Dort*, in Latin *Dordracum*, or rather *Dortrechtum*, in *Geography*, is a conſiderable town of the kingdom of Holland, in the department of the Maas, celebrated for the Proteſtant ſynod which was held here in 1618, (ſee Dort) and for being the place where the ancient counts of Holland uſed to be inaugurated. It is ſituated in an iſland called the Merwe; the harbour is commodious; it has a good ſalmon-fiſhery, and traded chiefly with timber, which in ſummer-time is floated down the Rhine and the Waal, and cut in the ſawing-mills, of which there is a great number in the neighbourhood of this town. Dordrecht is 12 miles S. E. of Rotterdam, 18 N. W. of Breda, and 45 S. by W. of Amſterdam. Long. E. from Ferro, 22° 11′ 30″. Lat. 51° 48′.

DORE, a ſmall river of France, in the department of the Puy-de-Dôme, has its ſource near Saint Amand, Roche Savine, from whence it runs ſouthwards, paſſes by St. Bonnet and Arlant, thence flowing to the north, it paſſes by Ambert, Oliergue, Courpiere, Puy Guillaume, and falls into the Allier near Ris.

Dore l'Eglise, a ſmall town of France, in the department of the Puy-de-Dôme, 21 miles E. of Iſſoire.

DOREBAT, a town of Arabia, in the country of Yemen, 10 miles diſtant from Mocha, the capital of the territories of Schiech-Ibn-Akian. Its ſituation on the ſummit of a hil renders it naturally ſtrong. At the foot of the hill ſtands a tower, the public priſon, which is ſaid to be the moſt diſmal in Yemen.

DOREE, or John Doree, in *Ichthyology*, a name given by us to a fiſh, called by authors the faber and gallus marinus. We have borrowed the name Doree from the French; and, as to the word John, by ſome writers prefixed to it, it ſeems only a corruption of the French word jaune, yellow; they expreſſing the colour of the ſides of this fiſh, which is a gold yellow, by the phraſe Jaune Dorée; this has given us the

the words John Doré, or by those who spell yet worse, John Dory, as we see it in some authors. This is the ZEUS *Faber*, which see.

The flesh is well tasted, and by many preferred to that of the turbot. It is caught in the Mediterranean and other seas, and is not uncommon on the Cornwall coast, and other of the English shores.

The Indian Doré is a fish caught in many parts of the East Indies, and called by the Dutch there the meerhaen, the same with the abacatuia of Marcgrave, caught in the Brasilian seas. See ABACATUAIA and ZEUS *Gallus*.

DORENBERG, or DUIRENBERG, in *Geography*, a town of Germany, in Westphalia, and county of Ravensberg; three miles N. W. of Bielefield.

DORENHAGEN, a town of Germany, in Westphalia, and bishopric of Paderborn; five miles S. S. E. of Paderborn.

DORENTHAL, or DOROTHEENTHAL, a town of Germany, in the circle of Upper Saxony, and circle of Erzgeberg; 13 miles S. of Freyburg.

DORETTE, a river of France, which runs into the Dive, near Troan, in the department of the Calvados.

DORFF, a town of Germany, in the archduchy of Austria, on the Danube; 11 miles N. W. of Bruck.

DORFFEN, or DORFEN, a market-town of the kingdom of Bavaria, in Lower Bavaria, situated on the Iser, in the district of Landshut.

DORFFTIS, a town of Germany, in the archduchy of Austria, seven miles S. of Zistersdorff.

DORFMARK, a town of Germany, in the circle of Lower Saxony, and principality of Luneburg; 20 miles N. W. of Zelle.

DORGAMANES, in *Ancient Geography*, a river of the Paropamisus, Ptolemy.

DÜRGIO, in *Geography*, a small town of Switzerland, in the canton of Uri, with a mineral spring, the water of which is reported to purify the blood.

DORHOBUS, a town of Poland, in the palatinate of Volhynia; 60 miles E of Lucko.

DORIA, ANDREW, in *Biography*, a very extraordinary character, was born at Oneglia in the year 1466, or 1468, of which his father, a noble Genoese, was feudatory lord. At an early period he exhibited a strong inclination for a military life, which was checked and discouraged by his parents. At their death he entered into the service of the pope as a man at arms. He next engaged in the service of the kings of Naples. In Venice he undertook the guardianship of Francis-Maria, whom he secured against the attempts of Cæsar-Borgia; and then repaired to his own country, Genoa. Twice he subdued, and brought to their allegiance, the revolted Corsicans. His enterprizing spirit by land obtained for him the office of captain-general of the Genoese gallies, about the year 1513. His first essays on the new element were upon the African pirates, with whom he engaged, and by the conquest of whom he was so far enriched as to become master of four gallies in his own pay. At this period Genoa was the prey to contending factions, and the city had, by one of them, been put into the hands of Louis XII. of France, from whom it afterwards revolted. Doria attempted to compose the distractions of the republic, but, finding his efforts ineffectual, he entered into the service of Francis I. of France, to which country he was exceedingly useful, but being neglected by the ministers, he joined himself to pope Clement VII. and became admiral of his gallies. In this situation he did not remain very long, for upon the capture of Rome under the constable Bourbon, Doria was persuaded to return to the service of Francis, who received him with open arms, and appointed him his admiral in the seas of the Levant. Doria had at that time eight gallies of his own, and notwithstanding his engagements to a foreign prince, he still maintained the independence of his mind; and when the French attempted to render Savona, long the object of jealousy of Genoa, its rival in trade, Doria remonstrated against the measure in a high and animated tone, which so irritated Francis, that he ordered his admiral to sail instantly to Genoa, then in the hands of the French troops, to arrest Doria, and to seize his gallies. Doria was apprized of their intentions, retired with all his vessels to a place of safety; and, while his resentment was thus raised, he closed with the offers of the emperor Charles V., returned his commission, with the collar of St. Michael, to Francis, and, hoisting the Imperial colours, sailed with his gallies towards Naples, not to block up the harbour of that unfortunate city, but to bring it protection and deliverance.

The ruin of the French army before Naples was the immediate consequence of this change. This was an important object, but Doria's highest ambition was to deliver his country from the power and dominion of foreign sovereigns. The moment favourable to this project seemed to have arrived: Genoa was afflicted with a grievous pestilence, the city was, in a manner, deserted, and the French garrison was greatly reduced and very ill paid. Doria seized the opportunity; sailed with thirteen galleys to the Genoese coast, landed a body of 500 men, and took possession of Genoa itself without the loss of a single man on either side. The French garrison retired to the citadel, where they were soon glad to capitulate; and upon their departure, the people rushed to the fortress, and levelled it with the ground, as a monument and instrument of their servitude. To the honour of the hero let it be mentioned, that he scorned to take the advantage which his situation gave him, by making himself the master of the country: he nobly assembled the body of citizens, disclaimed all pre-eminence, and restored into their hands the right of establishing such a form of government as they should think best. Twelve persons were appointed to new model the constitution, which was settled nearly in the form in which it existed till within these few years. Doria was greeted by the titles of the deliverer and father of his country; and the highest honours were conferred upon him. He was exempted from all public burdens, and a palace assigned him for his habitation, purchased at the charge of the state. A marble statue was erected in his honour, on which was a Latin inscription proclaiming him the founder of public liberty. He lived to the advanced age of 92 or 94, leaving behind him a name that can never die, while a spark of public spirit and public liberty survives. For farther particulars of this great man see the article GENOA. Robertson. Univer. Hist.

DORIA, in *Botany*. See SENECIO DORIA.

DORIA, or *Duria*, in *Ancient Geography*, a river of Spain, in Lusitania; now the *Douro*.

DORIA *Baltea*, or *Grand Doria*, in *Geography*, a river of Piedmont, which rises in the Alps, on the borders of the Valais, and after winding through the valley of Aosta, &c. discharges itself into the Po by two branches, between Chivazzo and Crescentino.

DORIA *Ripuaria*, or *Little* DORIA, a river of Piedmont, which rises in the Alps, on the borders of France, passes through the valley of Susa, &c. and runs into the Po, a little to the N. E. of Turin.

DORIAN, *adj.* as the Dorian mode in Greek music; it was the lowest of those which have since, in ecclesiastical music, been called authentic. (See MODES and CANTO FERMO.) The characters of this mode were gravity, solemnity, and its fitness for tragedy, subjects of war, and religious

rites. Pluto regards the majesty of the Dorian mode as efficacious in preserving order and decorum; for which reason he has permitted its use in his republic. It was called Dorian from having been first used by that people. Its invention is ascribed to Thamyris of Thrace; who having rashly challenged the muses, and been defeated, lost at once his lyre and his sight.

It is agreed that the ancient modes or keys are all minor. Some place the Dorian mode in D; but Ptolemy, who reformed the Greek modes, has placed it in E. Sir Francis Eyles Stiles, who wrote an ingenious paper on the subject of the modes or tones of the Greeks, which was read at the Royal Society, and is printed in the Transactions for 1761, supposes the modes to be only different species of octave of the sounds in C or A natural; but how such different and powerful effects could be produced by transpositions of the same sounds is not easy to conceive. See *Ancient Greek* Music and Modes.

DORIAS, or Dorius, in *Ancient Geography*, a river of India, on the other side of the Ganges, according to Ptolemy; the modern Zançan, the mouth of which is in the kingdom of Tonquin.

DORIC Order, in *Architecture*, is that peculiar form of a column and its entablature, which was originally formed in imitation of a wooden fabric supported with posts or the trunks of trees. It therefore lays claim to a more remote origin than either the Ionic or Corinthian. The antiquities which yet remain of this ancient order are to be seen in Greece, the place of its nativity, and in its colonies, in Sicily and Paestum in Italy, and a few fragments in Ionia. The examples which are found in these remains are of such uniform character as to denote its peculiar style or species. Though the Egyptian buildings and those of other anterior nations, bear so much resemblance to an order, as to have entablatures supported by circular pillars, yet these pillars have no specific form, and are in character so different from any of the Grecian orders, as to entitle the Greeks to be the inventors of that style of building, which is no where to be traced but in their own edifices. We are informed by Vitruvius, that the Doric order was first practised in the temple of Juno, in the ancient city of Argos, in the time and territories of Dorus, who reigned over Achaia and Peloponnesus; but its symmetry was not fixed till an Athenian colony led by Ion established itself in that part of Asia now called Ionia, after their leader Ion, and built a temple in the manner in which they had observed it practised in the Dorian states. In this building they made the columns six diameters in height, taking the proportion from the ratio which the foot of a man bears to his altitude.

The columns of the Doric order were imitated from the posts which supported the wooden structure, and were fluted to hold the spears or staves which the early Greeks always carried along with them. The capital was formed of a large convex moulding, representing a bow and a square stone, in order to protect the shaft from rain. The architrave consisted of a massy stone, or marble, representing the wooden beam. The frize was formed in imitation of the ends of the joists with open spaces between: however, in process of time, these were closed, and formed into receding pannels, and the projecting parts, representing the ends of the joists, were cut into vertical channels to conduct the rain from the surface: the tablets thus cut, were called triglyphs, from having two angular channels in the middle, and two half channels at the angles of the triglyphs. The glyphs or channels were each formed by two planes, making a right angle with each other internally, and an angle of 135 degrees with the face of the triglyphs externally, as also the half channels on each extreme of a triglyph. The cornice was formed in imitation of the projecting timbers of the roof, and small conical or cylindrical bodies were sculptured on the under sides of the rafters, to represent the drops of the rain which adhered to them. These drops were called guttæ, and consisted of three rows under each rafter, each row containing six. The parts which at first resulted from the primitive habitation, were afterwards carved into mouldings. The spaces or pannels between the triglyphs were called metopes, and were generally of a square figure. The first triglyphs always began at the angle of the building. The ends of the joists were called mutules, and were so disposed, that one was placed immediately over each triglyph, and one over the middle of each metope. The architrave had a projecting band, which covered the massy face below: under this band, and under each triglyph, was placed a fillet, with six pending guttæ, coinciding at the ends with the vertical sides of the triglyphs. The faces of the triglyphs are generally in the same surface or plane with the face of the epistylium, or architrave, and consequently the metopes are recessed. The Doric portico at Athens, the portico of Philip king of Macedon, and the temple of Apollo in the island of Delos, are instances where this is otherwise. This is the general character of the Grecian Doric, which is almost uniformly placed on three steps not proportioned to the human step, but to the magnitude of the edifice. The columns either diminish in a curve or right line from the inferior to the superior ends of the shaft. The shafts are almost constantly fluted: the temple of Apollo in the island of Delos, and the temple at Segesta, are instances to the contrary. The flutes are generally twenty in number, without fillets, and terminate under the annulets of the echinus of the capital.

The Doric order was the only order known in Greece, or its colonies, anterior to the Macedonian conquest. The examples which yet remain are of various proportions, as may be seen by the following examples, which are taken from the fragments of the edifices which yet remain of this order. However, as the proportions of the members of the entablature are very uniform, we shall venture to give the result which arises from the agregate or number of them. For public edifices, the columns may be five or five diameters and an half in height, and for private buildings six; and may diminish one-fourth of the inferior diameter of the shaft. The height of the capital may be two-fifths of the lower diameter, and may be divided into two equal parts, giving the upper one to the abacus: the lower one to the echinus and annulets: divide the lower one into five equal parts, giving one to the annulet, and four to the echinus. Divide the height of the entablature into four equal parts, giving one to the cornice: divide the three lower equally into two, giving one to the epistylium, and one to the zophorus or frize.

The following four plates contain a comparative view of the proportions of all the Dorics that have been ascertained by measurement.

Plate XV. *fig.* 1, (*Architecture*) from the temple of Apollo in the island of Delos. This is one of the two singular examples where the shaft of the column is not fluted except at the necking and a small part at the lower end. *Fig.* 2. from the portico of Philip, king of Macedon, also in the island of Delos: the moulding which occupies the place of the echinus is singular, being a conic frustum inverted: the proportions are very light, and may be used in private buildings or in works of gaiety. *Fig.* 3. from the temple at Ægesta: this is the other example where the shafts are not fluted: the necking is formed by making it recede within the surface of the upper part of the shaft; a recess also obtains at the lower

end of the ſhaft, but theſe receding annular ſurfaces are ſmooth, and not ſculptured into flutes, as in the temple of Apollo, in the iſland of Delos. *Fig.* 4, from the temple of Jupiter, at Selinus: this is the largeſt example of this order: the height of the column is 48 feet 7 inches, and the diameter of the lower end of the ſhaft 10 feet 7 inches and five-tenths of an inch: the fluting of the ſhafts is ſingular, and unlike every other example of this order, the flutes being ſeparated by fillets, as in the Ionic and Corinthian orders. *Fig.* 5, greater hexaſtyle temple at Selinus.

Plate XVI. *fig.* 1, temple at Corinth: the ſhaft is diminiſhed in a convex curve from the bottom to its termination under the annulets: this column is that which has the feweſt diameters in height; from this circumſtance, it is probable, that the temple exhibits one of the moſt ancient examples of the Doric order. *Fig.* 2, from the interior periſtyle of the hypaethral temple at Paeſtum, ſhewing a double range of columns one above the other. Here it may be obſerved, that the inferior diameters of the ſuperior range are not equal to the ſuperior diameter of the inferior range, but the ſides of both ranges are in continued ſtraight lines, and conſequently may be eſteemed as parts of the ſame cone wanting the intermediate fruſtum, which is occupied by the podeum: the ſhafts of the columns have only ſixteen flutes. *Fig.* 3, from the exterior periſtyle of the ſame temple. This example is almoſt ſimilar to that of the temple of Corinth with a low ſhaft and a bold projecting echinus; ſo that if we are to judge of the antiquity of an order by the proportion of the column, this example will rank next to the temple of Corinth. *Fig.* 4, from the temple of Minerva at Sunium, a light beautiful proportion of the Doric order, well adapted to works of gaiety or private buildings. *Fig.* 5, from the temple of Minerva, at Syracuſe: this example is ſingular, in as much as the columns are placed upon plinths all around the exterior periſtyle: there is another ſingularity attending the columns within the pronaos, that they are not only placed upon plinths, but have mouldings above forming what has been denominated the Doric baſe; with all the ſpecific members though not of the uſual proportion; and that the capitals have an aſtragal and fillet under the echinus inſtead of the annulets which are in all other Grecian examples placed in this ſituation; in this reſpect it is ſimilar to ſome of the examples compoſed by the Italians after the reſtoration of the Roman ſtyle.

Plate XVII. *fig.* 1, from the pſeudodipteral temple at Paeſtum: here the necking of the capital is receſſed as in ſome of the foregoing examples, and contrary to the uſual ſimplicity of the Doric, has a row of leaves diſpoſed around it, bending their tops downwards under the annulets. *Fig.* 2, from the temple of Theſeus at Athens, a moſt elegant light example well adapted for the purpoſes of domeſtic habitation: this building is among the moſt perfect of the ſacred edifices at Athens, and is now converted into a church dedicated to St. George. *Fig.* 3, temple of Concord at Agrigentum. *Fig.* 4, from the temple of Jupiter Panellenius in Ægina a ſmall building. *Fig.* 5, from the Parthenon, or great temple of Minerva at Athens: this is a moſt beautiful and auguſt building, conſiſting of the moſt graceful proportions, it was built during the adminiſtration of Pericles, who employed Ictinus and Callicrates for his architects: the cella of this temple is now occupied by a Turkiſh moſque.

Plate XVIII. *fig.* 1, from the theatre of Marcellus at Rome: this example is altogether out of character; the mutules, the genuine marks of the order, are wanting, and in their places are dentils, which are peculiar to the Ionic: the middle of the triglyph is placed in a plane paſſing through the axis of the column, and at right angles to the face of the epiſtylium: the column is too ſlender, repreſenting a poſt of wood rather than a ſtrong durable marble or ſtone column; the capital is overcharged with mouldings; in a word, the whole is void of that original ſimplicity and elegance which the Grecian Doric exhibits: yet this is the only remaining example which the Romans have left us of their taſte of this order. *Fig.* 2, from the hexaſtyle temple at Paeſtum: the entablature ſeems altogether to be Roman; it is without the mutules, and the ſoffit of the corona is coffered; the columns, however, have a nearer affinity to the Grecian than the Roman; the capital has a row of leaves under the annulets, as in the pſeudodipteral temple. *Fig.* 3, from the temple of Jupiter Nemaeus, between Argos and Corinth: this is a very lofty example; but the members are too ſmall to impreſs the mind with grandeur. *Fig.* 4, from the temple of Juno Lucina at Agrigentum; an example of bold and maſſy features. *Fig.* 5, from the Doric portico at Athens; a very beautiful light example, well adapted for private edifices: this, and the temple of Minerva, are the only examples in Greece where the crowning echinus is entire.

Plate XVIII *a*, contains the various peculiarities of the triglyphs and annulets of the Doric order, which are to be found among the various examples. *Fig.* 1, Nos. 1 and 2, ſhews the forms of the heads of the glyphs, as is to be ſeen in the temple of Minerva, the propylia and the temple of Theſeus at Athens; the temple of Minerva at Syracuſe; the temple of Juno Lucina at Agrigentum; the temple of Jupiter at Selinus, and the temple of Ægeſta. The form repreſented in *fig.* 2, Nos. 1 and 2, obtains in the Doric portico at Athens; the antae within the pronaos of the temple of Concord at Agrigentum, and the tomb of Theron at the ſame place; the hexaſtyle temple at Selinus; the temple of Apollo at Cora, and in plate 18, Ionian Antiquities, vol. ii. *Fig.* 3, from vol. i. ch. 2. pl. 11, Ionian Antiquities. *Fig.* 4, from vol. ii. pl. 35, Ionian Antiquities. *Fig.* 5, from the temple of Apollo, in the iſland of Delos. *Fig.* 6, from the hexaſtyle temple at Paeſtum. *Fig.* 7, from the temple of Concord, and from the temple of Jupiter Olympius, at Agrigentum, and the hexaſtyle temple at Selinus. *Fig.* 8, from the hexaſtyle peripteral temple at Paeſtum, diſpoſed over the axis of the column, as in the Roman Doric. *Fig.* 9, from the theatre of Marcellus at Rome, where it may be obſerved that the tops of the glyphs terminate in a plane, which has the ſame inclination to the face of the triglyph, as the vertical ſides which form the glyph have. *Fig.* 10, annulets from the temple of Minerva at Athens. *Fig.* 11, from the Doric portico at Athens. *Fig.* 12, from the temple of Jupiter Olympius at Agrigentum. *Fig.* 13, from the temple of Minerva at Syracuſe. *Fig.* 14, from the theatre of Marcellus at Rome.

Doric-*cimatium* is a member mentioned by Vitruvius, b. iv. ch. 3. placed above and below the corona of the Doric cornice: from theſe ſituations it would appear to be the ſemi-inverſa.

Doric, in *Grammar*. The Doric dialect is one of the five dialects or manners of ſpeaking, which obtained among the Greeks. See Dialect.

It was firſt uſed by the Lacedæmonians, and particularly thoſe of Argos; thence it paſſed into Epirus, Libya, Sicily, the iſlands of Rhodes and Crete.

In this dialect, Archimedes and Theocritus wrote, who were both of Syracuſe; as likewiſe Pindar.

In ſtrictneſs, however, we ſhould rather define Doric, the manner of ſpeaking peculiar to the Dorians, after their receſs near Parnaſſus, and Aſopus; and which afterwards came

came to obtain among the Lacedæmonians, &c. Some even diſtinguiſh between the Lacedæmonian and Doric; but in reality, they were the ſame, ſetting aſide a few particularities in the language of the Lacedæmonians; as is ſhewn by Rulandus, in his excellent treatiſe, De Lingua Græca, ejuſque Dialectis, lib. v.

Beſide the authors already mentioned to have written in the Doric dialect, we might add Archytas of Tarentum, Bion, Callinus, Simonides, Bacchylides, Cypſelas, Alcman, and Sophron.

Moſt of the medals of the cities of Græcia Magna, and Sicily, favour the Doric dialect in their inſcriptions: witneſs ΑΝΒΡΑΚΙΩΤΑΝ, ΑΠΟΛΛΩΝΙΑΤΑΝ, ΑΧΕΡΟΝΤΑΝ, ΑΧΥΡΙΤΑΝ, ΗΡΑΚΛΕΩΤΑΝ, ΤΡΑΧΙΝΙΩΝ, ΘΕΡΜΙΤΙΑΝ, ΚΑΥΛΟΝΙΑΤΑΝ, ΚΟΗΙΤΑΝ, ΤΑΥΡΟΜΕΝΙΤΑΝ, &c. Which ſhews the countries wherein the Doric dialect was uſed.

The general rules of this dialect are thus given by the Port-royaliſts:

"D'ε Ηα d'ω grand, d'ε. do & d'ω l'α fait le Dore.
D'ει fait ηα; d'ω, ω; & d' ω αν fait encore.
Oſte ι de l'infini: & pour le ſingulier,
Se ſert au femenin du nombre plurier."

But they are much better explained in the fourth book of Rulandus; where he even notes the minuter differences of the dialects of Sicily, Crete, Tarentum, Rhodes, Lacedæmon, Laconia, Macedonia, and Theſſaly.

The α abounds every where in the Doric; but this dialect bears ſo near conformity with the Æolic, that many reckon them but one.

This dialect was much eſteemed by the Greeks, but was preſerved moſt pure by the Meſſenians, even throughout their various tranſmigrations. It was juſtly eſteemed the moſt elegant, ſweet, and beſt adapted to Lyric poetry and muſic, of which the Dorians were very fond, and in which they were the moſt expert of all the Greeks.

Doric, in *Muſic*. The Doric mode is the firſt of the authentic modes of the ancients.

Its character is, to be ſevere, tempered with gravity and mirth: it is proper for occaſions of religion, and war. It begins with *D Sol, Re.*

Plato admires the muſic of the Doric mode, and judges it proper to preſerve good manners, as being maſculine. And on this account he allows of it in his Commonwealth.

The ancients had likewiſe the Sub-Doric mode, which was one of their plagal modes. Its character was, to be very grave, and ſolemn. It began with *G Ut*, a diateſſaron, lower than the Doric mode.

DORIENSES, or Dorians, in *Ancient Geography*, formed a part of the nation compriſed under the appellation of Hellenes. Under the king Deucalion, the Hellenes inhabited the Phthioide territory: under Dorus, the ſon of Hellen, they occupied the Hiſtiæotide diſtrict ſituated towards mounts Oſſa and Olympus. They were driven thence by the Cadmæans, and inhabited the town of Pindus and its territory, where they aſſumed the name of *Macednes*. Hence they diſtributed to a diſtance various colonies, one of which ſettled in the iſle of Rhodes. After the ſiege of Troy, the Dorians founded Megara on the confines of Attica, about the year 1131, before the Chriſtian era. Others migrated to the iſle of Crete, where they eſtabliſhed a colony; and ſome of them were diſperſed in the iſle of Rhodes, Halicarnaſſus, Cos, and Cnidus. In proceſs of time, other colonies of the Dorians paſſed into Sicily. But the country, which may be regarded as the principal ſeat of their power, was the Peloponneſus, of which they took poſſeſſion under the conduct of the Heraclidæ, about 80 years after the taking of Troy, 1104 B. C. In the year 1102 B. C. the Heraclidæ divided among them the territories of the Peloponneſus, reſerving ſome few towns to the Ionians upon the borders of Achaia. The Dorians of Peloponneſus made ſeveral irruptions on the territories of Attica. Herodotus reckons four of theſe expeditions. The firſt was that in which they conducted a colony to Megara; the ſecond and third, in which they expelled the Piſiſtratidæ; and the fourth, in which Cleomenes conducted the Peloponneſians againſt Eleuſis. Their language, according to Strabo and other writers, differed little from the Æolian. See Doric and Doris.

DORIGNY, Michael, in *Biography*, a painter and engraver, was born at St. Quentin in France, in the year 1617, and manifeſting an early inclination for the arts, was placed under Simon Vouet, a painter of great reputation, whoſe daughter he married. As a painter he copied the manner of his maſter, but he is better known as an engraver. He performed his plates chiefly with the point in a bold, powerful ſtyle; the lights are broad and maſſy, eſpecially upon the figures. But the marking of the folds of the draperies, and the ſhadows upon the outlines of the fleſh, are frequently ſo dark as to produce a harſh, diſagreeable effect, and ſometimes entirely to deſtroy the harmony of the engraving. Although he underſtood the human figure, and in ſome inſtances it was correctly drawn; yet by following the manner of Vouet inſtead of the ſimple forms of nature, his outlines were affected, and the extremities of his figures too much neglected. This artiſt was made profeſſor of the Royal Academy of Painting at Paris, where he died A. D. 1665, aged 48. His works are ſaid to have conſiſted of 105 prints. Amongſt theſe were "the Adoration of the Magi," "the Nativity of Chriſt," "Venus at her toilet," "Venus, Hope, and Love, plucking the feathers from the wings of Time," "Mercury and the Graces," and "the Rape of Europa," all from pictures of Vouet. He alſo engraved from Le Seur, Saraſin, and other maſters. Strutt.

Dorigny, Lewis, a painter of hiſtory, ſon of the former artiſt, was born at Paris in 1654; and having been inſtructed by his father in the rudiments of his art, he became on his death, at the age of 10 years, a diſciple of Le Brun. Here he made conſiderable progreſs; but diſappointed in his expectations of obtaining the firſt prize at the Academy, he travelled to Italy, and ſtudied for ſeveral years at Rome, Venice, and Verona. He was highly commended for the fertility of his invention, the grandeur of his compoſition, and the harmony of his colouring; but diſguſted by the unfavourable judgment pronounced on a cieling at Paris, repreſenting the fall of Phaeton, he returned to Verona and there ended his days, in 1742. His principal work is the dome of the great church at Trent. By the hand of this maſter we have ſeveral etchings. Pilkington and Strutt.

Dorigny, *Sir* Nicholas, *Knight*, an eminent engraver, the brother of the preceding Lewis, was born at Paris in 1657, and in conſequence of the death of his father, whilſt he was young, was brought up to the law. But at the age of 30 he quitted that profeſſion, devoted himſelf to the arts, and went to his brother at Rome to ſtudy the principles of painting. By his brother's advice, he took up the point, and produced ſeveral etchings. He afterwards reſumed the pencil. But again laying this aſide, he began again to engrave, and his firſt productions are ſaid to have been the ſeven planets from Raphael; and he alſo finiſhed the transfiguration, from the ſame maſter. Advanced in reputation, he was invited to England in order to engrave the cartoons, then at Hampton-court. He arrived in June 1711; but as he demanded the ſum of four or five thouſand pounds, this plan

plan was rendered abortive. Afterwards he undertook to execute it by subscription; and having apartments assigned him at Hampton-court, he sent for Dupuis and Dubosc from Paris to assist him; but from some disagreement that occurred, they left him, before the work was half completed. In 1719, he presented two complete sets to king George I. and a set a-piece to the prince and princess; for which the king gave him 100 guineas, and the prince a gold medal. The duke of Devonshire, who had assisted him, procured for him, in 1720, the honour of knighthood. His eyes afterwards failing him, he returned to Paris, where, in 1725, he was made a member of the Royal Academy of Painting, and died in 1746, aged 89.

His drawing was incorrect and affected; the naked parts of his figures are often falsely marked, and the extremities are defective. His draperies are coarse, the folds stiff and hard; and a *manner* of his own prevades all his prints, so that the style of the painter is constantly lost in that of the engraver. Nor did he ever fail more than in working from the paintings of Raphael. Basan, with an excusable partiality for his countryman, says of him, "we have many excellent prints by his hand, in which one justly admires the good taste of his drawing, and the intelligent picturesque manner, which he acquired by the judicious reflections he made upon the works of the great masters, during the residence of 22 years in Italy." We have of his prints the following, *viz.* "St. Peter curing the lame man at the gate of the temple," from Civoli; "the transfiguration" from Raphael; "the descent from the crofs," from Daniello da Volterra; "the martyrdom of St. Sebastian," from Dominichino, which two last are said to be his best prints; "the Trinity" from Guido, "the history of Cupid and Psyche," from Raphael's pictures in the Vatican; "the Cartoons," seven very large plates from the pictures of Raphael. He also engraved from Annibale Caracci, Lanfranche, Louis Dorigny, and other masters. Strutt.

DORING, or Daring, among the *Sportsmen*, a term used to express a method of taking larks, by means of a clap-net and a looking-glass. For this sport there must be provided four sticks, very straight and light, about the bigness of a pike; two of these are to be four feet nine inches long, and all notched at the edges, or at the end. At one end of each of those sticks there is to be fastened another of about a foot long on one side; and on the other side a small wooden peg, about three inches long. Then four more sticks are to be prepared, each of one foot length; and each of these must have a cord of nine feet long fastened to it at the end. Every one should have a buckle for the commodious fastening on to the respective sticks when the net is to be spread.

A cord must also be provided, which must have two branches. The one must be nine feet and a half, and the other ten feet long, with a buckle at the end of each; the rest or body of the cord must be twenty-four yards long. All these cords, as well the long ones, as those about the sticks, must be well twisted, and of the bigness of one's little finger. The next thing to be provided is a staff of four feet long, pointed at one end, and with a ball of wood on the other, for carrying these convienences in a sack or wallet.

There should also be carried, on this occasion, a spade to level the ground where there may be any little irregularities; and two small rods, each eighteen inches long, and having a small rod, fixed with a packthread at the larger end of the other. To these are to be tied some packthread loops, which are to fasten the legs of some larks; and there are to be reels to these, that these birds may fly a little way up and down.

When all this is done, the looking glass is to be prepared in the following manner. Take a piece of wood, about an inch and a half thick, and cut it in form of a bow, so that there may be about nine inches space between the two ends; and let it have its full thickness at the bottom, that it may receive into it a false piece; in the five corners of which, there are to be let in five pieces of looking glass. These are to be fixed, that they may part their light upwards, and the whole machine is to be supported on a moveable pin, with the end of a long line fixed to it; and made in the manner of the children's play-thing of an apple and a plumb-stone; so that the other end of the cord being carried through a hedge, the barely pulling it may set the whole machine of the glasses a turning. This and the other contrivances are to be placed in the middle between the two nets. The larks fixed to the place, and termed calls, and the glittering of the looking glasses, as they twirl round in the sun, invite the other larks down; and the cord that communicates with the nets, and goes through the hedge, gives the person behind an opportunity of pulling up the nets, so as to meet over the whole, and take every thing that is between them. The places where this sort of sporting succeeds best are open fields, remote from any trees or hedges, except one by way of a shelter for the sportsman, and the wind should always be either in the front or back; for if it blows sideways, it prevents the playing of the nets.

DORINGSTADT, or Durinstatt, in *Geography*, a town of Germany, in the circle of Franconia, and bishopric of Bamberg; 14 miles N. of Bamberg.

DORINK, or Doring, Matthias, in *Biography*, a learned German monk of the Franciscan order, was born about the year 1415 at Kiritz. In the year 1445, we find him professor of theology in the university of Magdeburg, discharging the duties of his office with great reputation. While he held this situation, strictures and objections against the short commentaries on the scriptures of Nicholas de Lyra, were published by Paul de Burgos; Dorink undertook their defence and farther illustration. The different pieces which he wrote on these subjects were collected together, and inserted in an edition comprehending the works of both those authors, which was published in Paris, in six volumes folio, in the year 1590. This work was well received, and went through several editions. To Dorink is generally ascribed the "Miroir Historial" commonly known by the name of "The Chronicle of Nuremburg," and in this respect he is considered as the forerunner of the illustrious Luther, the Chronicle being written with spirit and energy against the vices of the cardinals, the bishops, and the popes, and also against jubilees and indulgences. Moreri.

DORIS, in *Botany*, according to Pliny, is a name sometimes given, among many others, to a kind of bastard alkanet, *Anchusa*, whose root yields a red juice. The leaves are narrow, flaccid, and very woolly, and their juice, or that of the seed, taken internally, is celebrated as extremely efficacious against the bites of serpents. Commentators have supposed this plant a species of *Echium*.

Doris, or the *Doride*, in *Ancient Geography*, was a country of Greece, situated on the south of Thessaly, and separated from it by mount Oeta, and a ridge of other hills. On the south it had Phocis and part of Ætolia; on the east it was parted from the Locrii Epicnemidæ by the river Pindus; and on the west from Epirus and Acarnania by that of Achelous. The Cephisus was the only river of note which had its source in this country; but its mountains were numerous and not inconsiderable, of which the most famous were Oeta and Pindus, which, with some others less remarkable, bounded it on the north, as the Callidromians did on the west.

The country, however, though mountainous, abounded with ſpacious plains, and was very fruitful. The air was ſalubrious, and the ſoil capable of agricultural improvement. Its territory was not large, extending only about 40 miles in length, that is, from 39° 10′ to 39° 50′ lat., and about 20 miles in breadth at the wideſt part, or from 23° 10′ to 23° 30′ E. long., according to Ptolemy, Strabo, Mela, Cellarius, Wells, &c. This country was called Doris, and the people Dores or Dorians, from Dorus the ſon of Hellen, and grandſon of Deucalion, who is ſaid to have firſt peopled or conquered it, at leaſt that part of it which lies below the mountains of Oeta and Pindus. It was alſo called *Tetrapolis* from its four cities, viz. Pindus, Erineus, Cytinium, and Boium or Boæum. The Dores, though they inhabited a mountainous tract, were very poliſhed in their manners, good orators, poets, and muſicians, and at the ſame time ſtout and warlike, and accuſtomed to wear a tuft of horſe-hair on their helmets, from which Homer ſtyles them τριχάρυες. They extended their colonies to ſeveral parts of Aſia, and among others founded the city of Chalcedon, on the Euxine ſea; and as they ſent forth ſeveral colonies, we find different countries called Doris. Thoſe that continued in their original ſettlement were driven from it by the Cadmæans, and forced for ſome time to occupy the diſtricts about Macedonum and Pindus; but they returned ſoon after to *Dryopis*, (which ſee,) and the country about Oeta, where they continued till they made their deſcent into the Peloponneſus with the Heraclidæ (ſee DORIENSES), and whither they carried alſo their dialect, called from them *Doric* (which ſee). They alſo gave name to the Doric muſic, in oppoſition to that of the Lydians and Phrygians, and to the Doric order in architecture. Their chief city was called Doris, from the founder of this kingdom. This metropolis is mentioned by Homer, Herodotus, and others. After theſe people made their naval deſcent into Peloponneſus, and their ſettlement, in this peninſula, with the Heraclidæ, they built a ſtately temple to Jupiter Tropæus, in memory of this great event. Such indeed it was, and anſwerable to the appellation given to this deity, from τρέπω, *verto*, ſince it almoſt overturned the whole ſtate of affairs in all the different kingdoms and ſtates of Peloponneſus, whoſe cities were now forced to receive a garriſon of Dorians, and to ſubmit to a foreign government.

On the arrival of the Dorians in Aſia, they formed themſelves into ſix independent ſtates, or ſmall republics, which were confined within the bounds of ſo many cities; theſe were Lindus, Jalyſus, Camirus, Cos, Cnidus, and Halicarnaſſus. Other cities in that tract, called from them Doris, belonged to their confederacy; but the inhabitants of theſe alone, as true and genuine Dorians, were admitted into their temple at Triope, where they exhibited ſolemn games in honour of Apollo Triopius. The prizes were tripods of braſs, which the victors were obliged to conſecrate to Apollo, and leave in the temple on an altar of gold. When Agaſicles of Halicarnaſſus won the prize, he tranſgreſſed this cuſtom, and carried the tripos to his own houſe; on which account the city of Halicarnaſſus was ever afterwards excluded from the Dorian confederacy; ſo that the Dorians were, from that time, known by the name of the five cities, or Pentapolis. Herodot. l. i. c. 144.

DORIS, in *Zoology*, a genus of the Molluſca tribe of Vermes, including about thirty different ſpecies. The body is creeping, oblong, and flat beneath; mouth placed below on the anterior part; vent behind on the back, and ſurrounded by a fringe; feelers from two to four, ſeated on the upper part of the body in front, and retractile. Theſe animals are of the marine kind, and are found principally crawling on the rocks, or adhering to the zoophytes and marine plants attached to them under the ſurface of the water. It is only occaſionally that they are found at a diſtance from ſhore in the open ſea; they feed, like the greater part of the molluſca, on other worms, and when ſwimming exhibit a moſt beautiful appearance, the horns, or tentacula, and alſo the fringe ſurrounding the vent, both which are retractile at the pleaſure of the animal, being then expanded. An inconſiderable number of the ſpecies occur in warm climates, eſpecially in the Mediterranean; but according to the remarks of Dicquemere, they abound moſt in colder regions. Nearly all the ſpecies at preſent known have been obſerved by Müller in the northern ſeas.

The genus doris, as propoſed by Linnæus, is not uniformly adopted by the continental naturaliſts of the preſent time. It is diſapproved by Müller in his "Zoologia Danica." Cuvier divides them into two diſtinct genera, to one of which he retains the Linnæan name, the other he calls tritonis, a particular account of which may be ſeen in a memoir publiſhed in the "Annales du Muſeum." Lamarck alſo divides them into two genera in a ſimilar manner. Linnæus was himſelf aware of ſome objection to his genus doris, and in order to comprehend even the few ſpecies known in his time, found it neceſſary to conſtitute two families or ſections for their reception, and Gmelin adopts the like ſubdiviſions in the laſt edition of the Syſtema Naturæ. In both the body is oblong and creeping, but in the tritonis is acuminated behind, convex above, and flat beneath, with the ſpiracles prominent and diſpoſed like ſcales or tubercles along the back; the doris is flattiſh, and free from thoſe dorſal ſpiracles. The diſtinction between the two animals is well expreſſed in the ſpecies *claviger*, and *argo*, the firſt of which is a tritonis, the other a doris of thoſe authors.

Species.

VERRUCOSA. Body covered with tubercles above. Linn. *Limax marina verrucoſa*, Rumpf. *Mitella verrucoſa*, Seba.

The body of this ſpecies is oblong, and nearly cylindrical; the back covered with warts; lateral margin deflected; pedal limb oval, oblong, and furniſhed with a ſmooth margin. Inhabits the ſeas of Europe.

CLAVIGER. Oval, white with ſaffron-coloured clavate pedicels on the back. Müll. *Geknootide Zee-ſlakjemet*, Bommé.

Found on fuci in the Norway ſeas. The body is gelatinous and ſub-pellucid; head with a lateral yellow truncate tubercle; feelers ſaffron colour; tail pointed, and marked with a yellow ſpot.

QUADRILINEATA. White with four black lines; auricles ſulphur. Müll.

Like the former inhabits the Norway ſeas, and is found adhering to fuci. The body is ſometimes marked with ſulphur ſpots, and the tentacula are white.

FASCICULATA. Linear, grey brown, with ſub-ferruginous acute papillæ on the back. Gmel. *Limax marinus*, Forſk.

Inhabits the Mediterranean ſea, and is generally found adhering to fragments of timber floating in the water. The feelers are pale and pellucid.

PAPILLOSA. Body covered above with papillæ; dorſal line ſmooth. Gmel. *Limax papilloſus*, Linn. *Doris ſpinis mollibus hirſuta*, Baſter. *Doris bodoenſis*, Act. havnienſ. Found in the European ocean.

AURICULATA. White, with red dorſal faſciculate papillæ tipt with white. Müller. Diſcovered in the Norway ſeas.

LACINULATA. Whitiſh, with ſix obovate papillæ on each ſide the back. Forſk. Anim. Mar.

Inhabits

Inhabits the deeps of the ſea among ſuci; it is a ſmall ſpecies.

Minima. Pale cinereous, with four rows of dorſal papillæ. Forſk.

A minute ſpecies, about the ſize of a grain of rice found on fuci floating in the Mediterranean ſea. The body is oblong, the feelers white, and placed near the head; papillæ numerous, ovate-oblong, obtuſe, and pale cinereous.

Cervina. Reddiſh cinereous, with eight branched papillæ on the back. Gmel. *Haarts hoorn gelyk getakte Zeeſlakje*, Bommé.

Length half an inch; head and tail furniſhed with ramoſe papillæ. The ſpecies inhabits Holland, and is found adhering to the ſertularia abietina.

Radiata. Silvery-blue, beneath white, with lateral extenſile radiated faſciculate papillæ. Du Pont Phil. Tranſ. &c.

Inhabits the Weſt Indian ocean. The length is about an inch; its colour pale blue, with a ſilvery gloſs; the margin and tips of all the papillæ rich blue, obtuſe in front, and tapering to a ſharp point behind.

Coronata. Milk-white, beneath hyaline; back dotted with red with ſix pyramidal papillæ, tipt with red each ſide. *Gehnifde of gekroonde Zeeſlakje*, Bommé.

Leſs than an inch in length, and inhabits the ſhores of Holland.

Pennata. Back covered with ſub-cylindrical papillæ, incumbent towards the poſterior part. *Gevederde of Zacht gedoornte Zeeſlakje*, Bommé.

Inhabits the ſhores of Holland, where it occurs on zoophytes; it varies in colour from reddiſh to cinereous, and is about the ſize of the former.

Peregrina. Feelers four, not retractile; body milk-white, with ten rows of blue-brown cirri or proceſſes. Cavolin. Native of the Mediterranean.

Affinis. Feelers four, not retractile, annulated, and tipt with white; body purple, with ſeven rows of dorſal proceſſes. Cavolin. Found in the Mediterranean.

Tetraquetra. Quadrangular, coriaceous, pointed behind, above flat with carunculated clefts at the angles. Pallas.

Inhabits the ſeas about the Kurile iſlands, where it is boiled and eaten by the natives.

Fusca. Oval, and covered with a rough punctured plate. Müll. *Limax bilamellatus*, Fn. Suec. *Doris bilamellata*, Linn. Syſt.

The body of this ſpecies is glabrous, above pale brown with cinereous dots, beneath white; plate dotted with ſulphur; feelers two brown; vent tranſverſe, and ſurrounded with ſix ſulphur plumes.

Obvelata. White; body elongated with a flexuous plate, punctured above. Müll. *Concha ſine teſta*, Planeus.

Inhabits the bays of Norway, and moves like a ſnail. The body is ſub-pellucid, beneath glabrous, plate rough, with convex dots above; feelers ſimple.

Muricata. Body oval, and covered entirely with pale yellow tubercles. Müll. Native of the Norway ſeas.

Pilosa. Body ovate, pale yellow, and covered with ſoft white hairs; feelers ſecreted within their receptacles. Müll.

Lævis. Body oval and white; above flattiſh and ſmooth. Müll. Inhabits the Norway ſeas.

Arborescens. Feelers ramoſe; back gibbous and branching into protuberances. Müll.

Frondosa. Body entirely covered with numerous branched cirri. Gmel. *Amphitrite frondoſa*, Aſcanius. Found in the Norway ſeas.

Argo. Body oval, ſmooth, with two ſmall feelers at the mouth; vent ſurrounded by a ramified fringe. Linn. *Argo*, Bohadſch. *Lepus marinus, alter major*, Columna. *Limace a plante*. Dicquemere.

Body red with ſulphur ſpots and black dots; feelers white, dotted at the tips with red; ramified fringe of the vent ſulphur dotted with black. Inhabits European and Mediterranean ſeas.

Stellata. Body oval, with an eight-rayed ſtar at the vent, the rays ramoſe. Gmel. *Eegeltje met ceneſter op de ſluit*. Bommé.

Inhabits the ſhores of Zealand; body whitiſh-grey, beneath flat, and covered above with obtuſe tubercles.

DORISCI, in *Ancient Geography*, a people of Aſia, who, according to Pliny, inhabited the confines of Aria, Carmania, and Drangiana towards the weſt of Parthia.

DORISCUS, a plain of Thrace, near the Ægean ſea and the mouths of the river Hebrus, on which, according to Herodotus, was a royal fortreſs, and where Xerxes reviewed his army in bodies of 10,000 men, becauſe it could not contain a greater number. It extended to the promontory *Serrhium*.—Alſo, a promontory of Greece, in Attica, near the promontory of *Sunium*. Pliny.

DORIUM, a town of the Peloponneſus, in Meſſenia. Pauſanias.—Alſo, a town of Greece, in the iſland of Eubœa, Strabo.—Alſo, a town of the ſame name in Thrace.

DORKIAN, in *Geography*, a town of Aſiatic Turkey, in the province of Natolia; 44 miles W. of Sinope.

DORKING, a market-town and pariſh in the hundred of Wotton, in the county of Surry, England, is ſeated on the banks of the river Mole. Moſt of the houſes are built on the ſide of a hill, which conſiſts of a ſoft ſand-ſtone. This is excavated in many places for cellars, &c. The ſcenery of the country in the vicinity is diſtinguiſhed by bold eminences and fertile vales; and many gentlemen's ſeats are within a ſmall diſtance of the town. One of them, called *Deepden*, formerly belonged to the family of the Howards, dukes of Norfolk, in whom the manor is veſted. The cuſtom, called Borough-Engliſh, prevails in this manor; by which the *youngeſt* ſon becomes heir to a copyhold eſtate in caſe the parent dies inteſtate. An old Roman road, or cauſeway, called Stone-ſtreet, croſſed the country at this place, and ſome remains of it are ſaid to have been found in the church-yard. The church, a large, ancient ſtructure, was formerly connected with that of St. Mary Overy's, in Southwark, and is ſaid to have been erected and made collegiate by the founder of that building. The chief ſtreets of Dorking are paved; and beſides a commodious work-houſe, here are ſome alms-houſes. Dorking has long been noted for the ſuperior ſize and quality of the poultry that are bred and fattened here, the greater part of which is ſent to the London markets. Some of the capons weigh ſeven and eight pounds each when prepared for roaſting. Great quantities of linen are made in the vicinity of the town, and in the neighbourhood are ſeveral corn-mills. Dorking is about eight miles from Epſom, and 24 miles S. W. of London. According to the parliamentary report it contained, in 1801, 570 houſes, and 3058 inhabitants. Here is a weekly market on Thurſdays, and one annual fair.

In the vicinity of Dorking is Denbighs, a ſeat belonging to Joſeph Deniſon, eſq. It was rendered remarkable by its gardens, which were planted, laid out, &c. by Jonathan Tyers, the firſt proprietor of Vauxhall gardens, who had caves made in the ſide of the hill. One of theſe was ſingularly conſtructed and ornamented, and was called, with its accompaniments, "The Valley of the ſhadow of Death."

DORKOWKA, a town of Poland, in the palatinate of Braclaw; 44 miles S.S.E of Braclaw.

DORMAGEN,

DORMAGEN, a ſmall town of France, in the department of the Roer, chief place of a canton, in the diſtrict of Cologne, with a population of 831 individuals. The canton reckons 10,516 inhabitants, diſperſed in 18 communes.

DORMANS, a ſmall town of France, in the department of the Marne, chief place of a canton, in the diſtrict of Epernay. It is ſituated on the river Marne, 12 miles E. of Epernay, and five W. of Chateau-Thierry. The number of its inhabitants amounts to 2108. The canton itſelf has a population of 8584 individuals diſperſed in 15 communes, upon a territorial extent of 187$\frac{1}{2}$ kilometres.

DORMANT, from *dormio I ſleep*, is the herald's term for the poſture of a lion, or other beaſt, borne as ſleeping in a coat of arms.

DORMANT-TREE, or *Summer*, in *Building*, a beam of timber tenoned into a girder for ſupporting the ends of joiſts on both ſides of it.

DORMANT, or *Dormar-tyles*. See TYLE.

DORMER, or DORMANT, in *Architecture*, denotes a window made in the roof of a houſe, or above the entablature; being raiſed upon the rafters.

The Latins call it *lucerna*, whence the French *lucerne*, and our *luthern*.

There are diverſe kinds; ſquare, round, &c. See LUTHERN.

DORMITORY, a gallery in convents, or religious houſes, divided into ſeveral cells, wherein the religious lodge, or lie, &c.

The word is formed from the Latin *dormitorium*; of *dormire*, to ſleep.

It is deemed a crime in a religious to lie out of the dormitory. By chap. xxii. of the rule of St. Benedict, it appears that the ancient dormitories were not divided into cells, but were a kind of large open wards, filled with beds, as in our hoſpitals.

By the rule of St. Benedict a lamp was to be kept conſtantly burning in the dormitory, and the monks were to ſleep in their full dreſs, only laying aſide the knives which they carried at their girdles, for fear of hurting themſelves in their ſleep. The proper ſituation for the dormitory, as we gather from the capitularies and from actual inſpection, was the eaſt ſide of the great cloiſter or quadrangle, upon the upper floor, from which there were ſtairs into the ſouth tranſept of the church, ſo that the monks could readily deſcend from their ſleeping-room into the choir to perform their midnight and early offices.

DORMITORY is alſo uſed for a burying-place. See COEMETERIUM.

DORMOUSE, in *Zoology*. See MYOXUS.

DORMOUSE, *ſtriped*. See SCIURUS *Striatus*.

DORNABAD, in *Geography*, a town of Perſia, in the province of Choraſan; 150 miles N.W. of Herat.

DORNBERG, a town of Germany, in the circle of the Upper Rhine, and principality of Heſſe Darmſtadt; eight miles W N.W. of Darmſtadt.

DORNBEUREN, a town of Germany, in the county of Bregentz; five miles S. of Bregentz.

DORNBURG, in French DORNBOURG, or *Dornebourg*, a ſmall town of Germany, in the duchy of Saxe-Weimar, ſituated on the Saale, upon a ſteep hill, ſurmounted with an ancient caſtle, ſix miles N. of Jena. It has but 400 inhabitants, moſtly ſtocking manufacturers and cotton ſpinners. Its name is derived from the northern pagan deity called Thor, whoſe idol was worſhipped on this hill.—Alſo, an ancient caſtle in the principality of Anhalt-Zerbſt.

DORNE, a ſmall town of France, in the department of the Niévre, diſtrict of Nevers. It contains 960 inhabitants, and is the chief place of a canton which has a population of 5572 individuals, 10 communes, and a territorial extent of 257$\frac{1}{2}$ kiliometres.

DORNECK, or DORNACH, a ſmall town of Switzerland, in the canton of Soleure, with a ſtrong caſtle, and the celebrated convent of Mariæ-Stein. It is ſituated in a very fertile country; and is chiefly famous for the battle which the Auſtrians loſt near this place againſt the Swiſs, on the 12th of July 1799. The Swiſs were only 5000 againſt 15,000 Auſtrians, of whom they killed 3000, whoſe bones were depoſited in a chapel built for that purpoſe. There are ſeveral pariſhes belonging to the diſtrict of Dorneck.

DORNECY, a ſmall town of France, in the department of the Niévre; ſix miles E. of Clamecy.

DORNHEIM, or DORNHAN, a ſmall town of the kingdom of Wurtemberg, in the Black Foreſt, the diſtrict of which comprizes the pariſhes of Furnſaal and Underbrandi.—Alſo, an ancient ruined caſtle, in the grand duchy of Heſſe-Darmſtadt, in Germany, near the town of Darmſtadt, where the emperor Adolphus of Naſſau was killed, in the year 1298, by Albert I. of Auſtria.

DORNUM, a town of Germany, in the circle of Weſtphalia, and county of Eaſt Friſeland; ſix miles W.S.W. of Eſens.

DORNOCK, a royal borough and county town of Sutherland, Scotland.—Alſo, the name of an extenſive pariſh, of which this town is the capital. The town ſtands on the northern coaſt of the Frith of Dornock, and was conſtituted a royal borough by charter from king Charles I.; by which its government is veſted in a provoſt, four bailies, and ten counſellors, four of whom are annually changed. It contains about 500 inhabitants. Dornock was anciently the ſeat of the biſhop of Caithneſs, and a part of the cathedral is ſtill kept in repair as the pariſh church. It is uncertain when the ſee of Caithneſs was eſtabliſhed; but it muſt have exiſted before the year 1150, as we find Andrew biſhop of Caithneſs, a witneſs to a donation by David I. to the abbey of Dumferline in that year.

DORNOCK-FRITH, ſometimes called the Frith of Tain, is that arm of the ſea which divides the ſouthern parts of Sutherland from the county of Roſs. The entrance of this frith is nearly 15 miles wide, and gradually becomes narrower, till about three miles weſt of the town of Dornock; its breadth is not above two meaſured miles. After this it increaſes in width, and forms an inner harbour or bay, where a ferry is eſtabliſhed, called the Little-ferry. Sinclair's Statiſtical Account of Scotland.

DORNOCK, in the *Manufactures*, is a ſpecies of figured linen of a very ſtout fabric, manufactured chiefly in the north of Scotland, and uſed for table cloths. It is the moſt ſimple in pattern of all the varieties of this manufacture, and therefore the fabrics are generally of the coarſeſt kinds, the finer ſorts of table linen being uſually more ornamented, and woven either as diaper, or damaſk. A large proportion of the dornocks, which are made in Scotland, are woven by thoſe who are termed cuſtomer weavers, who receive linen yarn, ſpun from flax raiſed at home, from thoſe who employ them, and return the cloth, charging a certain price for the weaving. In many diſtricts, particularly the moſt remote ones, the greater part of every ſpecies of houſehold cloth is manufactured in this way, a ſufficient quantity of yarn being ſpun in moſt country families during the intervals of their other labour, to ſupply their own wants, and frequently a ſurplus to ſell at ſome neighbouring fair, or market. This trade, however, ſeems much upon the decline.

Dornock, like every other ſpecies of fanciful twilled

cloth, receives the figure by reverſing the fluſhing of the warp and woof at certain intervals, which form ſquare, or oblong figures upon the cloth. The moſt ſimple of theſe, is a ſucceſſion of alternate ſquares, forming an imitation of a checker board, or moſaic pavement. The coarſer kinds are generally wrought, as tweels of three leaves, where every thread floats over two, and is interſected by the third in ſucceſſion. Some of the finer are tweels of four and five leaves; but few of more; for the ſix and ſeven-leaf tweels are ſeldom, if ever, uſed, and the eight leaf tweel is confined almoſt excluſively to damaſk. A repreſentation of dornock, as it appears upon deſign paper, is given in *Plate* A, and the manner of mounting the loom in *Plate* C. *Plate* VIII. *Miſcellany*. See Draught and *Cording*.

DORNOLL, in *Geography*, a river of Wales, which runs into the Wye, in the ſouthern part of the county of Montgomery.

DOROBITZA, in *Ancient Geography*, a town and alſo a river of Illyria.

DOROBOI, in *Geography*, a town of European Turkey, in the province of Moldavia; 68 miles N.N.W. of Juſſi, and 142 N.W. of Bender.

DOROG, a town of Hungary; 6 miles S. E. of Nanas.

DOROGOBUSH, a town of Ruſſia, and one of the 12 diſtricts of the government of Smolenſko, ſituated on the Dnieper; 40 miles E.N.E. of Smolenſko. See Dogorobush.

DOROJAIEWICZE, a town of Lithuania, in the palatinate of Brzeſc; 90 miles E. of Brzeſc.

DORON, in *Ancient Geography*, a town of Aſia, in Cilicia. Pliny.

Doron. See Dora.

DORONICI Radix, in the *Materia Medica*, the name of a root kept in the ſhops in ſome places, but at preſent little uſed. There are two kinds of it, the Roman and the German. The Roman is a ſmall yellow root, appearing white when broken, of a ſweet aſtringent taſte, and viſcous in the mouth. The faireſt and plumpeſt roots ſhould be choſen, and ſuch as are freſh dried, or at leaſt not worm-eaten. The root is brought from the Alps, and ſome other places. The plant which produces it is the doronicum officinarum of Gerrard, and is kept with us in the gardens of the curious. The leaves are broad, and the flower is yellow, and of the ſize of a marygold.

It is faid to be an alexipharmic, but is not uſed in the preſent practice. Authors are indeed not at all agreed about its nature; ſome accounting it a very valuable medicine, and others a poiſon.

The German doronicum is a native of the mountainous parts of Germany, and flowers through the ſummer. The leaves and flowers bruiſed, emit a light pungent ſmell, which provokes ſneezing. They yield their virtues by infuſion, both to water, and rectified ſpirit; the roots are more aromatic than the other parts. This plant has been eſteemed in Germany as a ſpecific for diſſolving coagulated blood, occaſioned by falls and bruiſes, and thence has been intitled lapſorum panacea. It is likewiſe recommended in various obſtinate chronical diſorders; but its operation is too violent. Lewis's Mat. Med. p. 225. See Durunegi.

DORONICUM, in *Botany*, (Doronigi or Durungi of the Arabians, according to Ambroſinus. Hence Linnæus in Phil. Bot. ſect. 229, enumerates it among the barbarous names, which ought to be rejected; but he nevertheleſs retained it, becauſe perhaps its ſound, if not its ſenſe, was Greek; of which he gives other inſtances in the place juſt quoted.) Linn. Gen. 427. Schreb. 559. Willd. Sp. Pl. v. 3. 2113. Mart. Mill. Dict. v. 2. Juſſ. 182. Gærtn. t. 173. Claſs and order, *Syngeneſia Polygamia ſuperflua*. Nat. Ord. *Corymbiferæ*, Juſſ.

Gen. Ch. *Common Calyx* of about twenty lancet-awl-ſhaped, equal, erect leaves, in a double row, moſtly as long as the rays of the corolla. *Cor.* compound, radiated; the united florets tubular, five-cleft, numerous, in the diſk; the female ones ligulate, three-toothed, in the radius, equal in number to the calyx-leaves. *Stam.*, in the united florets, filaments five, capillary, very ſhort; anthers in a cylinder, tubular. *Piſt.*, in the united florets, germen oblong; ſtyle thread-ſhaped, the length of the ſtamens; ſtigma notched; in the female ones, germen and ſtyle as in the former; ſtigmas two, reflexed. *Peric.* none, except the ſlightly cloſed calyx. *Seed*, in the united florets, ſolitary, obovate, compreſſed, furrowed; down capillary; in the female ones leſs compreſſed, without any down. *Recept.* naked, flat.

Eſſ. Ch. Receptacle naked. Down ſimple. Calyx-ſcales equal, in two rows, longer than the diſk. Seeds of the radius deſtitute of down.

This genus is next akin to *Arnica*, which ſee, agreeing with it very much in habit, but differing in the want of down to the ſeeds of the radius, as well as of the five barren filaments in the radiant florets. *Doronicum Bellidiaſtrum*, Linn. Sp. Pl. 1247. Jacq. Auſtr. t. 400, a plant extremely like our Daiſy, *Bellis perennis*, but taller, is removed to *Arnica* by Villars, Gærtner, and Willdenow, becauſe all its ſeeds are furniſhed with down.

D. *Pardalianches*. Linn. Sp. Pl. 1247. Fl. Brit. 896. Engl. Bot. t. 630. Jacq. Auſtr. t. 350, (of which D. *auſtriacum*, Jacq. Auſtr. t. 130, is certainly a variety,) is found in ſome parts of England, and the lowlands of Scotland, as well as in Sweden, Germany, and Switzerland. It is not unfrequent in ruſtic gardens, and is one of the few ſyngeneſious flowers, that bloom in the ſpring. The corolla is of a light yellow, the herbage a pale green. The root, which is creeping and tuberous, has been thought poiſonous to beaſts of prey, whence the ſpecific name; while on the other hand it has, with as little reaſon probably, been ſuppoſed an antidote to poiſon. Some phyſicians of eminence have found it ſafe to adminiſter two drams at a doſe, though not in any caſe beneficial. D. *plantagineum*, Linn. Sp. Pl. 1247, (D. minus officinarum; Ger. em. 759. f. 1.) is an ambiguous ſpecies, having ſometimes down to all the ſeeds. It grows in the warmer parts of Europe, and has ovate or lanceolate, not heart-ſhaped, radical leaves. Its qualities are ſuppoſed to be like thoſe of the preceding. D. *glutinoſum*, Willd. Sp. Pl. v. 3. 2115, (After glutinoſus; Cavan. Ic. t. 168.) a native of Mexico, can ſcarcely belong to this genus on account of its imbricated calyx, neither is its habit that of a *Doronicum*.

Propagation and Culture.—The genuine ſpecies of this genus are hardy perennials, encreaſing much by their roots, which may be parted in autumn, and eaſily raiſed from ſeed, which is produced in great plenty.

DORONINSK, in *Geography*, a town of Ruſſia, and one of the four diſtricts in the province of Nertchinſk, and government of Irkutſk, ſituated on the Ingoda; 280 miles E.S.E. of Irkutſk.

DORONK, a town of Egypt; 2 miles S. of Siût.

DOROSTAY, a town of Poland, in the palatinate of Volhynia; 16 miles S.E. of Lucko.

DOROSTO, in *Ancient Geography*, a town of Bulgaria, taken by Zimiſus in the year 973.

DORP Abeit, in *Geography*, a town of Arabia, in the country of Yemen; 44 miles N. of Chamir.

DORPAT, or Dorpt, a town of Ruſſia, in the province of

of Livonia, government of Riga, on the river Embeck, called by the Ethonians Emma-Joggi, *i. e.* mother river, not far from the lake Peipus. It is the ſeat of an univerſity recently eſtabliſhed by the emperor Alexander. Its annual revenue granted by the inſtrument of its foundation, dated the 12th of December, 1802, old ſtyle, amounts to 126,000 roubles. The amphitheatre for anatomy is placed on a ſmall eminence, in a pleaſant airy ſituation, ſurrounded with new plantations. The library is placed in the old cathedral church, which is a fine monument of the architecture of the middle age. The univerſity of Dorpat has the direction of all the ſchools in the four provinces of Livonia, Courland, Fionia, and Ethonia.

DORRA, a town of Perſia, in the province of Segeſtan; 18 miles E.S.E. of Kio.

DORRBERG, a ſmall town of Germany, in the duchy of Saxe-Gotha, in the Thuringian foreſt, the inhabitants of which manufacture lamp-black, and near which there is an extenſive iron-work.

DORSAL, from *dorſum*, back, any thing that belongs to the back: as dorſal glands, dorſal nerves, dorſal muſcles.

DORSANE, Anthony, in *Biography*, a French divine, who flouriſhed in the 17th and 18th centuries. During his eccleſiaſtical career he became doctor of the Sorbonne, chanter of the church of Paris, and grand vicar and official of that dioceſe, under cardinal de Noailles. He was author of "A Journal," which gives the hiſtory, and moſt intereſting circumſtances which took place at Rome and in France, during the celebrated negociation reſpecting the conſtitution, or bull unigenitus, in two volumes, 4to. Thoſe who are deſirous of ſeeing a detail of the moſt minute circumſtances connected with this negociation, will find all that they can wiſh for in the "Journal," written in ſimple but clear language. The beſt edition of this work is the ſecond, which was publiſhed in 1756.

DORSCH, or Torsk, in *Ichthyography*, the common name of a ſmall fiſh of the cod-kind, frequent in the Baltic, but more rare in other ſeas, and called by authors the aſellus varius, or ſtriatus. See Gadus *Callarias*.

DORSET, in *Geography*, a townſhip of America, in the ſtate of Vermont, and county of Bennington, having Rupert to the weſt, Mancheſter to the ſouth, and Danby to the north, containing 958 inhabitants; 27 miles N. by E. from Bennington.

Dorset *and Somerſet Canal*, is the parliamentary name of a navigable canal in Wiltſhire, Somerſetſhire, and Dorſetſhire, intended to be about 40 miles long; it commences in the Kennet and Avon canal near Bradford, and is to terminate in the Chriſtchurch Stour river, in Shilling-ſtone, Okeford. A branch of this canal extends to Nettlebridge collieries, in Midſummer-Norton. See Canal.

DORSETSHIRE, a maritime county on the ſouthern coaſt of England, is bounded on the north by Wiltſhire and Somerſetſhire: on the eaſt by Hampſhire; on the weſt by Devonſhire, and part of Somerſetſhire; and on the ſouth by the Britiſh Channel. It is of a very irregular form: its long northern ſide has a conſiderable angular projection in the middle; the ſea-ſhore on the ſouth runs out into numerous points and head-lands, till it ſtretches to the iſle or promontory of Portland; thence weſtward the coaſt is not ſo deeply indented, but inclines obliquely towards Devonſhire. Its extent, from north to ſouth, is about thirty-five miles; from eaſt to weſt, about fifty-five: the circumference being nearly 160. The area includes about 775,000 acres; and has five grand diviſions, ſubdivided into 34 hundreds, containing upwards of 390 pariſhes, 22 towns, about 22,260 houſes, and 115,320 inhabitants. Before the invaſion of the Romans, Dorſetſhire, according to Ptolemy, and ſome other writers, was inhabited by the Durotriges, or Morini. On the diviſion of the iſland into Roman provinces, this diſtrict became part of Britannia Prima; and on the eſtabliſhment of the Saxons, was included in the kingdom of Weſſex, to which it continued attached till the union of the different ſtates under Egbert. Many of the Saxon ſovereigns appear to have lived in this county; and Kingſton-hall, and Corfe-caſtle, are pointed out by tradition as their places of reſidence. The general appearance of Dorſetſhire is uneven, and in many parts very hilly. Its moſt ſtriking features are the open and uninclofed parts, or downs, which are covered with numerous flocks of ſheep. In the natural diviſion of the lands, the larger proportion is appropriated to paſture; the arable is eſtimated at one-third, and the waſte at about a ninth part: the principal ſheep country is round Dorcheſter. Great numbers of ſheep and oxen are fed in the vale of Blackmore, which is diſtinguiſhed for the richneſs of its paſturage, and extends from north to ſouth about nineteen miles, and from eaſt to weſt about fourteen: here are alſo ſome orchards. Many of the other vales, on the ſouth-weſtern ſide, are uncommonly luxuriant. From the mildneſs of the air, and the beauty of its ſituation, Dorcheſter has been termed the garden of England. The ſoils are various. About Bridport the lower lands are moſtly deep rich loams; on the higher parts, throughout the weſtern diſtrict, the ſoil is a ſandy loam, intermixed with a baſe kind of flint, and well adapted to the growth of beech. To the north of Sherborne, which affords ſome of the beſt arable land in the county, it is a ſtone brack, which is the caſe in the iſle of Portland, and moſt parts of the iſle of Purbeck. The tillage in the open parts of the country is very much upon a chalk bottom, and all the land towards Abbotſbury and Weymouth is of an inferior quality. In the centre of the county the ſoil is good, and the land well managed. The growth of flax and hemp, particularly the former, is of great agricultural importance, eſpecially about Bridport, the village of Bradpole, and towards Beminſter, where it is chiefly cultivated. The beſt ſeed is annually imported from Riga. The land is frequently let to a middle man, called a flax-jobber, who pays the farmer a net ſum of four or five pounds *per* acre, manages the crop, finds the ſeed and labour, and expects nothing from the farmer but ploughing, and the diſcharge of the parochial taxes. The chief products of Dorſetſhire are corn, cattle, butter, ſheep, wool, timber, flax, and hemp. The cattle, and particularly the ſheep, have long been celebrated. Dyer has enumerated this tract among the moſt favourite ſpots for the breeding of this uſeful animal:

> ——— "Such Dorcheſtrian fields,
> Whoſe *flocks innumerous* whiten all the land."

The number of ſheep conſtantly kept in this county is eſtimated at 800,000, of which upwards of 150,000 are annually ſold, and ſent away. They are highly eſteemed for the fineneſs, ſhortneſs, and cloſe texture of their wool, which is much uſed in the manufacture of broad cloth. The annual produce of this wool is reckoned to be 90,000 weighs, or weights, of thirty-one pounds each. Within eight miles round Dorcheſter, nearly 170 000 ſheep and lambs are ſuppoſed to be kept. The iſle of Purbeck is famous for its ſtone quarries; ſome of the ſtone taking a poliſh nearly equal to marble, is uſed for chimney-pieces, hearths, &c. and the coarſer kinds for paving. The iſle of Portland produces excellent free-ſtone, which has been uſed in building Whiteha'l, in London; alſo St. Paul's, Weſtminſter and Blackfriars bridge, with many other public ſtructures.

The

The principal manufacture of this county is that of flax and hemp, which is chiefly carried on in the vicinity of Bridport and Beminster: and, on a smaller scale, in the isle of Purbeck. At Shaftesbury is a manufactory for all kinds of shirt-buttons, which employs great numbers of women and children: a sort of flannel or coarse white woollen cloth, called swan-skin, is also made in this town; but the chief trade in this branch is carried on at Sherminster. A large manufactory of shirt-buttons is also carried on at Blandford. At Stalbridge is an establishment for spinning silk; and at Sherborne another on a larger scale. At Wimborne, considerable business is transacted in the worsted stocking branch; and upwards of 1000 women and children are employed in knitting.

Dorsetshire was anciently a bishop's see, but was afterwards connected at different periods, with the sees of Oxford, Winchester, Sherborne, and Sarum: it was separated from the latter in the thirty-first year of Henry VIII., when it was constituted part of the newly erected bishopric of Bristol, to which it still belongs. It pays nine parts of the land tax; supplies the militia with 640 men; and sends 20 members to parliament, *viz.* two for the county, and two for each of the boroughs of Dorchester, Poole, Lyme-Regis, Weymouth, Melcombe-Regis, Bridport, Shaftesbury, Wareham, and Corfe-castle.

The Roman stations in Dorsetshire appear, according to the best authorities, to have been *Londinis*, Lyme-Regis; *Canca Ariana*, Charmouth; *Durnovaria*, Dorchester; *Vindogladia*, Wimborne-Minster; *Clavinio*, Weymouth; *Morinio*, Wareham; *Bolelaunio*, Poole.

The principal rivers of Dorsetshire are the Frome, the Stour, the Piddle, and the Ivel. The Frome rises in the north-western part of the county, near Evershot, and having received some smaller streams from the vicinity of Hook-park, flows by Cattlock, Maiden Newton, Frampton, and Bradford Peveril to Dorchester. Thence passing to the south-east, it receives the waters of the Winterbourne, at Frome Belet, and flowing onward, passes Moreton, Bindon, and Wareham, about three miles from which it falls into Poole bay. The Stour enters this county from Wiltshire, near Gillingham, below which it gives name to several villages. For some miles its course is nearly south, but having reached Sturminster, it proceeds in a south-eastwardly direction towards Blandford, Sturminster-Marshall Wimborne, and Parley, at a little distance from which it enters Hampshire. Several rivulets flow into it during its progress through this county. The Piddle, called Trent by Asser, rises northward of Piddle Trenthyde-church, and flowing to the south-east, gives name to several small villages and hamlets: near Keysworth, it unites with the waters of Poole bay. The Ivel, anciently named Yoo, has its origin from several springs, at a place called Horethorn, in a hill north-east from Sherborne; from which town it flows into Somersetshire, and falls into the Parret. Beauties of England and Wales, vol. iv. Hutchins's History of Dorsetshire; new edition by Gough. Agricultural Report for Dorsetshire.

DORSI LATISSIMUS, in *Anatomy*, (tensor ani, sealptor ani, le grand dorsal,) is one of the muscles which move the humerus on the scapula, so named from its great breadth, as it covers the lower half of the posterior surface of the trunk, immediately under the integuments. It arises by a thin and flat tendon from the spinous processes of the five, six, or seven lowest dorsal vertebræ; from the spinous processes of all the lumbar vertebræ, and of the sacrum; from the oblique processes of the sacrum; from the margin of the glutens maximus, with which it is united; and from the outer margin of the back part of the crista of the ileum; by fleshy slips from the outer surface of the four lower ribs, the portion derived from the twelfth rib being the broadest, and that from the ninth the narrowest. These portions meet with the origins of the obliquus externus abdominis. Its tendinous origin is thin and broad; narrower at the upper part, but expanding to a breadth of three or four inches below, and closely connected to the tendons of the serratus inferior posticus and obliquus internus abdominis. Its fibres all converge towards one point, hence they follow different directions according to their origins; but the greater part passes obliquely upwards and outwards. The superior fibres are nearly transverse; they become more and more oblique as we descend; and those arising from the ribs ascend almost in a straight direction. As the muscle proceeds towards its insertion, it becomes narrower but thicker; it goes over the inferior angle of the scapula, from which it sometimes derives a fasciculus of fibres, and lying on the teres major, forms a flattened but strong tendon, united to that muscle. It then turns so as to get in front of the teres, and is inserted either together with that muscle, or immediately in front of it, into the rough line that runs along the humerus from the smaller tubercle of the bone. The tendon has a twisted appearance; the superior fibres of the muscle joining its inferior edge, and *vice versâ*. It joins that of the pectoralis in the bicipital groove, and its lower edge is connected with the fascia. The latissimus dorsi is covered externally by the skin, except at its origin from the dorsal vertebræ, where the trapezius lies on it, and at its insertion where the teres major covers it. It covers a small portion of the rhomboideus major, the sacrolumbalis and longissimus dorsi, the serratus posticus inferior, a very small portion of the obliquus externus abdominis, and a larger part of the obliquus internus, the outer surface of the six or seven last ribs, and the corresponding intercostal muscles, the inferior angle of the scapula, the serratus magnus, and the teres major.

This muscle will move the arm, chest, pelvis, and at the same time the whole trunk. Its action on the former depends on the position of the limb. If that hangs by the side, it will be carried backwards, and hence the names of sealptor and tensor ani formerly given to the muscle; if it has been previously elevated, the latissimus dorsi will draw it down, if rotated outwards it will turn it in the opposite direction. The chest is affected by its costal fibres, which are exerted particularly when respiration is laborious; and hence we observe asthmatics seizing some fixed object, in order to render the humerus a fixed point to which the ribs may be elevated. The latissimus dorsi elevates the trunk to the upper limbs when the latter are fixed to any object above the head, as to the branch of a tree in climbing, and carries the body forwards upon the same limbs when we walk with crutches, or when we make an impression with a seal. In this class of actions it concurs with the pectoralis major. It may also be regarded as a tensor of the aponeurosis which covers the lumbar muscles.

DORSI *Longissimus*, (le long dorsal) one of the muscles of the back, so called from its great length. A common mass of muscular and tendinous fibres filling the hollow at the side of the loins and sacrum, gives origin to the longissimus dorsi and sacrolumbalis muscles. This mass, which is very thick and flattened on its surface, extends from the lower part of the sacrum nearly to the last rib, and is covered by a broad and strong aponeurosis, from which all the muscular fibres proceed. The aponeurosis is attached to the back end of the crista ilii, and to the lower extremity of the sacrum, being connected between these points to the gluteus magnus. It is fixed to the whole of the spinous processes of the sacrum and of the lumbar vertebræ. It covers on the sacrum

ſacrum the whole of the common origin of the two muſcles, but in the loins leaves the ſacrolumbalis, and is continued throughout the whole length of the longiſſimus dorſi. The latter muſcle has an elongated form, thick below, and gradually tapering to a point above, and extends in a line parallel to the ſpine from the end of the ſacrum to the firſt dorſal vertebra. Its fibres are derived from the anterior ſurface of the aponeuroſis juſt deſcribed; they paſs obliquely upwards, and detach, as they aſcend, ſeven or eight flattened fleſhy heads, which are inſerted into the lower margin of the ſame number of ribs; on the oppoſite ſide it ſends a tendinous attachment to the tranſverſe proceſs of each lumbar and dorſal vertebra.

The multifidus ſpinæ, complexus, and tranſverſalis colli lie along its inner edge, the ſacrolumbalis on its outer. Its poſterior ſurface is covered by the aponeuroſis of the obliquus internus and tranſverſalis abdominis, by the poſterior ſerrati, and the vertebral faſcia; while it lies in front on the levatores coſtarum and ribs. It extends the ſpine, reſtoring the vertebral column to its erect ſtate after it has been bent forwards, and being in a ſtate of conſtant action, in order to maintain the erect poſition of the trunk, which naturally tends to fall forwards.

Dorsi *ſemiſpinalis*, (*demi-epineux*, or *tranſverſaire epineux du dos*), one of the muſcles of the back. It ariſes from the tranſverſe proceſſes of four vertebræ towards the lower part of the back, and is inſerted into the ſpinous proceſſes of the two or three ſuperior dorſal, and the laſt cervical vertebræ. It is ſo connected to the multifidus ſpinæ on which it lies, and to the ſemiſpinalis colli, that it can with difficulty be made out ſeparately. It extends the dorſal region of the ſpine.

Dorsi *ſpinalis*, is a ſmall muſcle of the back, moſt intimately connected with the longiſſimus dorſi, of which it may be conſidered to form a part. It ariſes from the ſpines of the lower, and is inſerted into thoſe of the upper vertebræ of the back, and adheres cloſely to the inner edge of the tendon of the longiſſimus, lying between it and the ſpinous proceſſes. It will extend the back, and move it to one ſide.

Dorsi *interſpinales*, and *intertranſverſarii*, are ſome ſmall muſcles, of which the former lie between the ſpinous, and the latter between the tranſverſe proceſſes of the contiguous vertebræ. They are only found in the lower part of the back, and have the office of approximating the bones to which they are connected.

DORSIFEROUS, or Dorsiparous *Plants*, from *dorſum* and *fero*, I bear, are thoſe of the capillary kind; which are without ſtem, and bear their ſeeds on the back-ſide of their leaves.

DORSTEN, in *Geography*, a ſmall town of Germany, in the circle of Weſtphalia, on the river Lippe, which formerly belonged to the elector of Cologne, and lately to the grand duchy of Berg. It is 24 miles N.E. of Duriſburg, 60 miles N. of Cologne, and 45 S.W. of Munſter.

DORSTENIA, in *Botany*, (ſo named by Plumier after Theodoric Doreſtenius, a German phyſician and botaniſt, of ſome fame and learning in his time, who publiſhed at Frankfort, in 1540, a Latin herbal in folio, with rude wooden cuts. Linnæus obſerves that the obſolete or antiquated character of this work is expreſſed by the inelegant flowers of the *Doreſtenia*.) Plum. Gen. 29. t. 8. Linn. Gen. 62. Schreb. 84. Willd. Sp. Pl. v. 1. 682. Mart. Mill. Dict. v. 2. Juſſ. 401. Lamarck t. 83. Claſs and order, *Tetrandria Monogynia?* Nat. Ord. *Scabridæ*, Linn. *Urticæ*, Juſſ.

Gen. Ch. *Common Receptacle* of one large, expanded, flat, moſtly angular leaf, covered with very numerous minute florets, occupying its diſk. Perianth quadrangular, concave imbedded in the receptacle and connected with it. *Cor.* none. *Stam.* Filaments four, filiform, very ſhort; anthers roundiſh. *Piſt.* Germen roundiſh; ſtyle ſimple; ſtigma obtuſe. *Peric.* none, except the receptacle become fleſhy. *Seeds* ſolitary to each floret, roundiſh, pointed. Linn.

Linnæus ſuſpected there might be female flowers intermixed with the united ones, as in *Parietaria*, judiciouſly remarking that *Doreſtenia* was of a nature between that genus and *Ficus*, being, as it were, a fig laid open. He, however, profeſſed that his knowledge of the ſubject was imperfect, and required to be corrected by obſervations on the living plant. Hence Jacquin was induced to amend the account above given, in his *Collectanea*, v. 3. 201. Ic. Rar. v. 3. t. 614, from the inſpection of *Doreſtenia Contrayerva*, continually flowering in the ſtoves at Vienna. He deſcribes the cells of the receptacle as covered by one common ſkin, which is elevated over each cell into a vaulted protuberance, and he believes there is no proper perianth. Each cell is either male or female. The anthers lie in pairs, without filaments, on the ſummit of the protuberance over each of the former only; while in the bottom of every female cell is a ſolitary germen on a ſhort ſtalk, with a cloven ſtyle, reaching to the cover of the cell, with ſimple ſtigmas. Each germen becomes a bivalve, very elaſtic, capſule (which perhaps is the perianth of Linnæus) of one cell, encloſing a compreſſed, rugged, ſomewhat triangular ſeed. If this deſcription ſhould be found to accord with all the ſpecies, as is moſt probable, *Doreſtenia* muſt be placed in *Monœcia Diandria*.

Eſſ. Ch. Common receptacle flat, of one leaf, fleſhy, cellular. Seeds ſolitary in each fertile cell.

Linnæus enumerates four ſpecies of *Doreſtenia*, Willdenow ten. The moſt remarkable is D. *Contrayerva* above-mentioned, whoſe acrid aromatic root has been celebrated as an antidote to the bites of poiſonous reptiles. It is kept in the ſhops, having been recommended for its diaphoretic qualities. (See Contrayerva). This ſpecies is botanically diſtinguiſhed by its quadrangular receptacle, its palmate, ſomewhat pinnatifid, ſerrated leaves, and radical flower-ſtalks. It is a native of many of the Spaniſh ſettlements in South America, and of the iſlands of Tobago, St. Vincent's, and Martinique, growing in mountainous ſhady places. Nothing can be leſs like a flower than its green leafy receptacle, beſprinkled with whitiſh ſeſſile anthers in the firſt inſtance, and then with prominent ſeeds, which on the ſlighteſt touch, when nearly ripe, are projected to a diſtance by the elaſtic capſule. In order to collect them for ſowing Jacquin found it neceſſary to cover the whole receptacle with a piece of linen cloth.

Dorstenia *Contrayerva*, in the *Materia Medica*. See Contrayerva.

DORSUM, in *Anatomy*, a name applied to the back of the hand and foot; alſo to the outer or back ſurfaces of ſome bones, as the ſcapula and ileum.

DORSZYU, in *Geography*, a town of Lithuania, in the palatinate of Minſk; 46 miles N.N.E. of Minſk.

DORT. See Dordrecht.

DORT, *ſynod of*, in *Eccleſiaſtical Hiſtory*, a national ſynod, ſummoned by authority of the ſtates-general, the provinces of Holland, Utrecht, and Overyſſel, excepted, and held at Dort in 1618, and 1619.

This ſynod was convened in conſequence of the diſputes that prevailed in Holland, between the Calviniſts and Arminians upon the *five* points, relating to election, redemption, original ſin, effectual grace, and perſeverance. Each party, in the progreſs of the controverſy, had loaded the other with reproaches, and in the ardour excited by the diſpute, charged their opinions with the moſt invidious conſequences; inſomuch

insomuch that all social intercourse was interrupted, the pulpits were become the stages of unprofitable and angry altercation, and as each party prevailed, the other was turned out of their churches. The magistrates, who at first exhorted the contending parties to exercise moderation and charity, and who enforced these virtues by observing, that, in a free state, their respective opinions might be treated with toleration, without any detriment to the essential interests of true religion, became at length no less divided than the ministers, so that one city and town was ready to take up arms against another. By degrees this controversy grew into a state faction, which endangered the dissolution of the government. Maurice, prince of Orange, though a remonstrant, put himself at the head of the Calvinists, or contra-remonstrants, because they were for a stadtholder; and the magistrates, who were against a stadtholder, took part with the remonstrants or Arminians, among whom the advocate of Holland, Olden Barnevelt, and the pensionaries of Leyden and Rotterdam, Hogerberts and Grotius, were the chief. Several attempts were made for an accommodation, or toleration of the two parties; but these proving unsuccessful, the three leaders of the remonstrants or Arminians were taken into custody; and the magistrates of several cities and towns were changed by authority of the prince, which made way for the choice of such a synod as his highness desired. The classes of the several towns met first in a provincial synod, and these sent deputies to the national one, with proper instructions. The remonstrants were averse from convoking a synod, because their number was inferior to that of the Calvinists; and as their leaders were in custody, it was easy to apprehend their approaching fate. They complained of injustice in their summons to the provincial assemblies; and their deputies, being incensed and dissatisfied, absented themselves from their classes, and thus surrendered their power into the hands of their adversaries, who condemned their principles, and deposed many of their ministers. The national synod of Dort consisted of 38 Dutch and Walloon divines, five professors of the universities, and 21 lay-elders, amounting in the whole number to 61 persons, of whom not above three or four were remonstrants. Besides these, there were 28 foreign divines from Great Britain, from the Palatinate, from Hessia, Switzerland, Geneva, Bremen, Emden, Nassau, and Witteravia; the French king not permitting his Protestant divines to appear. Next to the state deputies sat the English divines; the second place was reserved for the French divines; and the rest sat in the order above-recited. Upon the right and left hand of the chair, next to the lay deputies, sat the Netherland professors of divinity; then the ministers and elders according to the rank of their provinces; the Walloon churches sitting last. After the divines had produced their credentials, and the choice of a president, assessors, scribes, and secretaries, a fast was appointed; and they then proceeded to the business of deciding the controversy between the Gomarists or Calvinists and the Arminians; the latter of whom were declared corruptors of the true religion. The synod continued to the 29th of May, 1619, in which time there were 180 sessions; in the 23d of which the members took an oath, expressing their purpose, during the whole course of the transactions of this synod, in which enquiry was to be made, and judgment and decision pronounced, concerning the *five points* and other sorts of doctrines, not to use any kind of human writings, but only the word of God, as a sure and infallible rule of faith; and to have no other object in view throughout the whole discussion, but the honour of God, the peace of the church, and above all, the preservation of the purity of doctrine. In the 145th session, April 30th, the Belgic confession of faith was debated; to which the English divines assented, the articles relating to the purity of ministers and ecclesiastical discipline excepted; declaring, that, after examination, they found it, with respect to faith and doctrine, conformable in the main to the word of God. They also added, that, upon consideration of the exceptions of the remonstrants or Arminians, they appeared to be such which might be made against all the confessions of other reformed churches. Their own church government they maintained to be founded upon apostolical institution. The five points of difference between the Calvinists and Arminians were, after a long hearing, decided in favour of the former, after which the remonstrant ministers were dismissed the assembly, and banished the country within a limited time, unless they submitted to the new confession. However the authority of this synod was far from being universally acknowledged either in Holland or in England. The provinces of Friesland, Zealand, Utrecht, Guelderland, and Groningen, could not be persuaded to adopt their decisions; and they were opposed by the authority of archbishop Laud, and king James I. in England. The reformed churches in France, though at first disposed to give a favourable reception to the decisions of this famous synod, in process of time espoused doctrines very different from those of the Gomarists; and the churches of Brandenburgh and Bremen would not suffer their doctors to be tied down to the opinions and tenets of the Dutch divines. The liberty of private judgment, with respect to the doctrines of PREDESTINATION and GRACE, which the spirit that prevailed among the divines of Dort seemed so much adapted to discourage and suppress, acquired new vigour, in consequence of the arbitrary proceedings of this assembly. Of this synod very different opinions have obtained amongst the contending parties. Several divines expressed their satisfaction with its proceedings. Mr. Baxter, speaking of it, says, that the Christian world, since the days of the apostles, never had an assembly of more excellent divines; and the learned Jacobus Capellus, professor of Leyden, further declared, that the equity of the fathers of the synod was such, that no instance can be given since the apostolick age of any other synod in which the heretics were heard with more patience, or which proceeded with better temper and more sanctity. Others, however, poured contempt upon it, and burlesqued its proceedings in such monkish lines as the following:

"Dordrechti synodus, nodus; chorus integer, æger;
Conventus, ventus, Sessio, stramen, amen."

All the favourers of the Arminian doctrine, as we may naturally conceive, charge them with partiality and unjustifiable severity. It would indeed be a difficult, nay, an unsurmountable task, to justify all the proceedings of this synod, how much soever its partisans have extolled them; and it were much to be wished that they had been more conformable to the spirit of Christian charity, than the representations of history, impartially weighed, shew them to have been. In England this synod had its advocates both in the established church, and among the Puritans, although king James, who, from his propensity towards popery, had deserted from the Calvinists to the Arminians, and who seemed inclined to bring about an union between the church of England and the church of Rome, and also the episcopal clergy under his immediate influence, disapproved its proceedings; and its decisions, in point of doctrine, were regarded by many, and perhaps, not without reason, as agreeable to the tenor of the "Book of Articles established by law in the Church of England." Brandt's Ref. vol. iii. Mosheim E. H. vol. v.

DORTICUM, in *Ancient Geography*, a town of Upper Mysia. Ptol. Itin. Antonin.

DORTMANNA, in *Botany*. See LOBELIA.

DORTMUND, in *Geography*, a small town of Germany, in the circle of Weſtphalia, on the river Ems, 42 miles S.W. of Munſter, and 45 miles N. E. of Cologne. It was formerly a free imperial city, and anciently one of the Hanſeatic towns.

DORVALLIA, in *Botany*, See FUCHSIA.

DORUM, in *Ancient Geography*, a village of Egypt, ſituated in the iſland of Meroe. Ptol.

DORY, in *Geography*, a town of Lithuania, in the palatinate of Wilna; 68 miles E. of Lida.

DORY, a harbour in the northern part of Papua or New Guinea See PAPUA.

DORYANTHES, in *Botany*, (from Δορυ, *a ſpear*, and ανθος, *a flower*,) Correa in Tr. of L. Soc. v. 6. 211. t. 23, 24. Claſs and order, *Hexandria Monogynia*. Nat. Ord. *Bromeliæ*, Juſſ.

Gen. Ch. *Cal.* none, except partial ſheaths, which are rather bracteas. *Cor.* of one petal, funnel ſhaped, in ſix deep diviſions, which are oblong-lanceolate, concave, keeled, the three innermoſt dilated at the baſe. *Stam.* Filaments ſix, almoſt as long as the petals and inſerted into their lower part, awl-ſhaped, their points penetrating deeply into the baſe of the anthers; anthers erect, ſomewhat cylindrical, two celled, after impregnation becoming of the ſhape of extinguiſhers. *Piſt.* Germen inferior, oblong, angular; ſtyle the length of the ſtamens, columnar, with three longitudinal furrows; ſtigma three-lobed. *Peric.* Capſule elliptic-oblong, with three furrows, crowned with the baſes of the corolla and ſtyle, of three cells and three valves. *Receptacles* central, longitudinal, two in each cell. *Seeds* ſomewhat kidney-ſhaped, depreſſed, ranged vertically in a ſingle ſeries, but alternately attached to each receptacle or line of the columella.

Eſſ. Ch. Corolla ſuperior, in ſix deep ſegments, upright. Filaments ſhorter than the corolla, erect. Anthers erect. Capſule of three cells. Seeds in one row, with a double inſertion.

1. D. *excelſa*. Native of the mountains of New South Wales. *Root* perennial. *Habit* that of a *Yucca* or *Agave*, with numerous, oblong, for the moſt part radical, *leaves*. *Stalk* ſolitary, ſtraight, firm, above twenty feet high, bearing cluſters of large, beautiful, crimſon liliaceous *flowers*. A portion of the ſtalk, brought from New South Wales, was ſo tenacious of life that it produced a flower in the garden at Kew, from which Mr. Correa made the above deſcription. The genus is nearly allied to *Agave*, but the anthers are not incumbent, and the ſeeds in each cell make but one row in fact, though they are alternately inſerted along two lines of the central column. How far theſe characters are ſufficient, even in this tribe, where we muſt often be content with ſlight ones to mark very natural genera, may admit of ſome doubt; eſpecially as the anthers become extinguiſher-ſhaped only by the rolling back of their lobes after ſhedding the pollen, and the filaments are inſerted into their backs, exactly as is the caſe with incumbent anthers. S.

DORYCNIUM. See CONVOLVULUS n. 136, alſo LOTUS DORYCNIUM, which Lamarck refers to *Aſpalathus*. Juſſ. 353, 356.

DORYCTELA, in *Ancient Geography*, a country of Aſia, on the coaſt of the Ægean ſea, according to Diodorus Siculus; named *Æolia* and the *Æolide* by other authors.

DORYDREPANON. See DREPANON.

DORYLÆIUM, or DORYLÆUM, in *Ancient Geography*, a town of Aſia, ſituated in the northern part of Phrygia Salutaris. The plain, on which this city ſtood, was watered by ſeveral rivers, which flowed into the Sangarus.

DORYPHORI, from δορυ, *ſpear*, and φερω, *I bear*, an appellation given to the life-guard-men of the Roman emperors. They were held in ſuch high eſtimation, as frequently to have the command of armies conferred on them.

It was uſual alſo for chief commanders to have their doryphori, or life-guard, to attend them.

DOSA, in *Ancient Geography*, a town of Aſſyria, placed by Ptolemy near Gaupa nela.

DOSARA, a town of India, on this ſide of the Ganges. Ptol.

DOSARENI, a people of Arabia Felix. Ptol.

DOSARON, a river of India in the peninſula on this ſide of the Ganges, which diſcharged itſelf into the ſea, N. E. of the river Tyndis.

DOSCI, a people of Aſia in Sarmatia, who are ſaid by Strabo to have occupied the coaſt of the Euxine ſea.

DOSE, in *Pharmacy*, &c. the quantity of a medicine to be taken at one time.

The word is formed from the Greek δοσις, which ſignifies gift, or a thing given, from διδωμι, *do*, *I give*.

In authors, and diſpenſatories, that deſcribe the ſame remedy, frequently the doſe is different; which occaſions a great difference in its effect.

Dr. Cockburn has given us an eſſay towards determining the doſes of purgative medicines, on mechanical principles.

Several attempts have been made to aſcertain the proportional doſes for the different ages and conſtitutions of patients; but, after all that can be ſaid on this ſubject, much muſt be left to the judgment of the perſon who adminiſters the medicine. The following general proportions may be obſerved, though by no means intended for exact rules. A patient between 20 and 14 may take two-thirds of the doſe ordered for an adult; from 14 to 9, one half; from 9 to 6, one-third; from 6 to 4, one-fourth; from 4 to 2, one-ſixth; from 2 to 1, a tenth: and under one, a twelfth. Buchan's Dom. Med. App. p. 695.

DOSENS, ſtraight cloths, made in Devonſhire, and ſo called in Rot. Parl. 2 Hen. V. See DOWSEINES.

DOSITHEANS, DOSITHEI, an ancient ſect among the Samaritans in the firſt century of the Chriſtian era.

Mention is made in Origen, Epiphanius, Jerome, and divers other Greek and Latin fathers, of one Doſitheus, the chief of a faction among the Samaritans; but the learned are not agreed as to the time wherein he lived. St. Jerome, in his dialogue againſt the Luciferians, places him before our Saviour; wherein he is followed by Druſius, who, in his anſwer to Serrarius, places him about the time of Sennacherib, king of Aſſyria; but Scaliger will have him poſterior to our Saviour's time. And, in effect, Origen intimates him to have been contemporary with the apoſtles; where he obſerves, that he endeavoured to perſuade the Samaritans that he was the Meſſiah foretold by Moſes.

From the "Recognitions of Clement," an ancient work ſaid to be written in the ſecond century, we learn, that Doſitheus, a Jew, was at firſt a diſciple of John the Baptiſt, but aimed at being thought the Chriſt, in oppoſition to both John and Jeſus, and after the death of the former actually placed himſelf at the head of his ſect. Some ſuppoſe that the evangeliſt John refers to him, ch. iii. 25, where inſtead of Ιουδαιων, the reading Ιουδαιου τινος is introduced.

He had many followers; and his ſect was ſtill ſubſiſting at Alexandria in the time of the patriarch Eulogius; as appears from a decree of that patriarch, publiſhed by Photius. In that decree, Eulogius accuſes Doſitheus of injuriouſly treating the ancient patriarchs and prophets; and attributing to

to himself the spirit of prophecy. He makes him contemporary with Simon Magus; and accuses him of corrupting the Pentateuch in divers places, and of composing several books, directly contrary to the law of God.

Archbishop Usher takes Dositheus to be the author of all the changes made in the Samaritan Pentateuch; which he argues from the authority of Eulogius; but all we can justly gather from the testimony of Eulogius is, that Dositheus corrupted the Samaritan copies since used by that sect; but that corruption did not pass into all the copies of the Samaritan Pentateuch, now in use among us, which vary but little from the Jewish Pentateuch.

And in this sense we are to understand that passage in a Samaritan chronicle, where it is said, that Dousis, *i. e.* Dositheus, altered several things in the law of Moses.

The author of that chronicle, who was a Samaritan by religion, adds, that their high-priest sent several Samaritans to seize Dousis, and his corrupted copy of the Pentateuch. Epiphanius takes him to have been a Jew by birth, and to have abandoned the Jewish party for that of the Samaritans. He imagines him likewise to have been the author of the sect of the Sadducees: this is inconsistent with his being later than our Saviour. And yet the Jesuit Serrarius agrees to make Dositheus the master of Sadoc, from whom the Sadducees are derived.

Tertullian, making mention of the same Dositheus, observes, that he was the first who dared to reject the authority of the prophets, by denying their inspiration. But he charges that as a crime peculiar to this sectary, which, in reality, is common to the whole sect, who have never allowed any but the five books of Moses for divine.

DOSOME, in *Agriculture*. a term provincially applied to such beasts as improve rapidly in flesh. Thus a thriving beast is said to be dosome.

DOSS, in *Rural Economy*, is a term provincially made use of to strike with the horn, or gore in a slight manner, as neat cattle frequently do to each other.

DOSSE, in *Geography*, a river of Germany, in the circle of Upper Saxony, and marquisate of Brandenburg, which runs into the Havel, 8 miles E.S.E. from Havelberg.

DOSSER, a sort of basket to be carried on the shoulders of men. It is used in carrying the overplus earth from one part of a fortification to another, where it is wanted. There are likewise small carts and wheel-barrows for the same use.

DOSSIL, *Surgery*, is lint made into a cylindric form, or resembling the shape of dates or olive stones. Dossils are sometimes secured by a thread tied round their middle.

DOSSO, Dossi, in *Biography*, a painter of history, was a native of Dosso, in the territory of Ferrara, and from the school of Costa went to Rome, where he studied six years, and five at Venice, forming a style compared sometimes to that of Raphael, sometimes to that of Titian, and sometimes said to resemble that of Correggio. Ariosto ranks him, and also his brother Gio. Batista, with the first names in Italy; and Dosso's pictures are said to prove that he did not owe this high rank to the partiality of the poet. The head of his St. John at Patmos, in the church. a'Lateranensi at Ferrara, is represented as a prodigy of expression. In the copy of his most celebrated picture in the church of the Dominicans at Faenza, exhibiting Christ among the doctors, the simplicity of the composition, the variety of the characters, and the breadth and propriety of the drapery, deserve admiration. Seven of his pictures are at Dresden. The style of Dosso is somewhat more obsolete than that of the great masters with whom he is compared; but he has a novelty of invention and drapery, which are his own; together with a colour that unites with variety and boldness a general harmony. He died about the year 1560. Pilkington's Dict. by Fuseli.

DOTAL Goods. See Goods.

DOTE Assignanda, in *Law*, a writ that lay for a widow, where it was found by office, that the king's tenant was seised of tenements in fee, or fee-tail, at the day of his death; and that he held of the king in chief, &c. in which case, the widow came into the chancery, and there made oath, that she would not marry without the king's leave. Anno 15 Edw. IV. c. 4. And hereupon she had this writ to the escheator; for which see Reg. of Writs, fol. 297. and Fitz. Nat. Br. fol. 263.

These widows are called the king's widows.

Dote *unde nihil habet*, a writ of dower that lies for the widow against the tenant, who bought land of her husband in his life-time, whereof he was solely seised in fee-simple, or fee-tail, in such sort, as the issue of them both might have inherited. Fitz. Nat. Br. fol. 147. See Dower.

Dote, *recto de*, see Recto.

DOTHAN, or Dothaim, in *Ancient Geography*, a place of Judæa, in the tribe of Zebulon, S E. of mount Itabyrium, or Tabor, and 12 miles N. of Samaria. It was at this place that the brethren of Joseph sold him to the Ishmaelite merchants of Gilead. (Gen. ch. xxxvii.) This was also the place where Elisha, the prophet, was encompassed by the troops of Benhadad, king of Syria, who were sent to apprehend him. 2 Kings, vi. 13.

DOTIS, in *Geography*, a small town of Hungary, on the road from Vienna to Comorn. It is very agreeably situated in an extensive plain, bounded by lofty hills.

Dotis *admensuratione*. See Admeasurement, and Reg. of Writs, fol. 171.

DOTIUM, in *Ancient Geography*, a town of Greece in Thessaly, placed by Strabo near the lake Boebeis.

DOTKIN. See Doitkin.

DOTMATYN, in *Geography*, a town of Hungary; 6 miles N.W. of Podolicz.

DOTTEREL, in *Ornithology*, the name by which the *morinellus* is commonly known in most parts of England. See Charadrius *Morinellus*.

Dotterel, *Sea*, Tringa *Marinella*, in the Linnæan system, a name given by authors to the bird, commonly known in England by the name of the *Turnstone*; and called by Turner, cinclus. See Tringa.

DOTTO, in *Natural History*, a name given by some authors to a species of the emerald, which was a good green, but not clear or fine.

DOU, in *Geography*, a river of Switzerland, in Neufchatel.

DOUADIO, a town of France, in the department of the Indre; 5 miles N. of La Blanc.

DOVAIN, a town of Savoy, in the Chablais, celebrated for its vineyards; 3 miles E.S.E. of Hermance.

DOUARNENEZ, a small town of France, in the department of Finisterre, chief place of a canton in the district of Quimper, with a small harbour in the bay of the same name, 12 miles W. of Quimper. It has 1795 inhabitants. Its canton comprises a population of 11,071 individuals, dispersed in 7 communes, on a territorial extent of 167½ kiliometres.

DOUAY, or Douai, in Latin *Duacum*, a considerable town of France, in the department of the North, chief place of the department and of the district of Douay. It is very advantageously situated on the navigable river Scarpe, which falls into the Scheldt, and it communicates, by means of a canal, with the river Deule, which affords an easy and cheap

intercourſe with Arras, Valenciennes, Dunkirk, and part of the department that formerly conſtituted the Auſtrian Netherlands. It is 18 miles N.W. of Cambray, 15 N.E. of Arras, and 145 miles N. of Paris.

Douay has a very handſome ſquare, a fine guildhall, a good arſenal, a ſtrong caſtle on the Scarpe, and a cannon foundery. Cloſe to the town is the village of *Lalain*, the church of which contains tombs of the middle age, remarkable for their ſculpture.

The principal manufactures of Douay are thoſe of earthenware, glaſs bottles, ſoap, oil, tin, linen cloth, cambric, cambric muſlin, thread, thread lace, gauze, flannel, and quilts. It has alſo ſome ſugar-houſes and ſalt works. Its chief trade is with oil, hops, cambric muſlin, linen cloth, and thread lace.

As chief place of a department, Douay has a prefect, two courts of juſtice, a ranger, a regiſter office, and a company of the national gens d'armes, formerly called *maréchauſſée*. Its population amounts to 18,230 individuals; but it is divided into three cantons. The northern part of Douay, which contains 6260 inhabitants, reckons in its canton 5 communes, and 12,598 inhabitants. The weſtern part has 5830 inhabitants, and comprises in its canton 10 communes, and 12,600 inhabitants. The ſouth part of Douay contains 6140 individuals, and its canton has 12 communes, with 12,603 inhabitants.

The diſtrict of Douay counts altogether 13 cantons, 146 communes, and 166,442 inhabitants, upon a territorial extent of 1142½ kiliometres. The ſoil produces corn of all ſorts, flax, tobacco, and hops. There are alſo coal mines in the neighbourhood of Valenciennes and Conde, now called Nord Libre.

The canal of Douay, from that place to Lille, was finiſhed in 1686, by Louis XIV. Herbin. Statiſtique de la France.

DOUAZIT, a ſmall town of France, in the department of the Landes, 6 miles ſouth of St. Sever.

DOUBLE, in the *Manege*. A horſe is ſaid to double his reins, when he leaps ſeveral times together to throw the rider. Thus we ſay, this ramingue doubles his reins, and makes pontlevis. See Ramingue, and Pontlevis.

A hare is ſaid to double when ſhe keeps the plain fields, and winds about to deceive the hounds.

Double, *Fr.* in *Muſic*, is equivalent to variation. Handel, in his two ſets of leſſons, of which the title is in French, has made uſe of the French terms throughout the two books. Variation at this time was only multiplying notes, and doubling their rapidity.

Double, is uſed in the French theatres for the ſubſtitutes of great actors and actreſſes, when a performer of an inferior order is allowed to take the part of a great performer during an indiſpoſition, real or imaginary; or when a new piece is preparing, which prevents them from appearing at the end of the run of a ſucceſsful drama. Without hearing an opera performed by ſubſtitutes, it is impoſſible, ſays Rouſſeau, to conceive how a piece is degraded, and what patience is requiſite in the audience, who deign to frequent the theatres at ſuch times. All the zeal of good French citizens is neceſſary to thoſe who have any ears, and who ever heard good performers, to bear ſuch deteſtable jargon.

Double *Aſpect*. See Aspect.

Double *Banked*, in *Sea Language*, denotes the ſituation of the oars of a boat, when two oppoſite ones are managed by rowers ſeated on the ſame bench, or thwart. The oars are alſo ſaid to be double-banked when two men row upon every ſingle one.

Double *Baſe*, *Contra-baſſo*, *Ital. Contra-baſſe*, *Fr.* This inſtrument has ſometimes three, and ſometimes four ſtrings with different tunings. But if it doubles the violoncello, or any baſe part, its tones will always be an octave below thoſe produced by other baſe inſtruments.

But whoever wiſhes to know of what the double-baſe is capable, ſhould hear the extraordinary performance of Sig. Dragonetti, who executes on the double-baſe all that can be played on a violin, or any other treble inſtrument; and, we believe, generally in *ſons harmoniques*.

Double *Baſtion*. See Bastion.

Double-*Bridge*, in *Geography*, a town of America in the ſtate of Virginia, and county of Luneburg, in which is a poſt-office; 225 miles from Waſhington.

Double *Caſt*, in *Huſbandry*, a term uſed by the farmers for that method of ſowing which does not diſpenſe the neceſſary quantity of ſeed for a piece of land at one bout, but requires the going over it twice. Plott. Oxf. p. 251.

Double *Children*, Double *Cats*, Double *Pears*, *&c.* inſtances of, are frequent in the Philoſophical Tranſactions, and elſewhere. See Monster.

Sir John Floyer, in the ſame Tranſactions, giving an account of a double turkey, furniſhes ſome reflections on the production of double animals in general. Two turkeys, he relates, were taken out of an egg of the common ſize, when the reſt were all hatched, which grew together by the fleſh of the breaſt-bone; but in all other parts were diſtinct. They ſeemed leſs than the ordinary ſize, as wanting bulk, nutriment, and room for their growth, which latter, too, was apparently the occaſion of their coheſion.

For, having two diſtinct cavities in their bodies, and two hearts, they muſt have ariſen from two cicatriculas; and conſequently, the egg had two yolks, which is no uncommon accident. He had a dried double chicken: he aſſures us, that though it had four legs, four wings, &c. it had but one cavity in the body, one heart, and one head; and that this, conſequently, was produced from one cicatricula.

So, Paræus mentions a double infant with only one heart; in which caſe, the original, or ſtamen of the infant, was one, and the veſſel regular: only the nerves and arteries towards the extremities, dividing into more branches than ordinary, produced thoſe double parts.

The ſame is the caſe in the double flowers of plants, occaſioned by the richneſs of the ſoil. So it is in the eggs of quadrupeds, &c.

There are, therefore, two reaſons of duplicity in embryos: 1. The conjoining, or connexion of two perfect animals; and, 2. An extraordinary diviſion, and ramification of the original veſſels, nerves, arteries, &c.

Double *Chorde*, *Fr.* double ſtops on the violin, that is, playing different parts on two ſtrings at the ſame time, as in the firſt ſix ſolos of Corelli, Geminiani, and Tartini. It is very difficult to play double ſtops on the violin in tunes, and ſtill more difficult on the violoncello; yet many great performers, with ſtrong hands and nice ears, have diſtinguiſhed themſelves by the accuracy of their performance of two parts at once. The elder Hamitz and Haydn have compoſed ſolos for one inſtrument, in which the under part is not a ſecond treble, but a real baſe, in the true character of an accompaniment of a ſolo on the violoncello or tenor, by ſlightly touching, *ſtaccato*, the under notes. Croſdil's playing the treble part and baſe of the *March in Scipio* on his violoncello, as completely as if performed by two violoncellos, will long be remembered.

Double *Concave*, and Double *Convex Glass*. See Concave, Convex, and Glass.

Double *Cone*. See Cone.

Double *Counterpoint*. See Composition, and Counterpoint.

Double *Croche*, *Fr.* a semiquaver, or a note with a black head, and two hooks to the tail, or two ties.

Double *Crotchet*, *Fr.* a *croche*, or what we call a quaver, cut twice in abbreviation: dividing the crotchet into four semiquavers See Abbreviation.

Double *Dancette*, in *Heraldry*. See Dancette.

Double *Deficient* intervals, in *Music*, are such as are two major commas greater than a true consonance, as double deficient Third, Fifth, &c. which see.

Double *Descant*. See Descant.

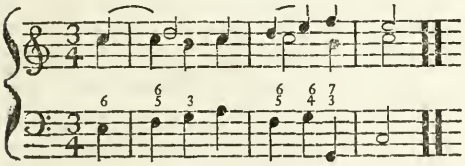
Double *Horizontal-dial*, one with a double gnomon, whereof one points out the hour on the outward circle, and the other shews the hour on the stereographic projection drawn upon it. This dial finds the meridian, hour, the sun's place, rising, setting, &c. and many other propositions of the globe. See Dial.

Double *Diesis*. See Diesis.

Double *Discords*, in counterpoint, must be doubly prepared and resolved.

Double *Eccentricity*. See Eccentricity.

Double *Emploi*, a name given by Rameau to two different ways of treating the chord of the $\frac{6}{5}$ to the fourth of the key, or as the French call it the *sous-dominant*; in the one the fifth is made a discord by the sixth, and resolved by descending one degree upon the third to the next base; in the other, the sixth is made a discord by the fifth, and is resolved by *ascending* one degree upon a sixth to the next base.



This generally precedes a close, when the $\frac{6}{4}$ are played instead of the $\frac{5}{4}$.

Double *Feast*. See Feast.

Double *Fever*. See Fever.

Double *Fiché*, or Double *Fichy*, in *Heraldry*. A cross is denominated double fiché, when the extremities are pointed at each angle; that is, when each extremity has two points; in contradistinction to fiché, where the extremity is sharpened away to one point.

Gibbon expresses it by an octagonal cross, the two points whereof at each extremity are parted inwards by a small space of a line; by which it is distinguished from the cross of Malta, the two points whereof proceed from a third point, or acute angle between them.

Double *Fine*. See Fine.

Double *Floor*, a floor constructed with one or more girders, with binding joists tenoned into the girders, and with bridging joists supported upon the binding joists.

Double *Fugue*, in *Music*, a fugue on two subjects, of which the second theme must have regular answers like the first. If these subjects or parts of them should reciprocally serve for accompaniments to each other, they would be more easily worked, and confusion avoided. The double fugue in Geminiani's sixth concerto, opera 111, and the double fugue in Handel's third lesson in F♯ minor, are admirable specimens of this kind of fugue. In this species of ingenuity, the subjects should come in, one after the other, and in notes of different lengths; as contrast in the subjects will render them more marked and distinct. With more parts more subjects might be introduced; but confusion is ever to be feared from a multitude of subjects: to treat them well is the utmost effect of the art. But these painful efforts are more calculated as exercises to try the strength of young students than masters. Rousseau compares them to the clogs and weight with which young horses are loaded to keep them within bounds.

Double *incision*, *grafting by*, in *Gardening*. See Engrafting.

Double *Island Point*, in *Geography*, a cape on the N.E. coast of New Holland, so called by Cook in 1770, because it looked like two small islands lying under the land; it may be known also by the white cliffs on the north side of it. S. lat. 25° 58′. W. long. 206° 48′.

Double *Leaf*, in *Botany*. See Twyblade.

Double *Letter*, in *Grammar*, a letter, which has the force and effect of two; as the Hebrew *Tsade*, which is equivalent to *T* and *S*; or the Greek ξ, or Latin *x*, &c.

These letters are evidently equal to two; when we pronounce the Latin *axis*, or the English *axillary*, we give the *x* the same sound, as if it were written with two *c c*, *accis*, *accillary*; or a *c* and *s*, *acsis*, *acsillary*. The Greeks have three, Z, Ξ, Ψ; the Latins only two, X and Z; and most of the modern languages have the same.

Double *Margin-door* is one constructed so as to represent a pair of folding doors when shut.

Double *Measure*. See Measure.

Double *Pedestal*. See Pedestal.

Double *Plea*, in *Law*, is where the defendant alleges for himself two several matters in bar of the action whereof either is sufficient to effect his desire, in debarring the plaintiff.

This is not admitted in common law; for which reason it is to be well observed, when a plea is double, and when not; for if a man alleges several matters, one not at all dependent on another, the plea is accounted double; but if they be mutually depending on each other, then it is accounted but single, and shall be allowed. (Kitch. 223.)

Where there are several inducements to a plea, they shall not make the plea double; and double pleas are allowable in assizes of novel disseisin, &c.; but not in other actions. (Jenk. Cent. 75.) By stat. 4 and 5 Ann. c. 16., a man, with leave of the court, may plead two or more distinct matters or single pleas; as in an action of assault and battery, these three, not guilty, *son assault demesne*, and the statute of limitations. See Plea and Pleading.

Double *Plough*. See Plough.

Double *Point*, in the *Higher Geometry*. When all the right lines tending the same way with the infinite leg of any curve, do cut it only in one point (as happens in the ordinates of the Cartesian and the cubical parabola,) and in the right lines which are parallel to the abscisses of hyperbolas, and parabolas, then you are to conceive that those right lines pass through two other points of the curve, placed, as it may be said, at an infinite distance. Which coincident intersection, whether it be a finite or an infinite distance, sir Isaac Newton calls the double point.

Double *Position*. See Position.

Double *Quarrel*, *Duplex querela*, in *Law*, a complaint made by a clerk, or other, to the archbishop of the province, against an inferior ordinary, for delaying or refusing justice in some ecclesiastical cause; as to give sentence, institute a clerk

clerk presented, or the like. Its denomination seems owing to this, that it is commonly made both against the judge and him at whose suit justice is denied or delayed.

Double *Ratio*, See Duple.

Double *Roads*. See Roads.

Double *Sharps*, in *Music*, marked ✕✕ or +, have the effect of rising a note two half tones; but according to Dr. Boyce's MSS. in the library of the Royal Institution, these half tones are not to be considered as strictly equal, but the double, or second sharp, as raising the note an *apotome* ($\frac{2048}{2187}$) higher than a single sharp had elevated it. Double-flats, marked ♭♭, or 𝄫, are likewise said to have the effect of adding an *apotome* to the flattening effect of a single flat. On the contrary, Mr. Maxwell makes a double sharp to have the effect of two single sharps in raising a note just two Semitones *medii*, which see.

Double *Star*, in *Astronomy*. Ever since the invention of telescopes, stars have been occasionally observed by different astronomers, which, though they appear single to the naked eye, yet when examined with a good telescope, are found to consist of two or more stars extremely near to each other.

But little notice had been taken of these objects, till Dr. Herschel directed the attention of astronomers by publishing his first catalogue of them in 1782 (Ph. Transf.), at the same time stating the probable advantages which he conceived astronomy might derive from a more attentive examination of these curious objects. In the Philosophical Transactions of 1785, Dr. Herschel published his second catalogue, and notwithstanding they are given in a very abridged form, and the words contracted and expressed by initials, yet it would occupy too much space for the limits of our work: we are therefore obliged to give it in a still farther abridged state, but arranged for the convenience of the practical astronomer in the order of the constellations.

These double stars have acquired additional interest from the great changes which have happened in them since they were first observed; a very full account of which may be found in the Transactions for 1803 and 1804.

It was by means of these objects, that Dr. Herschel proposed to determine the parallax of the fixed stars, by observing the variation in the very small angle subtended by them. We shall just explain the nature of this method, and refer to Parallax for a farther consideration of its merits and defects. Let x and y (*Plate* IX. *Astronomy, fig.* 67.) be two stars situated in a line with the earth at A, and perpendicular to the diameter A B of the earth's orbit, and when the earth is at B, observe the angle B x y. Let P = the angle A x B, or the annual parallax of x; p = the angle x B y found from observation. M and m the angles under which the diameters of x and y appear: and draw z x perpendicular to B x. Then p : P : : xz : A B : xy : A y : : (because M : m : : A y ∴ A x) M − m : M; hence $P = \frac{p \cdot M}{M - m}$ the parallax of x. If x be a star of the first magnitude, and y one of the third; and $p = 1''$, then $P = 1''\frac{1}{2}$, on these suppositions see the Philosophical Transactions, 1782.

The double stars seem, of all others, the best adapted to enable us to judge of the power and perfection of our telescopes. But even with the very best of Dr. Herschel's own construction, it requires a very great degree of attention to all the minute circumstances connected with distinctness of vision, to succeed in separating some of the most difficult of his catalogue, and some are so extremely close that it may be doubted if any other observer besides himself has ever seen them separated. But such changes have taken place in them, since the first publication of his catalogue, that many that he considered as most difficult, are now to be seen with much inferior instruments. γ Leonis for example may now be seen with any tolerable $3\frac{1}{2}$ feet achromatic telescope. ζ Herculis, on the contrary, has for some years ceased to appear as a double star. The best method of estimating the distance of their objects is in measures of their own apparent diameters, as estimated by the eye, which will be found in many cases much more exact than the best micrometer.

The following observations of Dr. Herschel, as given in the Transactions, will be found highly useful to those who are possessed of good instruments, and wish to examine these interesting objects.

When we increase the power, we lessen the light in the inverse ratio of the squares of the power. And telescopes will in general discover more small stars, the more light they collect. Yet with a power of 227, I cannot see the small star following δ Aquilæ, when, by the same telescope, it appears very plainly with the power of 460. Now in the latter case the power being more than double, the light is less than one fourth part of the former.

The experiment has been too often repeated to be doubtful, as has also been confirmed by others of nearly the same nature. For instance, the smallest of the two that accompany the star near *k* Aquilæ, the small star near μ Herculis, and the small star near α Lyræ, are invisible with my power of 227, and visible with the same aperture when the power is 460. Also the small star near Flamstead's 24 of Aquilæ, the smallest of two near σ Coronæ, the small star near the star south or ι Aquilæ, the small star near the second ο Persei, the small star near the star which accompanies Flamstead's 10th sub pede et scapula dextra Tauri, the small star near β Delphini, and the small star near the pole star, are all much brighter and stronger, and therefore much sooner seen with 460 than with 227.

As these are some of the finest, most minute, and most delicate objects of vision I ever beheld, I shall be happy to hear that my observations have been verified by other persons, which I make no doubt the curious in astronomy will soon undertake. I should observe, that since it requires no common stretch of power and distinctness to see these double stars, it will not be much amiss to go gradually through a few preparatory steps of vision, such as the following. When η Coronæ Borealis (one of the most minute double stars) is proposed to be viewed, let the telescope be some time before directed to α Geminorum, or if not in view to either of the following stars: ζ Aquarii, μ Draconis, ε Herculis, α Piscium, or the curious double star ε Lyræ. These should be kept in view a considerable time, that the eye may acquire the habit of seeing such objects well and distinctly. The observer may next proceed to ξ Ursæ majoris, and the beautiful treble star in the right fore foot of Monoceros, after these to *i* Bootis, which is a fine miniature of α Geminorum, to the star preceding α Orionis, and to *n* Orionis. By this time both the eye and the telescope will be prepared for a still finer picture, which is η Coronæ borealis. It will be in vain to attempt this latter if all the former, at least *i* Bootis, cannot be distinctly perceived to be fairly separated, because it is almost as fine a miniature of *i* Bootis, as that is of α Geminorum. If the observer has been successful in all these, he may at the same time try *h* Draconis, though I question if any power less than 4 or 500 will shew it to be double, but the former I have all seen very well with 227.

To try stars of unequal magnitude, they may be taken in some such order as the following: α Herculis, ω Aurigæ, δ Geminorum, κ Cygni, ι Persei, β Draconis, from these the observer may proceed to ε Bootis. Persons using $3\frac{1}{2}$ achromatic must not be disappointed if they cannot perceive the following stars to be double.

26	α Leonis
31	between 41 and 39 Lyncis of Flamstead
56	ζ Herculis
41	31 Draconis
44	4 Aquarii
46	13 Aquarii treble
47	29 Capricorni
75	26 Orionis
82	49 Serpentis
87	q Ophiuchi.

The foregoing remarks have suggested a method of seeing how far power and distinctness of our instruments will reach; I shall add the way of finding how much light we have. The observer may begin with the pole star and α Lyræ, then go to the star south of ε Aquilæ, the treble star near κ Aquilæ, and last of all to the star following ο Aquilæ. Now if his telescope has not a good deal of good distinct light, he will not be able to see the small stars that accompany them.

I have divided the double stars into several different classes. In the first I have placed all those which require indeed a very superior telescope, the utmost clearness of air, and every favourable circumstance to be seen at all, well enough to judge of them. They seem to me on that account to deserve a separate place, that an observer might not condemn his instrument or his eye, if he should not be successful in distinguishing them.

In the second class of double stars, I have put all those that are proper for estimation by the eye, or very delicate measures by the micrometer. To compare the distances with the apparent diameters, the power of the telescope should not be much less than 200, as they will otherwise be too close for the purpose. The instrument ought moreover to be as much as possible free from rays that surround a star, in common telescopes, and should give the apparent diameters of a double star, perfectly round and well defined, with a deep black division between them. It will be necessary here to take notice that the estimations, made with one telescope, cannot be applied to those made with another; nor can the estimations made with different powers, though with the same telescope, be applied to each other. Whatever may be the cause of the apparent diameters of the stars, they are certainly not of equal magnitude with the same powers in different telescopes, nor of proportional magnitudes with different powers in the same telescope.

In my instruments I have ever found less diameter in proportion the higher I was able to go in power; and never have I found so small a proportional diameter, as when I magnified 6450 times: therefore, if we would wish to compare any such observations together, with a view to see whether a change in the distance has taken place, it should be done with the very same telescope and power, even with the very same eye-glass or glasses; for others, though of equal power and goodness, would most probably give different proportional diameters of the stars.

In the third class, I have placed all those double stars, which are more than 5″ but less than 15″ asunder, and for that reason, if they should be used for observations on the parallax of the fixed stars, they ought not to be looked upon as quite free from the effects of refraction, &c. In the same manner that the stars of the first and second classes will serve to try the goodness of the most capital instruments, these will afford objects for telescopes of inferior power, such as magnify from 40 to 100 times. The observer may take them in this or the like order; ζ Ursæ majoris, γ Delphini, γ Arietis, π Bootis, γ Virginis, ι Cassiopeiæ, μ Cygni. And if he can see all these, he may pass over into the second class, and direct his instrument to some of those which were pointed out as objects for the very best telescopes, where, I suppose, he will soon find the want of superior power.

The fourth, fifth, and sixth classes contain double stars that are from 15″ to 30″, from 30″ to 1′, and from 1′ to 2′, or more asunder. Though these will hardly be of any service for the purpose of parallax, I thought it not amiss to give an account of such as I have observed; they may perhaps answer another very important end, which also requires a great deal of accuracy, though not quite so much as the investigation of the parallax of the fixed stars. I will just mention it, though foreign to my present purpose. Several stars of the first magnitude have already been observed, and others suspected to have a proper motion of their own, hence we may surmise that our sun, with all its planets and comets, may have a motion towards some particular part of the heavens, on account of a greater quantity of matter, collected in a number of stars, and their surrounding planets there situated, which may perhaps occasion a gravitation of our whole solar system towards it. If this surmise should have any foundation, it will shew itself in a series of some years, as from that motion will arise another kind of hitherto unknown parallax, the investigation of which may account for some part of the motions already observed in some of the principal stars: and for the purpose of determining the direction and quantity of such a motion, accurate observations of the distance of stars that were near enough to be measured with a micrometer, and a very high power of telescopes, may be of considerable use, as they will undoubtedly give us the relative places of those stars to a much greater degree of accuracy than can be had by transit instruments or sectors, and thereby much sooner enable us to discover the apparent change in their situation occasioned by this new kind of systematical parallax, if I may be allowed to use that expression, for signifying the change arising from the motion of the whole solar system.

Of the changes that have taken place in the relative situation of the double Stars.

For a more detailed account of these changes, the reader is referred to Dr. Herschel's papers in the Transactions of 1802, 1804. The following abridged account of them is taken from the Journals of the Royal Institution.

Doctor Herschel devotes this paper principally to the consideration of the second class of systems, into which he has divided the sidereal world. After cursorily remarking with respect to the solar system as a specimen of the first class, which among the insulated stars comprehends the sun, that the affections of the newly discovered celestial bodies extend our knowledge of the construction of this insulated system, which is best known to us, he proceeds to support, by the evidence of observation, the opinion which he has before advanced of the existence of binary sidereal combinations revolving round the common centre of gravity. Dr. Herschel first considers the apparent effect of the motion of either of the three bodies concerned, the two stars, and the sun with its attendant planets, and then states the arguments respecting the motions of a few only out of the fifty double stars, of which he has ascertained the revolutions. The first example is Castor, or Alpha Geminorum; here Dr. Herschel stops to shew how accurately the apparent diameter of a star, viewed with a constant magnifying, may be assumed as a measure of small angular distances, he found the ten different mirrors of seven feet focal length, exhibited no perceptible difference in this respect. In the case of Castor no change in the dis-

tance of the ſtars has been obſerved, but their angular ſituation appears to have varied ſomewhat more than 45°, ſince it was firſt obſerved by Dr. Bradley, in 1759, and they have been found by Dr. Herſchel in intermediate poſitions at intermediate times. Dr. Herſchel allows that it is barely poſſible that a ſeparate proper motion in each of the ſtars and in the ſun may have cauſed ſuch a change in the relative ſituation, but that the probability is very decidedly in favour of the exiſtence of a revolution. Its period muſt be a little more than 342 years, and its plane nearly perpendicular to the direction of the ſun The revolution of Gamma Leonis is ſuppoſed to be in a plane conſiderably inclined to the line in which we view it, and to be performed in about 1200 years. Both theſe revolutions are retrograde, that of Epſilon Bootis is direct, and is ſuppoſed to occupy 1681 years, the orbit being in an oblique poſition with reſpect to the ſun. In Zeta Herculis, Dr. Herſchel obſerved in 1802 the appearance of an occultation of the ſmaller ſtar by the larger one. In 1782, he had ſeen them ſeparate; the plane of revolution therefore muſt paſs nearly through the ſun, and this is all that can at preſent be determined reſpecting it. The ſtar of Delta Serpentis appears to perform a retrograde revolution in about 375 years, their apparent diameter is invariable as well as that of the two ſtars which conſtitute Gamma Virginis, the laſt double ſtar which Dr. Herſchel mentions in this place, and to which he attributes a periodical revolution of about 708 years.

Catalogue of Double Stars.

[v. very; poſ. poſition; N. f. North following; S. p. South preceding; S. ſmalleſt ſtar; L. largeſt ſtar; eq. equal.]

No. in Herſchel's Catalogue.		No. in Flamſteed.	Claſs.	Zone.	
					ANDROMEDÆ.
		α	V	62	v. un. 55″ 32‴, poſ. 10° 37′ S. p.
	foll. 24′ N. 33′	6	II	47	p. uneq. poſ. 34° 24′, N. p.
5		γ	III	48	v. uneq. 9″ 15‴, poſ. 10° 37′ N. f. beautiful object.
	pre. 23′ S. 12″	50	IV	49	p. uneq. 18″ 57″, poſ. 22° 23′ N. f.
		59	IV	51	uneq. 15″ 15‴, poſ. 55° 9′ N. f. a 3d ſtar in view.
	foll. 30′	47	I	53	p. uneq. poſ. 75° 30′ S. f.
17		π	V	57	v. v. uneq. 34″ 12‴
	foll. N. 8′	δ	V	60	eq. 45″ 1‴, poſ. 32° 34′ S. p.
					AQUARII.
38		24	IV	90	v. uneq. diſt. 25″
7		ζ	II	91	qu. 4″ 34‴, poſ. 71° 39′ N. f. with 227, 1¼ diameter, wit 460, 2 diameters.
		51	V	95	v. v. uneq. N. p. two ſtars in view.
44		4	I	96	v. un. v. minute, poſ. 81° 30′ N. p. almoſt in contact, a 3d ſtar (VI) diſt. 1′ with 460, al moſt ⅙ diam. of S.
		β	V	96	v. v. un. 33″ 16‴, poſ. 55° 48
90	near	β	I		v. uneq. poſ. 77° 36′ S. f. about 4½° from β towards γ.
	foll.	ε	I	98	v. un. poſ. 45° N. p.
12		φ	IV	102	uneq. 23″ 5‴
34		94	III	104	v. uneq. 13″ 45‴.
		τ	V	105	v. uneq. 36″. 47‴, poſ. 19° 54′ S. f.
24		α.4	II	100	uneq. with 227, 2 diameters.
46	near	ν	I	102	reble nearſt v. un. 62° N. p. fartheſt v. un. diſt. 1′ 24″. 36° N. f. about 1¾° foll. ν
50	near	λ	I		conſiderable ſtar v. un. poſ. 41° 12′ N. p.
					AQUILÆ.
	foll. 1′ S. 12′	ε	II	75	v. uneq. poſ. 16° N. p. a very ſmall ſtar.
32		11	III	7	v. v. uneq. 7″

No. in Herſchel's Catalogue.		No. in Flamſteed.	Claſs.	Zone.	
		π	I	78	. uneq. poſ. 34° 24′ S. f. nute and pretty.
28	foll.	ο	II	80	v. v. un. poſ. 36° 28′ N. requires a very powerful leſcope; according to H ſchel not viſible with 27 It has been ſeen with excellent achromatic with much lower power.
		α	VI	81	v. v. un. 2′ 23″ 18‴, poſ. 6 44′ N. p.
29	near	τ	II	83	v. v. un. poſ. 75° N. p.
	foll. 15″ S. 20′	η	II	89	l. uneq. poſ. 29° 3′ N. p.
14		24	I	90	v. v. un. poſ. 72° 0′ S. f good object for trying a leſcope; ſcarcely viſible w 227.
14		57	IV	98	un. 29″ 28‴, poſ. 81° 85′ S.
		20	V	99	v. un. 42″ 44‴
	prec.	δ	V	87	v. un. 30″
33	prec.	7	III	93	un. 11″ 35‴
13	near	37	I		treble, two neareſt v. un. th ſtar v. ſmall.
		h	V	94	un. 33″ 53‴
44		4	I	90	minu. v. un. poſ. 81° 30′ N.
91	prec.	γ	I	80	about ½ deg. n. pr. γ. in line par. to γ and ζ; of t that neareſt to γ: 227 ha ly viſible, with 460 bulous.
					ARIETIS.
5		33	IV	63	p. uneq. 25″ 32‴, poſ. 87°
		30	V	66	qual 31″ 6‴
12		λ	V	67	p. uneq 36″ 4[illegible]‴, poſ. 42° N
	prec.	6	I	68	v. uneq. poſ. 77° 24′ S. f.
9		γ	III	71	qual 10″ 10‴, poſ. 86° 5′ N. 2d rather largeſt.
64		π	I	73	v. v. uneq. treble poſ. 19° S. f. moſt diſt. 25″, all thr in a line, very off.
	3′ prec.	β	II	70	l. uneq. poſ. 23° 12′ N. p.

No. in Herfchel's Catalogue.		No. in Flamfteed.	Clafs.	Zone.	
					AURIGÆ.
2		41	III	41	v. uneq. 8″ 31‴, pof. 80° N. p. pretty.
		α	VI	44	v. v. un. 2′ 49″ 8‴, pof. 61° 23′. S. f.
		β	VI	45	v. v. un.
	foll.	52	IV	49	uneq. 24″ 53‴
	foll.	λ	V	50	v. uneq. 34″ 15‴, pof. 54° 6′ S. p.
21		τ	V	50	dift. 30″
		ν	V	50	v. v. un. 53″ 43‴, pof 61° 48′ S. p. fmall ftar not vifible at firft.
		59	IV	50	v. un. 23″ 50‴, pof. 50° 3′ S. p.
14		ω	II	52	v. un. pof. 82° 37′ N. p.
45	foll.	ω	I	51	un. pof. 47° 33′ S. p.
		θ	V	52	v. v. un. 35″ 18‴, pof. 16° N. p.
19	foll.	14	IV	57	v. un. 16″ 8‴, pof. 37° 38′ S. p.
	foll.	χ	I	57	v. un. pof. 23″ 57‴ N. f.
		26	III	59	v. un. 13″ 25‴, pof. 2° 26′ N. p.
22		λ	V	50	multip. two within 30″
					BOOTIS.
79		39	II	40	l. un. pof. 38° 21′ N. f. pretty
15		i	I	41	v. un. pof. 29° 54′ N. f. fine object to try a telefcope; miniature of α Gem. very beautiful.
1		ε	I	62	v. un. pof. 31° 34′ N. p. a v. beautiful object, with 227 ¾ diam. S.
11		κ	III	37	v. un. 12″ 30‴, pof. 30° S. p
		l	V	37	v. un. 37″ 33‴, pof. 52° 51′ N. f.
	foll.	e	I	67	treble
18		ξ	II	70	v. un. pof. 65° 53′ N. f.
8		π	III	72	p. un. 6″ 10‴, pof. 6° 22′ S. f.
		ζ	I	76	equal ext. difficult. This ftar was firft obferved to be double by Mr. Pond. The beft achromatic telefcope will but juft elongate the ftar. With a feven feet reflector, under favourable circumftances, they may be feparated
		15	II		
38	S. foll.	15	II	78	v. un. 5″ 10‴, pof. 83° 5′. S. p.
17		51	I	52	near μ. un. with 460 ¾ S.
					CAMELOPARDALI.
15			IV	5	32d Hevelii. un. 20″ 5‴
99	foll.	49	II	26	p. un. pof. 67° 15′ N. p.
	prec.	11	I or II	31	v. v. un. pof. 88° 33′ S. f.
	foll. lit-	29	IV	33	v. un. 22″ 26‴, pof. 47° 36′ S. f.
	tle S.	2	IV	36	p. un. 19″ 32‴, p f. 85° S. p.
53	prec.	12	II		v. v. un. pof. 18° 34′ S. f. 227, ftar with a tail, 932, plainly double

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					CANCRI.
30		57	I	58	p. un. pof. 68° 12′ N. p. beautiful
		48	IV	60	p. un. 29″ 54‴, pof. 39° 54′ N. p.
11		11	I	61	p. un. pof. 85° 10′ N. p.
		φ	II	62	uneq.
	foll.	μ	III	66	un. 8″ 50‴, pof. 65° 12′
24 } 19 }		ζ	I or III	71 {	treble 8″, pof. 88° N. f. difficult to be feen with 460 ¾ S
		θ	V	71	v. v. un. 44″ 52‴, pof. N. f.
		54	IV	73	uneq. 17″ 14‴, pof. 29° S. f.
					CANIS.
		π	V	110	treble; neareft v. un. farthefl v. v. un.
	foll. 2′ N. 28′ }	ξ	II	112	v. un. pof. 67° 36′ N. p.
					CANIS MINORIS.
23	foll.	α	I	84	moft minute uneq 27° 21′ S. f the 2d telefcope ftar following α; with 278 ½ S. beautiful object; clofer than n Corona
		14	VI	87	neareft v. v. un.
39	near	α	II		near Procyon. 2° S. f. in a line from λ Gem. through Procyon not vifible with 278, with 460 more than three diameters, pof. 54° 28′ S. f.
					CANUM VENATICORUM.
		2	III	48	v. un. 12″ 12‴, prof. 11° S. p.
17		12	IV	50	Cor. Caroli. v. un. 20″, pof 41° 47′ S. p.
					CAPRICORNI.
	foll.	7	II	100	p. un. pof. 61° 12′ N. p.
51		ϱ	II	108	v. un. pof. 84° S. f. treble VI. It is now of the firft clafs
		σ	V	109	v. un. 50″ 7‴, pof. 83° 12′ S. f.
		ο	IV	109	p. uneq. 23″ 30‴, pof. 30° 45′ S. f.
47 {	foll. prec. }	τ α	I	105	{ minute, un. 84° 48′ N. p. difficult.
3		ξ	IV		v. un. 25″
					CASIOSPEIÆ.
		47	V	13	50″ 58‴, pof. 3° 33′ N. p.
16		31	IV	22	20″ or more
4 & 34		55	I & III	24	treble v. un. neareft pof. 22° 30′ N. p. moft dift. 7″ 30‴, 10′ S. f.
		35	V	26	uneq. 42″ 35‴, pof. 85° 12′ N. f.
23		φ	III	32	v. v. un. 12″ or more.
	near	3	IV	32	v. un. 20″ or more.
39	foll.	τ	I	32	pof. 50° 42′ N. p. v. un. a pretty confiderable ftar.
5		σ	I	35	v. un. pof. 60° 28′ N. p.
	foll.	ζ	IV	37	v. v. un.

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	foll.	ξ	V	40	equal 43″ 26‴
		9	V	28	v. un. 52″ 39‴
3		η	III	33	v. un. 11″ 16‴, poſ. 27° 56′ N. f. beautiful.
18		α	V	34	v. v. un. 52″ 48‴, poſ. 40° 58′ N. p.
40	½° N. p.	25	I		v. un. poſ. 50° 30′ S. f.
39	prec.	β	I	32	v. un. poſ. 50° 42′ N. p.
					CENTAURI.
		k	III	121	p. un. 11″ 35‴, poſ. 22° S. f.
		η	V	124	p. un. 54″
					CEPHEI.
48	prec.	6	I		v. minute, poſ. 14° 9′ S. p. beautiful
70		K	III	12	v. un. 5″ 47‴ beautiful.
	foll.	16	IV	17	v. un. 28″ 5‴, poſ. 79° 18′ N. p.
6		β	III	20	v. un. 13″ 13‴, poſ. 15° 28′ S. p.
4		δ	V	32	un. 38″ 18‴
	prec.	η	IV	28	v. uneq. 19″ 32‴
16		ξ	II	26	fine 5″, poſ. 28° 18′ N. p.
31	near	δ	IV		treble diſt. neareſt 20″
49	1¼° N. f. λ	22	I		v. un. poſ. 85° 48′ N. f.
					COMÆ BERENICIS.
		e	V	62	p. uneq. 58″ 55‴, poſ. 77° S. f.
	foll.	22	V		l. uneq. 56″ 36‴
		2	II	67	p. uneq. poſ. 27° 42′ S. p.
		35	V		v. uneq. 31″ 17‴, poſ. 36° 51′ S. f.
27		24	IV	70	p. uneq. 18″ 24‴, poſ. 3° 28′ N. p.
					CORONÆ.
8		ζ	II	52	p. un. 5″ 28‴, poſ. 25° 51′ N. p.
16		η	I	58	v. minute, uneq. poſ. 59° 19′ N. f. miniature of i Bootis. It appears to be now more difficult than when originally ſeen by Dr. H.
3			I	55	treble p. un. poſ. 77° 34′ N. p. 3° 24′ N. f. v. faint.
18			I		The ſmalleſt of two teleſcopic ſtars between θ and δ equal
					CORVI.
		8	IV	105	v. v. un. 23″ 30‴, poſ. 54° S. p.
					CETI.
56	2′ foll.	54	I	80	nearly equal, poſ. 87° 39′ N. f.
		26	IV	89	v. un. 17″ 2‴, poſ. 14° 36′ S. p.
		61	V	91	v. un. 37″ 43‴
25		66	IV	93	16″ 52‴
	foll.	12	IV	95	p. un. 18″ 35‴
		5	V	99	42″ 48‴
	prec.	5	V	99	19″ 6‴

No. in Herſchel's Catalogue.		No. in Flamſteed.	Claſs.	Zone.	
					CYGNI.
		c	V	39	nearly equal 30″
		c	V	40	v. uneq. 40″
97	foll. 9′	51	I	40	minute p. uneq. poſ. 46° 24′ N. f.
23		ω	IV	41	p. un. 30″ poſ. 7° 23′ N. p.
24		ω	IV	41	treble, all within 30″ v. un. poſ. brighteſt ſtar 44° 19′ N. p.
22		f	IV	43	v. v. un. 18″ 11‴
94		δ	I	45	v. uneq. poſ. 18° 21′ N. f.
	prec.	77	III	49	quadruple.
		76	V	50	uneq. 48″
	prec. 15′	σ	IV	51	v. v. uneq. 17″ 30‴, poſ. 28° 24′ N. p. a 3d in view.
39	N. f.	σ	IV	51	v. v. uneq. 18″, poſ. 30° 28′ S. f.
18		61	IV	52	p. uneq. 16″ 17‴, poſ. 36° 28′ N. f.
	foll.	τ	V	52	v. uneq. 44″
	prec. 9′	11	II	53	uneq. poſ. 29° 12′ N. f.
				54	Between 4 Cygni and b a double, quadruple III. ſextuple and treble I.
		69	V	54	treble v. un.
	prec. 12′	η	V	55	p. un. 35″ 1‴, poſ. 57° N. f. conſiderable ſtar.
11		χ	IV	56	v. un. 24″ 52‴
		49	II	58	v. un. poſ. 31° 48′ N. f.
25		k	II	60	v. v. un. poſ. 31° 3′ N. f. a neb. croſſes this ſtar.
	prec. 3′	ζ	II	60	treble, neareſt v. v. un. poſ. 40° N. p. 3d diſt. 1′
5		β	V	62	p. uneq. 39″ 32‴ beautiful.
15		μ	III	62	p. uneq. 6″ 55‴, poſ. 20° 15′ S. f.
	2′ foll.	β	II	62	v. uneq. poſ. 87° 48′ N. f.
15		Ψ	II	38	v. un. poſ. 82° 37′ N. p.
					DELPHINI.
10		γ	III	74	near equal 11″ 49‴, poſ. 4° 9′ N. p.
	prec.	γ	II	74	p. un. poſ. 78° 48′ N. p.
	foll.	ζ	IV	76	treble nearly equal, neareſt 21″ 3‴
35		β	IV	76	v. v. un. 25″ 54‴, poſ. 78° N. p. ſcarcely viſible with 227.
16	prec.	ε	III	79	l. un. diſt. 12° 5′, poſ. 9° 42′ S. p.
					DRACONIS.
41	¾° N.	31	I	17	v. minute, v. un. poſ. 84° 21′ N. p. cannot be ſeen but in favourable circumſtances.
		40	IV	10	20″ 39‴
	foll. 1′	29	I	15	v. minute, very difficult.
7		↓	IV	17	28″ 14‴ unequal.
8		ε	I	20	v. minute, difficult, 63° N. p. 227. ⅔ L, 932. 2 L, a fine lucid point.
19	near	h	I	24	a moſt minute double ſtar; 30°

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					S. p. extremely difficult, perhaps never ſeen out of Dr. Herſchel's garden; it is a ſmall teleſcopic ſtar following 24.
7		b	I	31	v. v. uneq. 77° 8′ N. f. a 3d ſtar near. minute, rather difficult, the ſmall ſtar a fine lucid point.
43	near. N.	48	I	32	v. uneq. v. minute, 88° 24′ N. p.
20		o	IV	30	v. un. 26″ 39‴, poſ. 90° N.
11		ν	V	34	54″ 48‴, poſ. 44° 19′ N. p.
		c	VI	34	a rich ſpot.
4		16	I	35	p. un. poſ. 24° S. f.
	between	β γ	I	38	p. un. poſ. 2° 24′ S. p.
13		μ	II	35	eq. poſ. 37° 38′ S. p. or N. f.
31		56	II	13	l. un. 5″ 7‴
					EQUILEI.
37		δ	IV	80	v. v. un. 19″ 32‴, poſ. 11° 39′ N. f.
62	prec. 1′	4	I	84	p. un. poſ. 35° 9′ S. p.
61	prec. 3′ N. 15′	1	I	86	minute, v. un. 18° 24′ N. p. pretty; difficult.
21		1	III	86	p. un. 9″ 22‴, poſ. 5° 39′ N, f. a 3d ſtar following
63	1° S.	γ	I		eq. poſ. 5° 57′ S. p.
					ERIDANI.
	foll. 12′	ξ	III	94	v. v. un. 15″ 21‴, poſ. 9° 18′ S. p. difficult.
	prec. 30′	ω	IV	95	v. un. 19″ 32‴, poſ. 31° 48′
	prec. 8′	55	III	99	p. un. 11″ 53‴, poſ. 16° 24′ S. p.
		55	III	99	l. un. 9″ 9‴. 44° 9′ N. p.
43		λ	IV	99	v. un.
	foll. 4′	49	II	89	v. un. poſ. 51° 36′ N. p.
36		32	II	93	v. un. 4″ 19‴, poſ. 73° 23′ N. p.
					GEMINORUM.
		π	IV	56	v. v. uneq. 21″ 31‴, other v. ſmall ſtars in view.
1		α	II	57	uneq. poſ. 32° 47′ N. p.
		15	V	69	32″ 39‴ v. un.
	prec.	r	III	69	l. un. 6″ 15‴, poſ. 43° 54′ N. f.
	foll.	f	II	71	v. un. poſ. 4° 9′ N. p.
		21	IV	72	l. un. 25″
28	30″ pre. N. 6′	γ	IV	73	un. 19″ 41‴, poſ. 57° S. p.
		54	IV	73	un. 17″ 14‴, poſ. 29° S. f.
27		δ	II	72	v. un. poſ. 85° 51′ S. p.
					HERCULIS.
		42	IV	40	v. un. 21″ 31‴, poſ. 3° 40′ S. f.
3		ρ	II	52	p. un. 2″ 58‴, poſ. 30° 21′ N. p.
		23	V	57	36″ 27‴
36		ζ	I	58	v. un. poſ. 20° 42′ N. p. fine. No longer viſible.

No. in Herſchel's Catalogue.		No. in Flamſtead.	Claſs.	Zone.	
42	Cloſe to	ν	IV	59	p. un. 18″ 19‴, poſ. 4° 58′ N. p.
79		46	I	61	v. v. un. poſ. 66° 36′ S. f. ſcarcely viſible; near 1 diam. L.
	near	63	III	62	v. un. 11″ 53‴ poſ. 47° 48′ N. f.
41		μ	IV	62	v. v. uneq. 18″. poſ. 30° S. p. ſmall ſtar ſcarcely viſible.
1		δ	V	64	v. v. un. 33″ 45‴, poſ. 72° 28′ S. f.
40	near	87	III	64	v. v. un. 10″ 20‴, poſ. 19° 37′ S. f.
			I	64	In the ſame zone following p. un. poſ. 79° N. p.
26		95	III	68	eq. 6″ 6‴, poſ. 4° 9′ S. p. or N. f.
19		γ	V	70	v. v. un. 41″ 49‴, poſ. 19° 30′ S. p.
	prec.	K	V	72	un. 37″ 59‴
8		K	V	72	un. 39″ 59‴, a 3d ſtar nearly poſ. 79° 37″ N. f.
	foll. 10′	49	IV	74	v. un. 21″ 3‴, poſ. 25° 3′ S. p.
	prec.	ω	II	75	v. un. poſ. 44° 45′ N. p.
2		α	II	75	v. un. 4″ 34‴, poſ. 30° 35′ S. f. beautiful.
	3′ prec.	41	V	83	p. un. 48″ 40‴, poſ. 19° 45′ N. p.
41		i	III	80	equal. 11″ 43‴, poſ. 88° 23′ N. p.
37	N. f. φ	11	I		v. un. poſ. 59° 48′ S. f.
					HYDRÆ.
	12′ prec.	ε	III	82	p. un. 12″ 30‴, poſ. 62° 48′ N. f.
	2′ foll.	δ	IV	83	p. un. 25″ 43‴, poſ. 59° 24′ N. f.
	1ʰ prec.	σ	II	85	v. v. un. poſ. 54° 28′. S. f.
		15	V	96	v. v. un. 43″ 2‴, poſ. 70° S. f.
		α	VI	87	treble.
		10	III	114	Hyd. contin. v. un. 11″ 17‴, poſ. 38° 15′ S. f.
		θ	V	86	v. v. un. 1′ ±, poſ. 75° S. f. not eaſily ſeen.
					HYDRÆ et CRATERIS.
	22′ foll.	ε	VI	99	v. un.
	1′ foll.	α	IV	101	v. v. un. 21″ 49‴, poſ. 36° 54′ N. p.
	3′ foll.	γ	IV	106	equal. 26″ 15‴
					LACERTÆ.
		16	IV	49	treble, a 4th and 5th ſtar in view
		12	VI	50	1′ 0″ 10‴
		8	IV	51	quadruple, 2 largeſt uneq. 17″ 14‴
		10	V	52	v. un. 52″ 34‴, poſ. 38° 45 N. f.
17		1	III	53	p. un. 13″ 43‴, poſ. 76° 16′ S. p.
					LEONIS.
30		54	III	64	p. un. 7″ 6‴, poſ. 9° 14′ S. f.
28		γ	I	69	p. un. poſ. 5° 25′ N. f. two ſtars prec. beautiful; it is now very eaſy to be ſeen, being more ſeparated, 1807.

No. in Herſchel's Catalogue.		No. in Flamſtead.	Claſs.	Zone.	
	2′ prec.	o	V	73	v. un. 37″ 15‴, poſ. 70° 48′ N. f.
		7	V	74	v. un. 42″ 25‴, poſ. 8° 36′ N. f.
		88	III	74	v. v. un. 14″ 38‴, poſ. 47° 33′ N. p.
		25	V	77	v. v. un. 52″ 46‴
28		b	V	79	v. un. 36″ 9‴, poſ. 12° 55′ N. f.
29	14ᵗ foll.	44	I	80	v. v. un. poſ. 26° 32′ N. f.
13		83	IV	85	l. un. 29″ 5‴, poſ. 54° 55′ S. f.
	2′ prec.	75	V	86	treble, neareſt v. un. 54″ 37‴ fartheſt ſmaller.
		57	V	88	v. un. 33″ 16‴
26		ω	I	80	v. min. one behind the other, poſ. 20° 54′ S. f., with 227, no ſuſpicion of its being double; with 932, not quite ſeparated.
27		90	I	72	treble, two neareſt very unequal, poſ. 61° 9′ S. p.
					LEONIS MINORIS.
		7	V	55	v. v. uneq. 58″ 18‴
					LEPORIS.
		i	III	102	v. v. un. 12″ 20‴, poſ. 89° 21′ N. p. diff.
					LIBRÆ.
27	near	ε	V	99	eq. 44″ 12‴, poſ. 40° 17′ S. f.
		18	IV	100	v. v. un. 17″ 59‴ poſ. 44° 45′ N. f.
	prec.	σ	V	104	v. un. 39″ 59‴
	prec.	28	V	107	p. un. 47″ 46‴
20, 21, & 33		ξ	III		double double, two firſt v. un. 6″ 23‴, poſ. 1° 25′ N. f., two laſt ſm. and obſcure.
					LYNCIS.
6 or 22		12	I	30	treble, curious, v. cloſe, 88° 37′ S. p. moſt diſt. 9″ 23‴
	foll.	24	V	30	uneq. 30″ 40‴
	12′ foll. S. 23′	9	II	33	pretty eq. poſ. 11° 0′ S. p.
		19	III	34	uneq. 14″ 11‴, poſ. 46° 54′ S. p.
9		38	I	39	v. un., poſ. 25° 51′ S. p. a very fine object.
	1′ foll.	41	IV	43	v. v. un. 15″ 52‴, poſ. 50° 48′ N. p.
	1′ prec.	43	IV	49	un. 24″ 53‴
32	45″ S. prec.	44	I		v. un. poſ. 8° 27′ S. p.
					LYRÆ.
58	foll.	δ	I	53	v. v. un. poſ. 13° N. p. diff.
39		α	V	51	v. v. un. 37″ 13‴, poſ. 26° 46′ S. f.
	foll. 8′	α	III	51	v. v. uneq. 9″ 27‴, poſ. 66° 18′ N. f.

No. in Herſchel's Catalogue.		No. in Flamſtead.	Claſs.	Zone.	
2		η	IV		p. un. 25″ 42‴, poſ. 31° 51′ S. p.
	v. near	η	V		un. 38″ 8‴, poſ. 26° 18′ N. f.
5, 6		4ᵉ	II	50	p. un. poſ. 56° N. f. in the ſame field, a beautiful object.
		5ᵉ	II		n. equal; poſ. 72° 57′ S. f.
	13′ foll.	do.	IV		v. v. un. 19″ 50‴
2		ζ	V	52	p. un. 41″ 38‴, poſ. 62° 18′
	v. near S. 3′	ε	II	52	treble.
		θ	VI		1′ 30″
	prec.	i	V	54	v. v. un. 45″ 42‴, another double ſtar a little S. very fain object.
3		β	V		quadruple and variable, diſt. o 1ſt and 2d 43″ 57‴, po 60° 28′ S. f.
		ιυ	V	57	treble.
60	foll.	λ	I	58	v. v. un. poſ. 16° 48″ N. p.
59	near β	18	I	54	l. un. poſ. 75° S. p. very fain
40		ν	V		treble, v. v. un. 56″ 47‴, po 28° 27′ S. f.
					MONOCEROTIS.
14	foll.	5	V	96	multiple.
43	do.	do.	III		v. v. un. poſ. 23° 39′ N. p.
10		11	I		treble, curious, firſt largerſt other two equal; two neare 11° 32′ S. f.
		10			a cluſter round.
44		8	III	85	p. uneq. 12″ 30‴, poſ. 60° 1 N. f.
		12		84	a fine cluſter round it.
		15	III	79	in a cluſter of 30 p. large ſta
	9′ foll.	8	III	85	v. v. un. poſ. 61° 57′ S. p.
	51′ prec.	4	III	101	eq. 11″ 44‴, R. A. 5ʰ 8′
	4′ prec.	σ	III	106	v v. un. 11″ 16‴, poſ. 22° 2 N. f.
					OPHIUCHI.
35		54	III	76	v. v. un. 8″
30		53	V	80	v. un. 32″ 21‴
23	near	11	II	84	p. un. poſ. 46° 24′ N. p.
87		q	I	86	v. minute, p. un. poſ. 2° 4 S. p. diſſ. requires 460.
		λ	I	87	v. un. poſ. 14° 30′ N. f. ver beautiful.
		19	IV	87	v. un. 20″ 27‴, poſ. 3° 9′ S.
32		61	IV	87	un. 19″ 4‴
		38	I	116	v. un. poſ. 60° 48′ N. p.
4		p	II	87	p. un. poſ. 9° 14′ S. p.
88	foll.	τ	I	98	un. 61° 36′ N. p. one behin the other, cloſeſt of all, hard ly ſuſpected with 460, r quires 932.
19		g	II		p. un. poſ. 82° 10′ S. p.
83		λ	I	87	v. un. poſ. 14° 30′ N. f. wit 932. ⅓ of S. a cloſe and beau tiful double ſtar.

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					ORIONIS.
	foll.	72	V	73	40″
	foll.	62	V	76	treble, un. 37″. fartheſt v. un.
	foll. 40′	μ	III		
20		52	I	83	uneq. poſ. 69° 41′ S. p. equal 18″
	6′ foll.	52	IV		
25		a	I	84	p. un. poſ. 52° 10′ S. p.
	foll.	76	II		uneq. poſ. 50° 51′ N. f. one foll. do. III.
		m	IV	86	p. un. 26″ 9‴, poſ. 59° 33′ N. f.
22		n	I		p. un. poſ. 61° 23′ N. f. pretty object, eaſily ſeen.
68	near	10	I	88	un. poſ. 84° 54′ S. f.
	foll. 4′	10	III		p. un. 13″ 40‴, poſ. 37° 3′ N. f.
		59	V		v. v. un. 37″ 15‴, poſ. 65° S. f. ſmall ſtar, ſcarcely viſible, not v. diff.
	foll.	31	V	91	v. un. 30″
	do.	do.	V		v. v. un. poſ. 13° 6′ S. p.
10 } 11 }		σ	II	92 {	double treble, or two ſets of treble ſtars, ſimilarly ſituated. pretty.
21		ζ	IV		v. un. 25″, poſ. 83° N. f.
26	near	c	II	94	in a cluſter, v. v. un. poſ. 26° 5′ N. f.
13 } 14 }		i	III	95 {	multiple, two ſets, double treble and treble.
25		τ	V	97	v. un. 30″
33		β	II	98	v. v. un. 6″ 27‴, poſ. 68° 12′ S. p. beſt with ſmall power.
	foll.	e	II		v. un. poſ. 52° 24′ S. f.
		λ	II	80	un. diſt. 5″ 20‴, poſ. 45° 28′ N. f.
1		θ	III	95	quadruple, v. un. teleſcopic trapezium in the nebula, two ſtars prec. diſt. 8″, ſouthern ſtars 12″, two foll. 15″, northern ſtars 20″
12		i	III	95	treble, diſt. of neareſt 12″ 5‴, poſ. 43° 51′ f. diſt. fartheſt 48″ 51‴, poſ. 11° 19′ S. f.
		δ	V	90	v. un. diſt. 52″, poſ. 88° 10′ N. p.
52	N. f.	25	I	88	v. un. poſ. 42° 48′ N. p.
53	10′ prec.	30	I	87	v. un. poſ. 43° 24′ N. f.
54	prec.	τ	I	97	v. un. poſ. 35° 42′ N. p.
57	prec.	70 } 67 }	I	74 {	multiple, in a nebulous ſpot, v. un. poſ. 19° 48′ S. f.
61	near	ω	II	86	treble, v. v. un. ſmall ſtars, mere points.
					PEGASI.
		33	V	70	p. un. diſt. 45″ 3‴, poſ. 89° 12′ N. f.
20		e	V	71	v. un. 37″ 5‴, poſ. 38° 19′ N. p.
	near	3	II	84	l. un. poſ. 88° 24′ N. p. 3 diam S.
					PERSEI.
4	Hevelii	v	IV	34	v. uneq. 26″, poſ. 20° 5′ N. p.

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		a	V	39	un. 50″
		8	III	41	v. v. un. 13″ 31‴, poſ. 20° N. p.
	prec.	e	III	49	v. un. 11″ 32‴
	near	9	IV	50	p. un. 21″ 59‴
22		ε	II	50	v. v. un. poſ. 81° 28″ S. f.
		p	III	52	v. v. uneq. 14″ 2‴, poſ. 30° 30′ S. f.
	2′ prec.	o	II	56	eq. poſ. 8° 24′ N. p.
39		o	III	56	v. v. un. 14″ 59‴, ſmall ſtar, ſcarcely viſible.
37 } 38 }	prec.	o	III	58	double double ſtar.
		ζ	VI	58	treble.
		χ		33	multiple, an aſtoniſhing number of ſmall ſtars.
					PISCIUM.
		i	II	63	equal, poſ. 30° 57′ N. p.
	1′ prec.	↓	IV	69	eq. 29″, poſ. 68° 21′
9		↓	IV	69	27″ 5‴, poſ. 80° S. f.
	prec.	103	IV	74	v. un. 15″ 49‴, poſ. 62° 15′ N. f.
	foll.	105	V	74	eq. 51″ 16″
		100	IV	78	p. uneq. 15″ 52‴, poſ. 5° N. f.
49	prec.	o	II	81	uneq. poſ. 59° 6′ N. p. third ſtar in view 1′ 45″
		35	III	82	p. un. 12″ 30‴, poſ. 58° 54′ S. f
50		38	II	82	p. un. poſ. 25° 3′ S. p.
		51	IV	84	v. un. 24″ 29‴, poſ. 0° 36′ N. f.
		77	IV	86	l. un. 29″ 37‴, poſ. 4° 48′ N. f.
12		α	II	88	p. un. 5″ 7‴, poſ. 67° 23′ N. p.
8		ζ	IV	83	p. un. 22″ 11‴, poſ. 22° 37′ N. f.
		σ	V		v. un. diſt. 48″, poſ. 15° 28′ N. p.
					SAGITTÆ.
30		ζ	II	71	v. un. 37″ 5‴, poſ. 34° 10′ N. p.
65	foll.	α	I	72	v. un 14° N. p. largeſt and moſt ſouthern of a cluſter.
32	foll.	3	II	73	5″ 3‴
	do.	do.	V	73	v. v. un. 32″ 48‴
		χ	IV	73	treble, 23″ 2‴
91	foll.	z	II	73	v. v. un. poſ. 74° 57′ N. f.
	do.	z	II	73	v. un. fartheſt v. v. un.
	foll.	y	V	74	p. un. 38″ 36‴
24		8	III	79	treble, two neareſt v. un. diſt. 11″ 8‴ diſt. fartheſt 1′ 7″
					SAGITTARII.
	2′ foll.	65	III	103	v. vn. 14″ 20‴, poſ. 73° 48′ N. f.
47	1′ foll.	τ cap.	I	105	minute un. poſ. 84° 48′ N. p. diff.
		μ	V		treble, diſt. neareſt 30″
					SCORPII.
7		β	III	109	v. un. 14″ 23‴, poſ. 64° 51′ N. f.
6		ν	V		v. un. diſt. 38″ 20‴, poſ. 69° 28′ N. p.

No. in Herſchel's Catalogue.		No. in Flamſteed.	Claſs.	Zone.	
					SERPENTIS.
82		49	I	75	uneq. poſ. 21° 33′ N.p. v. minute and beautiful.
	foll.	do.	II		v. v. un. poſ. 44° 45′ N. p.
	foll.	39	II	76	v. un. poſ. 53° 9′ S. f.
42		δ	I	78	p. un. poſ. 42° 48′ S. p. beautiful.
6		φ	IV	86	eq. 19″ 23‴
	9′ foll.	a	II	91	v. v. un. poſ. 46° 0′ N. p.
12		d	I	90	v. uneq. poſ. 44° 33′ N. p.
36		β	IV		v. un. 24″, poſ. 3° or 4° S. p.
29		ν	V	102	un. 35″
81	prec.	π	I	66	l. un. poſ. 49° 48′ S. p.
					TAURI.
13		φ	V	63	55″ 36‴
	2′ foll.	11	III	65	v. un. 13″ 37‴, poſ. 89° 51′ N. f.
		7	IV	66	v. un. 19″ 56‴, poſ. 23° 15′ N. f.
		o	V	68	v. v. un. 51″ 34‴, poſ. 77° 54′ S. p.
55	prec.	8	I	71	l. uneq. poſ. 82° 48′ S. f.
	foll.	do.	III	71	equal 7″ 10‴, poſ. 87° 15′
	prec. 1′ S. 10′	ε	II	71	v. v. un. poſ. 68° 42′ S. p.
	foll.	δ	IV	72	v. un. 10″ 31‴, poſ. 25° 45′ N. f.
		117	III		nearеq. 12″ 12‴, poſ. 52° 27′ S. f.
	foll.	137	I	75	p. un. poſ. 19° 48′ S. f. in a cluſter of 12 or more nebulous ſtars in finder.
	foll.	48	IV	79	v. v. un.
	7′ prec.	d	IV	80	v. un. 23″ 35‴, poſ. 61° 36′ S. f.
10		χ	IV	64	18″
	prec.	ζ	I	69	the corner of a rhomboid made of this and two more, poſ. 36° 24′ S. p.
		118	II	65	l. un. 4″ 41‴, poſ. 77° 15′
					TRIANGULI.
42	1′ foll.	δ	III	56	un. 6″ or 7″
40		a	IV	62	un. 17″ or 19‴ Between the triangle and neck of Taurus one of III. claſs, eq. 11″ 17‴

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21		c	I	66	v. un. 60″ N. p.
					VIRGINIS.
	foll. 2′	ξ	IV	80	un. 27″ 28‴, poſ. 56° 30′ S. f.
	10′ foll.	o	IV		v. un. 23″ 21‴, poſ. 15° 54′
		17	IV	83	p. un. 20″ 9‴, poſ. 58° 21′ N. p.
44		o	II	85	v. v. un. poſ. 29° 5′
	14′ foll.	108	I	88	equal poſ. 58° 24′ N. p.
18		γ	III	90	equal 7″ 10‴, poſ. 40° 44′ S. f.
	8′ prec.	38	III	92	un. 12″ 58‴, poſ. 79° N. p.
	prec.	45	V	93	v. un. 96″ 42‴
	do.	do.	II	93	v. v. un. poſ. 52° 24′ S. f.
	foll.	i	V	101	un. 41″ 58‴
45		54	II	107	l. un. poſ. 75° N. p.
80		81	I	96	eq. poſ. 41° 12′ N. f. or S. p.
					URSÆ.
		σ 2	II	22	v. un. 7″ 56‴, poſ. 13° N. p.
		87	III	24	v. un. 12″ 34‴, poſ. 87° 42′ N. p.
	prec.	72	IV	33	un. 19″. poſ. 10° 12′ N. f.
2		ζ	III	33	p. un. 14″ 30‴, poſ. 56° 46′ S. f.
73		21	II	35	v. un. poſ. 36° 45′ N. p.
	foll.	κ	I	42	poſ. 41° 21′ S. p. un.
72		65	I	42	v. v. un. poſ. 53° 45′ N. f. a third ſtar near, v. diff.
			III	43	AR 11ʰ 28ᵐ, PD 43° 33′ un. pretty.
2		ξ	I	57	un. poſ. 53° 47′ S. f. with 222⅔ diam. L, a pretty object, not very difficult.
29		h	IV	37	v. un. diſt. 19″ 14‴, poſ. 3° 14′ N. p.
		c	V	36	n. un. diſt. 48″ 59″, poſ. 80° 47′ S. p.
33	prec.	44	I		l. un. poſ. 2° 6′
					URSÆ MINORIS.
1		α	IV	1	v. v. un. 17″ 15″, poſ. 66° 42′ S. p.
		19	IV	13	26″ 24‴, poſ. 3° 12′ N. f.

DOUBLE *Superfluous*, or *redundant intervals*, in *Muſic*, are ſuch as are two major commas greater than a true conſonance, as double ſuperfluous THIRD, FIFTH, &c., which ſee.

DOUBLE *Tenaille*. See TENAILLE.

DOUBLE *Time*. See TIME.

DOUBLE *Tongue*, in *Botany*, a name ſometimes given to the butcher's broom. See RUSCUS.

DOUBLE *Tonguing*, on the *German Flute*, is articulating with the tip of the tongue and management of the breath every note of the moſt rapid diviſion. It was ſaid of Dothel Figlio, a celebrated performer on that inſtrument about the middle of the laſt century, that he ſlit his tongue in order to perform this feat better than his neighbours, as the tongues of parrots and magpies have been double pointed to help their articulation, and augment their mechanical prating powers.

DOUBLE *Truſſing*, pieces of wood bolted in pairs, one of a pair on each ſide of the principal rafters.

DOUBLE *Vault*. See VAULT.

DOUBLE *Veſſel*, in *Chemiſtry*, is when the neck of one bolt-head, or mattraſs, is put, and well luted, into the neck of another. Of theſe there are divers kinds and forms uſed in the circulation of ſpirits, in order to their being exalted and refined as high as can be. See CIRCULATION.

DOUBLE *Voucher, recovery with*. See RECOVERY.

DOUBLE *Wheeled Plough*. See PLOUGH.

DOUBLE *Winding Stairs*. See STAIRS.

DOUBLED *Column*. See COLUMN.

DOUBLER *of Electricity*, is an inſtrument capable of augmenting a very ſmall quantity of electricity ſo as render it more

more than sufficiently manifest by means of an electrometer, or even capable of affording sparks.

In the year 1787, the Rev. Abraham Bennet announced to the scientific world an ingenious contrivance of his, to which he gave the name of *a Doubler of Electricity*, and which he principally used for detecting very weak atmospherical electricities, in order to form, in an easier and more satisfactory manner, an electrico-meteorological diary. The description is contained in the second part of the 77th vol. of the Philosophical Transactions for the above-mentioned year, and is as follows:

"I place," Mr. Bennet says, "upon my electrometer (*viz.* the gold-leaf electrometer) a circular brass plate, three or four inches in diameter, polished and thinly varnished on the upper surface. On this I place another brass plate, of equal diameter, polished and varnished on both sides, with an insulating handle attached to one edge of it. A third plate is also provided, of equal diameter, polished and varnished on the under side, and with a perpendicular insulating handle from the centre of the upper side."

"The method of collecting electricity from the atmosphere, and continually doubling it as much as required, is as follows. If the weather be dry, I carry into the open air a lighted torch, not liable to be easily blown out, or a small lantern with a lighted candle in it, to the bottom of which is fixed, by means of a socket, an insulating handle of glass covered with sealing-wax; in the other hand is carried a coated phial; then elevating the flame a little higher than my head, I apply to it the knob of the phial, holding it in this situation about half a minute. Then returning into the house (where the above-described doubler is kept dry, by being placed on a table not far from the fire) I apply the knob of the phial to the under side of the first plate, which lies immediately upon the electrometer, and at the same time touching the second plate with a finger of the other hand, (see *Plate* III. *Electricity*, *fig.* 18.) Then laying aside the phial, I lift up the second plate by its insulating handle, and if the electricity be not now sensible by the electrometer, I place the third plate, by means of its insulating handle, upon the second plate thus elevated: then touching the third plate, by stretching a finger over the juncture of its insulating handle, and again withdrawing the finger (*fig.* 19.) I then again separate the third plate from the second. In this situation it will be apparent to electricians that two of the plates are of one kind of electricity, and nearly of equal quantity, and one only of the other. I then apply the third plate to touch the under surface of the first plate which remains on the electrometer, and at the same time covering the first plate with the second, (*fig.* 20.) I then touch the second plate by stretching a finger over the juncture of its insulating handle; and first taking away the third plate, and then withdrawing my finger from the second, and lifting it up from the first plate, the electricity becomes doubled. If by this first operation the quantity of electricity does not become sensible by the electrometer, I repeat the process to ten or twenty times, which, by doubling it every time, makes visible the smallest conceivable quantity of electricity, since at the twentieth operation it is augmented to above 500,000 times. And though in description the above process of doubling to twenty times may appear tedious, yet when the operator can perform it with sufficient readiness (which is soon acquired) it takes less time than 40 seconds."

"If it be required to produce sparks, the plates are to be placed upon an insulating stand, without an electrometer, and the process repeated as above till the sparks appear."

"The experiment which proves that the electricity is doubled by each operation is this. If the two slips of pendulous leaf-gold of the electrometer be made to diverge to a certain distance by the above process, that distance will be nearly doubled by repeating the operation. Another proof of this duplicate accumulation is, that, when the third plate is applied to the first, the divergency of the leaf-gold is apparently undiminished, though in this situation their electricity is diffused over double the quantity of surface."

"It is obvious that some caution is necessary in managing experiments of so much nicety, since, by the least friction of the hand on the varnished sides of the plates or insulating handles, or if the metallic side of one plate be accidentally rubbed against the varnished side of the other, some degree of electricity is produced, which, becoming sensible by the operation of doubling, may render the experiment equivocal."

"To obviate these inconveniences, I join a conducting handle, by means of an insulating nut, to each of the plates. This handle consists of turned unbaked mahogany, about three inches long, into one end of which is inserted a nut of baked wood, about half an inch long, covered with sealing-wax, upon the other end of which nut the brass socket of the plate is fixed; by this means it is not necessary to touch the sealing-wax of the insulating nut, but occasionally to stretch a finger over it to touch the plate, whilst the mahogany handle is held in the same hand."

"Having found, by repeated experiments, that two clean metallic plates, or two equally varnished plates, rubbed together, produce no electricity, I varnished the second plate on both sides, but more thinly than when one side only was varnished, and in some experiments used thimbles on the ends of the touching fingers. In this way the inconveniences of accidental friction were in some measure obviated, but much less than I first expected; for, notwithstanding the utmost care, electricity is produced without previous communication: therefore, in experiments requiring the electricity to be often doubled, its communication may yet be ascertained by applying it to the first and second plates alternately; so that positive electricity communicated to the first plate appears positive by the electrometer; but the same electricity, applied to the second plate whilst the first is touched, produces negative in the electrometer."

It appears from the last paragraph, that Mr. Bennet was sensible of his doubler being capable of shewing an electric power when no electricity had been communicated to it; yet he flattered himself that the instrument might be usefully employed for detecting very minute quantities of electricity, and such indeed as could not be perceived by means of any other instrument known at that time. The account of this instrument was no sooner read at the Royal Society, than the use of it was adopted by various able philosophers, and especially by Mr. Cavallo, who gave a full account of his experiments and observations relative to this instrument to the Royal Society. (See the Phil. Transf. for the year 1788, P. 1.) As these experiments and observations, besides a thorough examination of Mr. Bennet's doubler, explain several interesting particulars concerning the nature of similar instruments, as well as of the natural dispersion of the electric fluid, we shall now subjoin the account of the most useful part in Mr. Cavallo's own words.

"As soon," he says, "as I understood the principle of this contrivance, I hastened to construct such an apparatus, in order to try several experiments of a very delicate nature, especially on animal and vegetable bodies, which could not have been attempted before, for want of a method of ascertaining exceedingly small quantities of electricity; but after a great deal of trouble, and many experiments, I was at last forced to conclude, that the doubler of electricity is not an instrument to be depended upon, for this principal reason, *viz.* because it multiplies not only the electricity which is willingly

willingly communicated to it from the ſubſtance in queſtion; but it multiplies alſo that electricity which, in the courſe of the operation, is almoſt unavoidably produced by accidental friction, or that quantity of electricity, however ſmall it may be, which adheres to the plates in ſpite of every care and precaution."

"Having found, that with a doubler conſtructed in the above-deſcribed manner, after doubling 20 or 30 times, it always became ſtrongly electrified, though no electricity had been communicated to it before the operation, and though every endeavour of depriving it of any adhering electricity had been practiſed; I naturally attributed that electricity, which appeared after repeatedly doubling, to ſome friction given to the varniſh of the plates in the courſe of the operation. In order to avoid entirely this ſource of miſtake, or at leaſt of ſuſpicion, I conſtructed three plates without the leaſt varniſh, and which, of courſe, could not touch each other, but were to ſtand only within about one-eighth of an inch of each other. To effect this, each plate ſtood vertical, and was ſupported by two glaſs ſticks, which were covered with ſealing-wax. A B, *figs.* 21 and 22, is a wooden pedeſtal $7\frac{1}{4}$ inches long, $2\frac{1}{2}$ broad, and $1\frac{1}{4}$ inch thick; C and D are the two glaſs ſticks cemented into the ſtand or pedeſtal A B, and likewiſe into the piece of wood E, which is faſtened to the back of the plate. The plate itſelf is of ſtrong tin, and meaſures about eight inches in diameter. The ſtand A B projects very little before the plate, by which means, when two of thoſe plates are placed upon a table facing each other, the wooden ſtands ſtill prevent their coming into actual contact, as may be clearly perceived in *fig.* 23."

"I need not deſcribe the manner of doubling with thoſe plates, the operation being eſſentially the ſame as when the plates are conſtructed according to Mr. Bennet's original plan, excepting that inſtead of placing them one upon the other, mine are placed facing each other, and in performing the operation they are laid hold of by the wooden ſtand A B; ſo that no friction, &c. can take place."

"Having conſtructed thoſe plates, I thought that I might proceed to perform the intended experiments without any farther obſtruction; but in this I found myſelf quite miſtaken: for on trying to multiply with thoſe new plates, and when no electricity had been previouſly communicated to any of them, I found that after doubling 10 or 15, or at moſt, 20 times, they became ſo full of electricity as to afford even ſparks. All my endeavours to deprive them of electricity proved ineffectual. Neither expoſing them, and eſpecially their glaſs ſticks to the flame of burning paper, nor breathing upon them repeatedly, nor leaving them untouched for ſeveral days, and even for a whole month, during which time the plates remained connected with the ground by means of good conductors, nor any other precaution I could think of, was found capable of depriving them of every veſtige of electricity; ſo that they might ſhew none after doubling 10, or 15, or at moſt 20 times."

"The electricity produced by them was not always of the ſame ſort; for ſometimes it was negative for two or three days together; at other times it was poſitive for two or three days more; and it often changed in every operation. In ſhort, the electricity which was produced by the plates was of a fluctuating nature, even when, inſtead of touching the plates with the finger, they had been touched with a wire, which was connected with the ground, and which I managed by means of an inſulating handle."

"At laſt, after a great variety of experiments, which it is unneceſſary to deſcribe, I became fully convinced that thoſe plates did always retain a ſmall quantity of electricity, perhaps of that ſort with which they had been laſt electrified, and of which it was impoſſible to deprive them. The various quality of the electricity produced was owing to this, *viz.* that as one of thoſe plates was poſſeſſed of a ſmall quantity of poſitive electricity, and another was poſſeſſed of the negative electricity, that plate which happened to be the moſt powerful, occaſioned a contrary electricity in the other plate, and finally produced an accumulation of that particular ſort of electricity."

"As thoſe plates, after doubling only four or five times, ſhew no ſigns of electricity, none having been communicated to them before, I imagined that they might be uſeful ſo far only, *viz.* that when a ſmall quantity of electricity is communicated to any of them in the courſe of ſome experiment, one might double it with ſafety four or five times, which would even be of advantage in various caſes; but in this alſo my expectations were diſappointed. Having obſerved, after many experiments, that, *ceteris paribus*, when I began from a certain plate, for inſtance, A, the electricity which reſulted was generally poſitive; and when I began from another plate B, *viz.* conſidered this plate B as the firſt plate, the reſulting electricity was generally negative: I communicated ſome negative electricity to the plate A, with a view of deſtroying its inherent poſitive electricity. This plate A being now electrified negatively, but ſo weakly as juſt to affect an electrometer, I began doubling; but after having doubled three or four times, I found, by the help of an electrometer, that the communicated negative electricity in the plate was diminiſhed inſtead of being increaſed; ſo that ſometimes it vaniſhed entirely, though by continuing the operation it often began to increaſe again, after a certain period. This ſhews, that the quantity of electricity, which, however ſmall it may be, remains in a manner faſtened to the plates, will help either to increaſe or to diminiſh the accumulation of the communicated electricity, according as it happens to be of the ſame, or of a different nature."

"After all the above-mentioned experiments made with thoſe doubling-plates, we may come to the following concluſion, *viz.* that the invention of the doubler is very ingenious, but its uſe is by no means to be depended upon."

The obſtinate adheſion of electricity to the plates of the doubler, induced Mr. Cavallo to inquire into the electrical equilibrium of ſuch bodies as are ſaid not to be electrified, and from the experiments and computations, which are ſtated at large in the ſame above-mentioned paper, he was led to conclude, that, ſtrictly ſpeaking, every ſubſtance is always electrified; *viz.* that every ſubſtance, and even the various parts of the ſame body, are not exactly poſſeſſed of their proportionate ſhare of electric fluid; for though when much condenſed, the electric fluid eaſily paſſes from thoſe bodies which are overcharged to thoſe which are undercharged; yet when its denſity is inconſiderable, its paſſage from one body to another, or even from one part to another of the ſame body, is extremely difficult.

Mr. Bennet's original doubler not being eaſily managed on account of the three ſeparate plates, which was alſo the caſe with Mr. Cavallo's vertical plates, and the remarkable effect of the inſtrument ſtill appearing capable of uſe, ſeveral perſons endeavoured to ſimplify the conſtruction, and the management of it. A doubler was made with vertical plates, which ſtood upon an horizontal frame, and ſome of which moved backwards and forwards by means of a rack and pinion, which was moved by means of a handle; but a moſt excellent conſtruction was invented by Mr. Nicholſon, and is deſcribed in the ſecond part of the volume of the Phil. Tranſ. for the year 1788. He calls it "an inſtrument, which, by the turning of a winch, produces the two ſtates of electricity without friction or communication with the earth."

earth." But, in fact, it is a revolving doubler, in which Mr. Cavallo's improvement of placing the plates not in contact with each other, is adopted; and whose parts are disposed so as to effect the necessary communications without any farther interference of the operator, besides his merely turning a winch. The description of this curious machine is as follows:

Fig. 24, Mr. Nicholson says, represents the apparatus supported on a glass pillar 6½ inches long. It consists of the following parts. Two fixed plates of brass, A and C, are separately insulated and disposed in the same plane, so that a revolving plate B may pass very near them, without touching. Each of these plates is two inches in diameter; and they have adjusting pieces behind, which serve to place them accurately in the required position. D is a brass ball, likewise of two inches diameter, fixed on the extremity of an axis that carries the plate B. Besides the more essential purpose this ball is intended to answer, it is so loaded within on one side, that it serves as a counterpoise to the revolving plate, and enables the axis to remain at rest in any position. The other parts may be distinctly seen in *fig.* 25. The shaded parts represent metal, and the white represent varnished glass. O N is a brass axis, passing through the piece M, which last sustains the plates A and C. At one extremity is the ball D, already mentioned: and the other is prolonged by the addition of a glass stick, which sustains the handle L and the piece G H separately insulated. E, F, are pins rising out of the fixed plates A and C, at unequal distances from the axis. The cross-piece G H, and the piece K, lie in one plane, and have their ends armed with small pieces of harpsichord-wire, that they may perfectly touch the pins E, F, in certain points of the revolution. There is likewise a pin I, in the piece M, which intercepts a small wire proceeding from the revolving plate B.

"The touching wires are so adjusted, by bending, that when the revolving plate B is immediately opposite to the fixed plate A, the cross-piece G H connects the two fixed plates, at the same time that the wire and pin at I form a communication between the revolving plate and the ball. On the other hand, when the revolving plate is immediately opposite the fixed plate C, the ball becomes connected with this last plate, by the touching of the piece K against F; the two plates, A and B, having then no connection with any part of the apparatus. In every other position the three plates and the ball will be perfectly unconnected with each other."

"Mr. Cavallo's discovery, so well explained in the last Bakerian lecture, that the minute differences of electrization in bodies, whether occasioned by art or nature, cannot be completely destroyed in any definite time, may be applied to explain the action of the present instrument. When the plates A and B are opposite each other, the two fixed plates A and C may be considered as one mass; and the revolving plate B, together with the ball D, will constitute another mass. All the experiments yet made concur to prove, that these two masses will not possess the same electric state; but that with respect to each other, their electricities will be plus and minus. These states would be simple and without any compensation, if the masses were remote from each other; but as that is not the case, a part of the redundant electricity will take the form of a change in the opposed plates A and B. From other experiments I find that the effect of the compensation on plates opposed to each other, at the distance of one-fortieth part of an inch, is such that they require, to produce a given intensity, at least one hundred times the quantity of electricity that would have produced it in either, singly and apart. The redundant electricities in the masses under consideration will therefore be unequally distributed: the plate A will have about 99 parts, and the plate C one; and, for the same reason, the revolving plate B will have 99 parts of the opposite electricity, and the ball D one. The rotation, by destroying the contacts, preserves this unequal distribution, and carries B from A to C, at the same time that the tail K connects the ball with the plate C. In this situation, the electricity in B acts upon that in C, and produces the contrary state, by virtue of the communication between C and the ball; which last must therefore acquire an electricity of the same kind with that of the revolving plate. But the rotation again destroys the contact, and restores B to its first situation opposite A. Here, if we attend to the effect of the whole revolution, we shall find that the electric states of the respective masses have been greatly increased: for the 99 parts in A and in B remain, and the one part of electricity in C has been increased so as nearly to compensate 99 parts of the opposite electricity in the revolving plate B, while the communication produced an equal mutation in the electricity of the ball. A second rotation will, of course, produce a proportional augmentation of these increased quantities; and a continuance of turning will soon bring the intensities to their maximum, which is limited by an explosion between the plates."

"If one of the parts be connected with an electrometer, more especially that of Bennet, these effects will be very clearly seen. The spark is usually produced by a number of turns between 11 and 20; and the electrometer is sensibly acted upon by still fewer. When one of the parts is occasionally connected with the earth, or when the adjustment of the plates is altered, there are some variations in the effects, not difficult to be reduced to the general principles, but sufficiently curious to excite the meditations of persons he most experienced in this branch of natural philosophy."

"If the ball be connected with the lower part of Bennet's electrometer, and the plate A with the upper part, and any weak electricity be communicated to the electrometer, while the position of the apparatus is such that the cross-piece G H touches the two pins; a very few turns will render it perceptible. But here, as well as in the common doubler, the effect is rendered uncertain by the condition, that the communicated electricity must be strong enough to destroy and predominate over any other electricity the plates may possess. I scarcely need observe, that if this difficulty should be hereafter removed, the instrument will have great advantages as a multiplier of electricity in the facility of its use, the very speedy manner of its operation, and the unequivocal nature of its results."

If this remarkable machine be not useful for ascertaining any small quantities of electricity in various cases, surely it may be applied to other uses. Mr. Read of Knightsbridge, in his "Summary View of the spontaneous Electricity of the Earth and Atmosphere," says, "Query, would not a doubler of electricity, properly mounted with large brass plates, answer all the purposes of the most powerful electrical machines? I think I can conceive how it may be done. It will no doubt be difficult to make the revolving plate gradually recede in proportion as the charge advances."

It is remarkable that notwithstanding this hint, and the very promising appearance of success; no philosophical instrument-maker has, as yet, been induced to attempt the construction.

We shall, lastly, barely mention, that the doubler of electricity has likewise been constructed under other forms somewhat different from, but not superior to, the above. A contrivance has also been made for applying the doubler to the

the pendulum of a clock, *viz.* so that the bob of the pendulum rod of a clock, in the form of a flat plate, might, in the course of the vibrations, perform the office of the revolving plate of a doubler; but such construction would be capable of a very inconsiderable effect, at the same time that it would disturb the regular vibrations of the pendulum.

DOUBLES, in our *Statutes*, signify as much as letters patent, being a French word made of the Latin *diploma*. Anno 14 Hen. VI cap. 6.

DOUBLETS, among *Lapidaries*, denote crystals wrought into such a form, and so coloured, that the surfaces of two pieces thus coloured being laid together, might produce the same effect as if the whole substance of the crystal had been tinged. For this purpose, two plates of crystal must be cut in the manner of a brilliant, and fitted so exactly, that no division can appear when they are laid together. The upper part must be polished ready for setting, and then the colours may be put between them by the following process; take of Venice, or Cyprus turpentine, two scruples, and add to it one scruple of the grains of pure mastic powdered. Melt them together in a silver or brass spoon, ladle, or other vessel, and mix with them any of the coloured substance proposed, well powdered. Warm the doublets to the same degree of heat with the mixture, and paint the upper surface of the lower part, and put the upper one instantly upon it, pressing them evenly together. When the cement is quite cold, scrape the edges, and set the doublets be skilfully set, by carrying the mounting over the joint, so that the two pieces may be well secured from separating. The colour of the ruby may be imitated, by mixing a fourth part of carmine with fine crimson lake; the sapphire and amethyst may be counterfeited by mixing very bright Prussian blue, with a small quantity of crimson lake; the emerald may be imitated by distilled verdigrise, with a little powdered aloes; the garnet may be counterfeited by dragon's blood, the brightness of which may be improved by the addition of a small quantity of carmine; the yellow topazes may be imitated by mixing the powdered aloes with a little dragon's blood. Glass may be also prepared in the same manner.

Doublets may be easily distinguished, by holding them betwixt the eye and the light, in such position, that the light may pass through the upper part and corner of the stone; which will then shew such parts to be white, and that there is no colour in the body of the stone. Handmaid to the Arts, vol. ii. p. 328, &c.

DOUBLETTE, in *Music*, the principal, or octave stop in French organs.

DOUBLINGS, in *Heraldry*, the lining of robes, or mantles of state; or of the mantlings in atchievements.

Doubling, in a *Military Sense*, is the putting of two ranks, or files of soldiers, into one.

When the word of command is, "double your ranks," then the second, fourth, and sixth ranks are to march up into the first, third, and fifth; so that of six ranks they make but three, leaving double the interval there was between them before. But it is not so when they "double the half files," because then three ranks stand together, and the three others came up to double them; that is, the first, second, and third are doubled by the fourth, fifth, and sixth; or on the contrary.

"Double your files," directs each to march to that next to it on the right or left, according to the word of command; in which case the six ranks are turned into twelve, the men standing twelve deep; the distance between the files being now double of what it was before.

Doubling *a Cape or Point*, in *Navigation*, signifies the coming up with it, passing by it, and leaving it behind the ship.

The Portuguese pretend to be the first that ever doubled the Cape of Good Hope, under their admiral Vasquez de Gama; but we have accounts in history, particularly in Herodotus, of the Egyptians, Carthaginians, &c. having done the same long before them.

Doubling *nails*, among *Shipwrights* are the nails commonly used to fasten the lining of the gun-ports, &c.

Doubling-*upon*, in a *Naval Engagement*, is the art of inclosing any part of a hostile fleet between two fires, or of cannonading it on both sides. It is usually performed by the van or rear of that fleet which is superior in number taking the advantage of the wind; or of its situation, and tacking, or veering round the van or rear of the enemy, who are thereby exposed to great danger, and can scarcely avoid being thrown into a general confusion.

DOUBLON, Dubloon, a Spanish and Portuguese coin, being the double of a pistole. See Pistole and Coin.

There are also double dubloons formerly current among us for three pounds twelve shillings.

DOUBS, *the department of the*, in *Geography*, is the third department of the fourth, or eastern region of France. It derives its name from the river Doubs, by which it is nearly encircled, and was formerly part of the province of Franche Comté. Besançon is its chief place.

The department of the Doubs is bounded to the north by the department of the Upper Rhine; to the east, and south-east, by the Helvetian republic; to the south-west, by the department of the Jura, and to the north-west, by that of the Upper Saône. Its principal rivers are the Doubs, the Louve, the Oignon, and the Dessouvre. The surface is diversified by hills and plains, which produce wheat, oats, and wine. Towards Switzerland it is bounded by lofty mountains, covered with a few dwarf trees, and yielding but a very scanty pasture. In the interior there are some fine extensive forests, iron and coal mines, quarries of marble, jasper, agate, and free stone, and abundance of turf. It has several extensive marshes, which want draining, chiefly near Besançon, Ruffey, Morteau, Pontarlier, and Saint Marie.

The territorial extent of the department of the Doubs is 1,040 381 arpens, or 5309½ square kiliometres, equal to about 251 square leagues. Its forests cover a surface of 244,864 arpens. Its population amounts to 227,075 individuals, or 908 inhabitants to the square league. It contributes annually to the expences of the state 1,886,833 livres, which averages 8 livres 31 centimes, or about 7 s. sterling, for each individual.

The department of the Doubs is divided into four districts, Besançon, Baume, St. Hypolite, and Pontarlier, 25 cantons and 605 communes. It has several manufactures, of which those of cast iron, hardware, pins, cutlery and watches are the principal. (Herbin. Statistique de la France.)

Doubs, *the*, is a river of France, which gives its name to the third of its eastern departments. It has its source in the mountains called Jura, near Mouthe, to the south of Pontarlier, flows round the Jura, divides the department to which it gives its name from the Helvetian republic, passes by Saint Hypolite and Montbeliars, runs to the west of Baumes, Besançon, and Dole, and after having taken up the Louve, falls into the Saône near Verdun, in the department of Saône and Loire. Its course is remarkable both for its singularity, and for its length, which is about 180 English miles, or more than 300 kiliometres. It abounds in fish, especially carp of an excellent kind.

The

The river Doubs is not navigable; but there are feveral projects to render it fo, and to form canals by which it is to communicate with the Rhine, the Saône, and the Rhône. It frequently overflows its banks.

DOUBTFUL Island, an ifland in the fouthern Pacific ocean, difcovered by M. Bougainville and feen by captain Cook, in his fecond voyage, Auguft 1773. S. lat. 17° 20′. W. long. 141° 38′.

Doubtful *Harbour*, a bay on the W. coaft of the fouthernmoft ifland of New Zealand, in the fouth Pacific ocean. S. lat. 45° 6′. W. long. 168° 5′.

DOUBTING, the act of with-holding a full affent from any propofition; on fufpicion, that we are not thoroughly apprifed of the merits thereof; or from our not being able peremptorily to decide between the reafons for, and againft it.

The Sceptics and Academies doubt of every thing; the character of their philofophy is, not to allow any thing for truth; but to with-hold the affent, and keep the mind free, and in fufpence. See Sceptics.

The Epicureans truft their fenfes, and doubt of their reafon; their leading principle is, that our fenfes always tell truth; that they are the firft and only criterions of truth; and that if you go ever fo little from them, you come within the proper province of doubting.

The Cartefians, on the contrary, of all things bid us doubt our fenfes; they are perpetually inculcating the deceitfulnefs of our fenfes; and tell us, that we are to doubt of every one of their reports, till they have been examined, and confirmed by reafon. See Cartesians.

Doubting, in *Rhetoric*, a figure wherein the orator appears fome time fluctuating, and undetermined what to do, or fay. See Aporia and Diaporesis.

Tacitus furnifhes us with an inftance of doubting, almoft to a degree of diftraction, in thofe words of Tiberius, written to the fenate: "Quid fcribam, P. S. aut quomodo fcribam, aut quid omnino non fcribam hoc tempore, dii me deæque pejus perdant quam perire quotidie fentio, fi fcio."

DOUBTLESS Bay, in *Geography*, a deep bay of New Zealand, 7 leagues to the weftward of the Cavalles iflands, running in to the land S.W. by W. and W.S.W.; the entrance being formed by two points, which lie W.N.W. and E.S.E.; 5 miles diftant from each other. S. lat. 34° 47′. W. long. 186° 21′.

DOUC, in *Zoology*. See Simia *Nemæus*.

DOUCETS, or Doulcets, among *Sportfmen*, denote the teftes of a deer or ftag. Dict. Ruft.

DOUCINE, in *Architecture*, a moulding, or ornament, on the highcft part of the corniche, in form of a wave, half convex, and half concave.

The doucine is the fame with a cymatium, or gula. See Cymatium, and Gula *recta*, and *inverfa*.

DOUDEVILLE, in *Geography*, a fmall town of France, in the department of the Lower Seine, chief place of a canton, in the diftrict of Yvetot; 27 miles N.W. of Rouen, and 12 miles S. of St. Valéry. The number of its inhabitants is 2929; thofe of the canton amount to 11,797, difperfed in 20 communes, on a territorial extent of 85 kiliometres.

DOUDYNS, or Dodvens, William, in *Biography*, a painter of hiftory, was born at the Hague in 1630; and having acquired a competent knowledge of drawing and defign from Alexander Petit, an inconfiderable artift, he went to Italy, purfuing the art of painting as an amufement more than as a profeffion, becaufe his family was very rich. But his attachment to it increafing, he at length made it his fole employment. Having fpent 12 years at Rome, he returned home, in compliance with the importunate wifhes of his family; was immediately employed in feveral grand works, and was appointed director of the academy in deference to his merit. His manner of defigning and compofing his fubjects was grand; and he was diftinguifhed by correctnefs of outline, and elegance of form. His draperies are well caft, broad, light, and natural, and his pencil is free and firm; fo that the beft judges confidered his pictures as the productions of an Italian invention, tafte, and defign. He died in 1697. Pilkington.

DOUE, or Doe, in Latin *Theotvaldum*, in *Geography*, an ancient but fmall town of France, in the department of Maine and Loire, chief place of a canton, in the diftrict of Saumur, with a population of 1805 individuals; 9 miles S.W. of Saumur, remarkable for the ruins of the palace of the ancient dukes of Aquitaine, for its beautiful fountains, and for a ftud lately eftablifhed by general Harville. Its canton contains an extent of 230 kiliometres, 18 communes, and 10 867 inhabitants.

DOVE, a river of England, in the county of Derby, which runs into the Trent near Burton.

Dove, *Cape*, a cape on the coaft of Nova Scotia. N. lat. 44° 20′. W. long. 64°.

Dove, in *Mythology*, was an object of reverence, and even of worfhip, in the Eaftern nations; and more efpecially in India, Arabia, Syria, and Affyria. This refpect fhewn to the dove, is traced by Bryant to the deluge; and to the dove which returned to Noah with a leaf of olive, whence it was inferred that the waters of the deep were affuaged. To this circumftance, as he conceives, it was owing that this bird was held in many nations as particularly facred. It was looked upon as the peculiar meffenger of the deity, and an emblem of peace and good fortune; whereas the raven, which difappointed the hopes repofed in him, and which never returned, was for the moft part efteemed a bird of ill omen. The name of the dove, fays this learned etymologift, among the ancient Amonians, was Iön and Iönah, fometimes expreffed Iönas, whence came the Οινας, Oinas, of the Greeks. It was efteemed an interpreter of the will of the gods to man; and, on that account, in the firft ages was looked upon as a bird of prefage. Among mariners it was thought to be particularly aufpicious; who, in their voyages, ufed to let a dove or pigeon fly from their fhips, in order to judge from its movements of the fuccefs of their voyage. The moft favourable feafon for fetting fail was at the heliacal rifing of the feven ftars, near the head of Taurus; and they, fays Bryant, are in confequence of it called Peleiades (Pleiades), or the doves. It was at the time of their appearance that the Argonauts were fuppofed to have fet out upon their expedition. (Theocrit. Idyll. 13. v. 25.) It was thought a fortunate time for navigation in general, as we learn from Ovid (Fefti, l. v. v. 65.) The Argonauts are faid, in a time of difficulty and danger, to have made the fame experiment with a dove, as was fuppofed to have been made by Deucalion, and to have formed from it the like fortunate prefage. (Apollon. Rhod. l. iii v. 328.) From the prophetic bird Iönah and Iönas, the Greeks formed many terms, which related to augury. As the dove was efteemed the interpreter of the will of the deity, the priefts and foothfayers were from that circumftance ftyled Iönah, or doves. And as Theba, in Egypt, was originally the temple of the ark, it is natural to look for priefts of this denomination in a fanctuary of that name. Some of thefe are fuppofed to have carried the rites of Theba, or the ark, to Libya, and others to Dodona in Epirus, where Deucalion was fuppofed

posed to have settled. See DODONA. The dove, under its ancient and true name, Iönah or Iönas, was almost universally received as a sacred emblem; for not only the Mizraim, and the rest of the line of Ham, so esteemed it, but it was admitted as an hieroglyphic among the Hebrews; and the mystic dove, says Bryant, was regarded as a symbol from the days of Noah, by all those who were of the church of God. The prophet who was sent upon an embassy to the Ninevites, is styled Iönas; a title probably bestowed upon him as a messenger of the deity. The great patriarch who preached righteousness to the antediluvians, is by Berosus and Abydenus styled Oan and Oannes, which is the same name as Ionah. The author of the Apocalypse is denominated in the like manner; whom the Greeks style Ἰωάνης, Ioannes. And when the great forerunner of our Saviour was to be named, his father industriously called him Ἰωάνης, for the same reason. John, continues our author, signifies a dove, and also means an oracular person, by whom the voice of the Most High is made known, and his will explained. The dove, it is said, was a truly sacred symbol, and so acknowledged in the times of the most pure worship. But the sons of Ham perverted that which was intended to be only typical, and carried their regard for it to a degree of idolatrous veneration. They inhabited the regions of Chaldæa and Babylonia, where they constituted the first kingdom upon earth, and whence we obtain the earliest account of those rites and mysteries, which prevailed in the Gentile world, in consequence of the deluge. The dove, or Iönah, was of course a favourite hieroglyphic among the Babylonians and Chaldæans; and from them it was transmitted to other nations. It was depicted on their military standard, when they went to war, and hence they seem to have been styled Iönim, or the children of the Dove, and their city Iönah. (See Jerem. xxv. 38. xlvi. 16. li. 16.) The Cuthites brought with them to Samaria the ensign of their country, and shewed a great veneration for the dove. Hence it was reported that the Samaritans worshipped a dove, and that they had a representation of it on mount Gerizim. (Bochart. vol. iii. c. 1. p. 6.) Hence originated a tradition, that the standard of Semiramis was a dove.

The dove with an olive branch was an emblem of peace; it was a token of the deity to man, assuring him of an evil being past and of future plenty and happiness. According to Bryant, Semiramis was an emblem under the figure of a dove, or pigeon; and not a real person. (See SEMIRAMIS.) Venus also, says this writer, was no other than this ancient Iönah; and accordingly we find in her history numberless circumstances relating to the Noachic dove and to the deluge. (See VENUS.) For other allusions we must refer to Bryant's Analysis of Anc. Myth. vol. i.

DOVE, in *Ornithology*. See COLUMBA.

DOVE, *ring*. See COLUMBA *Palumbus*.

DOVE, *turtle*. See COLUMBA *Turtur*.

DOVE, *sea turtle*, or *Greenland-dove*. See COLYMBUS *Grylle* and ALCA *Alce*.

DOVE, *order of the*, or of *the Holy Ghost*, an order instituted in Spain, according to some writers, in the year 1379, by John I. king of Castile, or, as others say, by his son Henry, in the year 1399; but whenever it was instituted, it soon fell into decay. The badge of the order was "a dove displayed argent, on rays of gold," pendant to a collar of two chains of gold.

DOVE *cots*. See PIGEON-*house*.

DOVE's *foot*, in *Botany*. See GERANIUM.

DOVE-*tail piles*, or *plank-piles*, in *Carpentry*, piles of wood with grooves in their sides to receive tongues or slips of wood after they are driven close together, to prevent water from passing. See *Plate* IV. *Canals*, *fig*. 30.

DOVE *tailing*, a method of toothing two pieces of wood together, by cutting the ends of both pieces into notches, so that the projecting parts of the one piece are adapted to the hollows of the other, and that the piece which contains the projecting parts can only be drawn in one direction out of the other, or that only one of the pieces can be drawn out.

Dove-tailing is of three kinds. The most common shews the ends of the teeth in the form of trapezoids, or in the form of the tail of a dove, whence the name dove-tailing seems to be derived. On the other side, which contains the angle, the teeth or projecting parts, or indeed the whole joinings, appear as rectangles. The second is called lap dove-tailing, which conceals the dove-tails, but shews a straight joint parallel to the angle, and a part of the thickness of the ends of one of the pieces. The third is called mitre dove-tailing; this not only conceals the dove-tails but the joint also, which is only in the angle of the two planes. The first kind is the strongest, but the last is the most beautiful. The first mode is employed in all work where strength is more regarded than beauty, and the last mode where beauty and strength are both necessary.

DOVEIN, in *Geography*, a town of Egypt; 7 miles S.S.E. of Siût.

DOVELLA, in *Ichthyology*, a name given by the Massilians to the fish called the donzellina by the Italians: it is the julis, or julis, of authors; and according to the Artedian system, it is a species of the labrus. That author distinguishes it by the name of the labrus of variegated colours, with two large teeth in the upper jaw. See LABRUS.

DOVER, in *Geography*, a sea-port, cinque-port, and market-town of Kent, England, is a place of considerable note in the historical annals of Great Britain. It is seated in a valley, nearly surrounded by lofty chalk hills, and is the nearest English sea-port to the coast of France, being only $7\frac{1}{2}$ English leagues from the shore of that empire. The port, castle, fortifications, and white-cliffs of Dover, are objects of much importance; have each afforded a theme for poetic and historic narrative; and will therefore demand from us a more circumstantial description than we usually appropriate to topographical articles. The contiguity of this place to the continent must have rendered it important as a port, or harbour, at the earliest period of commercial, or warlike intercourse between this island and the main land: but all attempts at identifying the time when, or persons by whom, the station was first occupied, must be nugatory. That the ancient Britons possessed it as a military post anterior to the Roman conquest is extremely probable: and that the Romans fortified and adapted it to their system of tactics is admitted by the most authentic and discriminating writers. Various relics and vestiges of this have been discovered here; some of which have remained till a late period. Mr. King, in his Munimenta Antiqua, vol. ii. repeats and sanctions the old tradition, that "Arviragus, the British chief, here fortified himself, when he refused to pay the tribute imposed by Julius Cæsar; and that here, afterwards, king Arthur also held his residence." Darrell, in his "History of Dover Castle," has given currency to another tradition, which assigns the foundation of this fortress to Cæsar himself: and Lambard quotes Lidgate and Rosse, as saying, that "they of the castle kept till this day certeine vessels of olde wine and salte, which they affirme, to be the remayne of suche provision as he" (Cæsar) "brought into it." From what we know, however, of Cæsar's operations in this country, as detailed in his own commentaries, the assumed fact

fact may be considered as wholly devoid of truth; though the ancient Pharos, which still remains on the upper part of the Castle hill, furnishes unquestionable evidence of Roman workmanship; and as the importance of this situation must have pointed it out as an object of primary regard, there is strong presumption that it must have been one of the first places fortified by the Romans. The outline of the Roman camp may yet be traced, which, in this instance, partook of a customary deviation, according to the nature of the ground, and had more of the oval in its figure than of the parallelogram. The form of the Roman Pharos is octagonal without, but square within: the sides of the internal square, and each side of the external octagon, being about fourteen of our feet, or about fourteen and half Roman feet, in dimensions: the thickness of the wall, in the lower part, is about ten feet. The foundations were laid in a bed of clay, notwithstanding it is built on a chalk rock; a circumstance that has also been observed in other Roman buildings. It has an arched door way, about six feet wide on the east side: on the other three sides of the internal square were Roman arches, and narrow spaces for windows, about thirteen feet and an half high, and nearly four feet wide: these have been much altered in subsequent ages, to convert them into loopholes. The old arches at the top of these recesses were turned with Roman tiles, and with pieces of stalactitical concretion cut wedge-shaped, about four times the thickness of the tiles, and placed alternately with them. The component parts of this Pharos plainly shew its age: for it is composed (in the usual Roman style) of long, thin, irregular bricks; but in the intermediate courses, both the facing, and great part of the interior substance of the wall, was filled up, not, as might have been expected, with flints and chalk-rubbish from the neighbouring country, but with masses of hard stalactitical incrustations, cut into blocks of various dimensions, that could not have been met with nearer than the more northern coasts on the east side of the island; and therefore could not have been obtained by any Roman commander prior to Agricola, who first circumnavigated Albion. Immediately contiguous to the Roman Pharos, are the ruins of an ancient church, which is generally stated to have been built by king Lucius in the second century. The roof is entirely destroyed, and the walls much dilapidated. Whatever may be the fact as to a Christian edifice having been founded here at that early period, the remains of the building are certainly of much later date; though, as in St. Martin's church at Canterbury, Roman tiles have been worked up in the walls, particularly of the tower. These remains, with the Pharos, and the foundations of a building, supposed to have been a Roman bath, which have been several times laid open in digging graves near the west end of St. Mary's church, are all the vestiges of Roman occupation that are now known in this town.

In the Itinerary of Antoninus, Dover is called *Ad Portum Dubris*. Lambard supposes its name to have been derived from the British *Dwfyrrba*, signifying a steep place; and Camden agrees with him in this derivation. The Saxons called it *Dorfa* and *Dofris*, which in the Domesday book is softened into *Dovere*. The third Iter of Antoninus proceeds immediately from London to this port, "a Londinio ad Portum Dubris;" mentioning only the intermediate stations of Rochester and Canterbury: the tract of the old road over Barham Downs can be easily traced. It is probable that the Roman town was on the south side of the river which flows through the valley into Dover harbour, and that the Watling-street, coming straight from Canterbury over Barham Downs, entered it where Biggin gate formerly stood.

The Saxons are stated, by Darell, to have made themselves masters of Dover at an early period; and soon after their conversion to Christianity, the ancient church within the walls of the castle is said to have been re-consecrated by St. Augustine, at the request of king Ethelbert, whose son and successor Eadbald founded a college near it for secular canons, under the government of a provost. In the reign of Edward the Confessor, and probably before, the great earl Goodwin was governor of Dover castle, and is recorded to have strengthened it by additional works.

The importance of this castle was so well known to William the Norman, that when he was contriving the conquest of England, he refused to permit earl Harold to depart from Rouen, 'till he had bound him by a solemn oath to deliver up after Edward's death, the *castle* of Dover, with the *well of water* in it.

From Domesday book we learn that "in the time of king Edward, Dovere paid 18*l.*, of which sum Edward had two parts, and the earl Goodwin the third part of one moiety, and the canons of St. Martin the other. The burgesses have furnished the king with twenty ships once in each year for fifteen days, and in each ship were twenty-one men; this they had done because he had freed them from sac and soc. When the king's messengers have come there, they have given for the passage of a horse, 3*d.* in winter and 2*d.* in summer; but the burgesses found a steersman, and one other assistant: if more were necessary, they were provided at the expence of the king. Whoever constantly resided in the town, and paid custom to the king, was quit of toll throughout England. All these customs were in use there when king William came into England. At his first coming, the town itself was burnt; and therefore the value of it, when the bishop of Baieux received it, could not be computed: now it is rated at 40*l.*, though the bailiff renders from thence 54*l.* In Dover are twenty mansions, of which the king has lost the custom."

At this period, and during several succeeding centuries, Dover castle was regarded as the "key and barrier of the whole kingdom." "Clavis et repagulum totius regni," are the words used by Matthew Paris; and the propriety of this description may be easily seen, when it is recollected, that in every civil broil the possession of this fortress was eagerly sought by the contending powers. Henry II., on his arrival from Normandy, re built the keep on the Norman plan, and otherwise fortified the castle, so that its strength was materially increased. Lewis, the dauphin, besieged it when he landed to assist the discontented barons; but was repulsed with great loss, by Hubert de Burgh, then governor, with a garrison of only 140 men.

Many alterations were made in the fortifications and apartments of the castle by different sovereigns, previous to the time of the civil war of the 17th century, when it was wrested from the king by a merchant named Drake, who was a zealous partizan for the parliament, and on the night of August 1, 1642, took it by surprize, with the aid of ten or twelve men only. By the means of ropes and scaling ladders, he contrived to lead his party to the top of the cliff on the sea-side, which being considered as inaccessible, was left unguarded. After the terrors of civil commotion had subsided, this strong pile was, for upwards of a century, left to moulder into ruins; though on one occasion, in 1745, barracks had been built here sufficiently large to contain a regiment of soldiers. The effects of the French revolution, however, and the many threats of invasion thrown out by the successive rulers of the French empire, have occasioned a vast alteration in the defences of this coast; and government has thought it adviseable to put Dover castle into a state of

sufficient

ſufficient ſtrength, to enable it to withſtand any attempt to carry it by coup-de-main, or any thing ſhort of a continued ſiege.

Dover caſtle, in its *preſent ſtate*, conſiſts of an immenſe congeries of almoſt every kind of fortification which the art of war has contrived to render a fortreſs impregnable; though its conſequence has been materially leſſened ſince the invention, and general uſe of cannon; the eminences to the north-weſt by weſt, and ſouth-weſt, being much higher than the ſite even of the keep itſelf. The buildings occupy nearly the whole ſummit of the high eminence which bounds the ſouth-eaſtern ſide of the deep valley in which Dover is built. In a general way, this caſtle may be deſcribed as conſiſting of two courts, a lower and an upper, defended by deep, broad, and dry ditches, from which communications with the inner towers have been made by well-like ſubterraneous paſſages. The lower court is ſurrounded by an irregular wall, excepting on the ſide next the ſea, where a conſiderable part of the cliff, with the remainder of the wall, was thrown down by an earthquake on the 6th of April, 1680. This wall is called the curtain, and is flanked, at unequal diſtances, by a variety of towers of different ſhapes, ſemi-circular, ſquare, polygonal, &c. Theſe are the workmanſhip of different ages: the oldeſt of them, which is on the eaſtern ſide of the caſtle, is ſaid to have been built by earl Goodwin, and ſtill bears his name; though this, as well as moſt of the others, have been much altered ſince their original erection. Nine of the other towers are ſtated to have been built in the Norman times, and to have derived their names from ſir John de Fiennes, and the eight approved warriors whom he had ſelected to aſſiſt in the defence of this fortreſs. Theſe towers, according to their relative ſituation on the wall, beginning from the cliff on the weſtern ſide, are, 1. The Old, or Canons' tower, which anciently had a drawbridge and battery: 2. A pentagonal tower, originally named after its firſt commander Albrancis, but afterwards Rokeſly tower, from one of its captains: 3. Chilham, or Calderſcot tower, built by Fulbert de Lucy, lord of the manor and caſtle of Chilham: 4. Hurſt: 5. Arſic, or Sayes: and, 6. Gatton towers. Theſe three were named after adjacent manors appropriated to their repairs: 7. Peveril, Beauchamp, or Marſhal's tower, ſo ſucceſſively called after William de Peveril and Hugh de Beauchamp, ancient commanders, and the marſhalmen who had the ſuperintendence of military ſtores, &c.: 8. Port, or Porth's tower, which took its name from William de Porth, and was alſo called Gaſtings, from one of its captains; but now bears the name of Mary's tower, from queen Mary, by whom it was re-built: 9. Fiennes tower, as it was originally named, after ſir John Fiennes, now more generally called New-gate, to diſtinguiſh it from the ancient entrance; and Conſtable's tower, from its having been the occaſional reſidence of the conſtable or governor of the caſtle: 10. Clopton's tower, built by Edward IV., and deriving its name from the lord of a manor aſſigned for its repair: 11. Godsfoe tower, ſo called from an ancient commander: 12. Crevequer's, Cravile's, or the earl of Norfolk's tower, a work of great magnificence, which has a ſubterraneous paſſage leading to a vault of vaſt extent, and ſtrongly defended: 13. Fitz-William, or St. John's tower, which derived its former name from Adam Fitz-William, to whom, for his valour at the battle of Haſtings, the conqueror gave the ſcarf from his own arm, and its latter name from lord St. John, who held the lands allotted to it: 14. Averanche's, or Maunſel's tower, a fine remain of Norman workmanſhip, ſo named from Averanche, an ancient commander of this caſtle, and his ſucceſſor Maunſel, who was lord warden of the cinque ports in the reign of Henry III.: 15. Veviile, or Pincetter tower, ſo called from two of its commanders, the latter of whom aſſiſted Hubert de Burgh in the defence of the caſtle againſt the Dauphin: 16. Earl Goodwin's tower, built by that nobleman when governor of the caſtle, in the time of Edward the Confeſſor.

The upper court of the caſtle is, like the lower one, ſurrounded by a ſtrong wall and various towers; and near the centre ſtands the ſpacious keep, erected in the beginning of Henry III.'s reign. This noble building is ſtill in fine preſervation, and is conſtructed on a ſimilar plan to thoſe built by biſhop Gundulph, and particularly to that at Rocheſter. It is now uſed as a magazine, the roof having been rendered bomb-proof for additional ſecurity. On the eaſtern ſide of this court are three towers, which derived their names from Gilbert de Maminot, or Mainmouth, who was one of the knights that accompanied the conqueror to England, and was appointed marſhal of this caſtle by John de Fiennes: theſe towers command the whole vallum and aſcent leading to the principal entrance to this court; near the ſouth angle of which is another entrance, by a gate called Palace, or Subterranean Gate. The new works recently formed for the defence of this important fortreſs conſiſt of different batteries, furniſhed with a very formidable train of artillery, caſemates dug in the ſolid chalk-rock, magazines, covered-ways, and various ſubterranean communications and apartments for ſoldiery: the latter are ſufficiently ſpacious for the accommodation of about two thouſand men, and, with their inhabitants, form a very curious ſpectacle: light and air are conveyed into them by well like apertures cut in the chalk, and by other openings in the face of the cliffs. A new road has alſo been made, under the direction of the Board of Ordnance, from the town to the top of the hill (where it unites with the Deal road) in a direction to be commanded by the batteries, the old road having become to hollow, as rather to protect than obſtruct the approaches of an enemy: a branch from this road turns to the right nearly oppoſite Gatton tower, and enters the caſtle by a new bridge and gate. Near the edge of the cliff ſtands a piece of braſs ordnance, twenty-four feet long, cast at Utrecht in 1544, and called Queen Elizabeth's Pocket Piſtol, it having been a preſent from the ſtates of Holland to that queen.

This fortreſs occupies about thirty-five acres of ground: the hill on which it ſtands is very ſteep and rugged on the ſide of the town and harbour; and towards the ſea it is a complete precipice of upwards of 350 feet from its baſe on the ſhore. Like other royal caſtles, it was formerly both extra-parochial and extra-judicial; but as ſeveral of the ancient franchiſes are either loſt or diſuſed, the civil power has of late years been exerciſed within its limits, independently of any controul from the lord warden. Since the re-commencement of hoſtilities, in 1803, the heights on the weſtern ſide of Dover have been ſtrongly fortified, agreeably to the modern ſyſtem, and a new military road leading to them made. The other fortifications are Archliff fort, at the extremity of the pier, and Amherſt battery, at the north Pier-head; theſe acting in conjunction with the heights and caſtle, entirely command the road to Dover. During the American war two other forts were erected; North's battery on the Rope Walk, and Townſend's battery on the ſouth Pier-head: theſe have been rendered uſeleſs by inroads of the ſea, and are now wholly decayed, except the guard houſes and magazines.

It is evinced by ſeveral concurrent circumſtances, that, in ancient times, the ſea flowed over the greateſt part of the valley in which Dover is now ſituated, and that the harbour was conſiderably more inland, towards the north-eaſt, than at preſent. At what particular era the ancient haven became

came uſeleſs is not exactly known. From the number of ſhips furniſhed by the burgeſſes of Dover for the king in Edward the Confeſſor's time, as we have already mentioned, it may be conjectured that the harbour was then flouriſhing. Of the preſent harbour, little is recorded till the time of Henry the VIIth, in whoſe fifteenth year, anno 1500, a round tower was built, on its ſouth-weſt ſide, to proteſt the ſhipping from the violence of the ſouth-weſt winds: to this tower the veſſels were moored by rings; and it is ſaid to have made that part of the haven ſo pleaſant, that it was called *Little Paradiſe*. Conſiderable ſums were alſo expended in this reign on other works; but it was at length found that nothing but the conſtruction of a pier could effectually benefit the harbour. Accordingly, in the next reign, a plan was laid down by ſir John Thompſon, who at that time held the living of St. James in this town, and this being approved by the king, was commenced in 1533, under the direction of Thompſon as chief ſurveyor. The pier was begun at Archcliff, on the ſouth-weſt ſide of the bay, and carried out directly caſtward into the ſea, to an extent of 131 rods. It was compoſed of two rows of main poſts, and large piles of about 26 feet long, ſhod with iron, and driven into the main chalk, and faſtened together by iron bolts and bands. The bottom was laid with vaſt ſtones, of twenty tons weight, brought from Folkſtone by water, on rafts ſupported by empty caſks; and the whole was filled up with beach-ſtones, chalk, &c. The king himſelf came ſeveral times to Dover, to view the works, and is ſtated by Harris (from the Dering Manuſcripts) to have expended about 80,000*l* on this pier; yet his abſence at the ſiege of Boulogne, and ſubſequent illneſs and death, prevented its completion. Slight attempts were made in the two following reigns to forward the work, but no effectual advance was made till the time of Elizabeth, to whom a memorial on the ſubject was preſented by ſir Walter Raleigh, who ſtated that "no promontory, town, or haven, in Chriſtendom, is ſo placed by nature and ſituation, both to gratify friends, and annoy enemies as this town of Dover." About this time, the immenſe quantity of beach thrown up by the ſea, had formed a bar acroſs the harbour which totally impeded the paſſage. Several projects were then formed to make a proper channel; and the queen granted the town the free exportation of 30,000 quarters of wheat, 10,000 quarters of barley, and 4000 tons of beer, in aid of the expence; and for the ſame purpoſe, in her twenty-third year, a duty of three-pence *per* ton was laid on every veſſel paſſing this port above twenty tons burthen: this duty produced about 1000*l*. annually. A commiſſion was then iſſued for the repairs and improvements of the harbour; and after ſeveral failures and alterations in the plan, a ſecure haven was at length conſtructed: and its preſervation and repairs have been provided for by ſeveral grants and acts of parliament in the ſeventeenth and eighteenth centuries. The harbour at the preſent time is in a reſpectable condition. Agreeably to the idea of captain Perry, in his report after a ſurvey in 1718, ſeveral jetties have been erected towards the eaſt, to prevent the encroachments of the ſea; and though the ſtrong ſouth-weſt winds ſtill throw up large quantities of beach at the mouth of the harbour, the ſluices have been ſo conſtructed, that, with the aid of the back-water, they generally clear it in one tide. Ships of 400 or 500 tons may now enter in ſafety; the depth at ſpring tides being between eighteen and twenty feet, and at neap tides about fourteen.

Dover was the firſt of the cinque ports incorporated by charter, which was granted by Edward I. who had a mint here; and who, by letters patent in the twenty-ſeventh of his reign, appointed "the table of the exchequer of money" to be held here, and at Yarmouth. Shortly before this, the greateſt part of the town had been burned by the French, though two cardinals from France were then in England to treat of peace. In the 17th of Edward II., as appears from the patent rolls of that year, Dover was divided into twenty-one wards, each of which was charged with one ſhip for the king's uſe, and on that account each had the privilege of a licenſed packet-boat, called a Paſſenger, to convey goods and paſſengers from this port to Whitſan in France, which was then a common place of embarkation to this country. In the 10th of Edward III., it was enacted that "all merchants, travellers, and pilgrims, going to the continent, ſhould not go from any other place than Dover;" and the price of conveyance, as regulated in the next reign, was, in ſummer, for a ſingle perſon *6d*. and for a horſe *1s*. *6d*.; and in winter, for a ſingle perſon *1s*. and for a horſe *2s*. It is probable that the above law for confining the intercourſe between England and the continent to this port, was not duly obſerved, as, in the 4th of Edward IV., another ſtatute was paſſed, ordaining that none ſhould take ſhipping for Calais but at Dover. This laſt act was repealed 21 James I. In the year 1665 the great plague, which made ſuch dreadful ravage in the metropolis, extended itſelf to this town, and carried off 900 of its inhabitants.

The ancient town of Dover was defended by a ſtrong embattled wall, which included a ſpace of about half a mile ſquare, and in which were ten gates; though not a trace of any now remains, except a part of Cow-gate. The form of the town is ſingular, and from the hills above, it has a moſt intereſting and romantic aſpect. It conſiſts of three long ſtreets, extending in contrary directions, to the eaſt, ſouth-weſt, and north, and meeting at one point in the centre. The town is now divided into the two pariſhes of St. Mary the Virgin, and St. James the Apoſtle: there were formerly ſix, each of which had its diſtinct church; four of theſe edifices have long been deſtroyed, with the exception of ſome parts of thoſe of St. Nicholas and St. Martin le Grand. The latter church was founded by king Withred in 691 for ſecular canons: theſe were ſuppreſſed by Henry I., at the inſtigation of archbiſhop Corboyl, who formed a deſign to replace them by a priory of canons regular, the buildings for which he begun, but dying before he completed them, they were finiſhed by his ſucceſſor, Theobald. Great part of the priory buildings ſtill remains: the gateway and refectory are nearly entire; and a portion of the church is yet ſtanding. This priory was, for a long period, called the Newark, to diſtinguiſh it from the ancient foundation from which it ſprung. On the left of the entrance to the town was a *maiſon dieu*, or hoſpital, built and endowed by Hubert de Burgh the great juſticiary of England, about the beginning of the reign of Henry III., who made conſiderable additions to the endowment. After the diſſolution, it was converted by queen Mary into an office for victualling the navy, to which uſe it is ſtill appropriated. In times of war, much buſineſs is done here, this being the only eſtabliſhed office between Portſmouth and Sheerneſs; and all ſhips in the Downs, belonging to the royal navy, are ſupplied hence by veſſels engaged for that purpoſe. They ſail from the Victualling quay, near the old dock, at the bottom of Snargate-ſtreet, where there are ſtorehouſes for the uſe of government, and whence all ſtores are ſhipped. The buildings of this office, though much altered and modernized, evince the maiſon dieu to have been an extenſive and ſpendid eſtabliſhment. Another hoſpital, connected with this town, though ſtanding in the adjoining pariſh of Buckland, was built for lepers at the joint expence of Henry II., and the monks of St. Martin's priory, to whom it was ſubject; not a veſtige of

of the building is now remaining, though an ancient fair is ſtill kept on the ſpot, on the anniverſary of St. Bartholomew, to whom the hoſpital was dedicated.

Of the two churches in this town, St. Mary's is the principal: this is a ſpacious and curious edifice, in length about 120 feet, in breadth 55, conſiſting of a nave and aiſles, with a tower at the weſt end. It is ſaid to have been built by the priory and convent of St. Martin, in the year 1216; yet, as the architecture of the tower, and part of the weſt end, is that of an earlier age, it ſeems probable that this was one of the three churches in Dover, which are recorded in Domeſday book as being ſubject to St. Martin, and of courſe its origin muſt have been prior to the date mentioned. The weſt front is of Norman architecture, as are alſo the three firſt arches and their ſupporting columns on each ſide of the nave. Among the numerous monuments in this church, the moſt obſervable is one to the memory of Philip Eaton, eſq., who died in January, 1769. Two years after the diſſolution, this church, which had previouſly belonged to the maiſon dieu, was given to the pariſhioners by Henry VIII., who was then at Dover; and every houſekeeper, paying ſcot and lot, has now a right to vote in the election of a miniſter. The other church, St. James's, is an irregular ſtructure, and its interior, which is kept particularly neat and clean, diſplays its origin to have been Norman: it has a ſquare tower at the weſt end.

Dover, in its preſent civil juriſdiction, is governed by a mayor, twelve jurats, and thirty-ſix common-councilmen; from the latter of whom a town clerk and chamberlain are annually choſen. The mayor is elected by the reſident freemen, in St. Mary's church, on the eighth of September, the nativity of the Virgin. The two members of parliament are alſo choſen in St. Mary's church by the whole body of freemen, reſident and non-reſident, in number about 1600. Freedom is acquired here by birth, ſervitude, marriage and burgage tenure: the franchiſe obtained by marriage ceaſes at the death of the wife, and that by tenure at the alienation of the freehold. The ancient charter of Dover was ſurrendered to Charles II., and in Auguſt 1684 a new one was granted, according to the general proviſions of which, though the charter itſelf is loſt, the town is now governed.

The trade of Dover is extenſive; and, in times of peace, the general buſineſs is particularly great, this being ſtill the principal place of embarkation for the continent. Previouſly to the preſent war, thirty veſſels, excluſive of packets, were employed in the paſſage to the oppoſite ſhores: they were about ſixty or ſeventy tons burthen each; were fitted up in an elegant manner; and were conſidered as the handſomeſt ſloops in the kingdom. With a favourable wind, they have frequently reached Calais in three hours: the ſhorteſt paſſage ever known was two hours and forty minutes. A "Fellowſhip of Trinity Pilots" was eſtabliſhed here in 1515, under the direction of the court of Load-manage, whoſe buſineſs was to pilot veſſels into the Thames. King William, in 1689, reſtored to the pilots their ancient right of chooſing a maſter and wardens from their own body; and appointed the lord warden and his deputy, the mayors of Dover and Sandwich, with the captains and lieutenants of Deal, Walmer, and Sandown caſtles, commiſſioners of load-manage. In 3 George I. the pilots obtained an act authorizing an eſtabliſhment of fifty pilots at Dover, fifty at Deal, and twenty in Thanet: ſince that time the mayor of Sandwich has loſt his commiſſion, but the other commiſſioners are the ſame as before. The inſtrument by which a pilot is admitted is called a branch, and the ſeal of the admiralty and chancery courts is affixed to it.

Various improvements have been made at Dover ſince the year 1778, when an act was obtained for the better paving, cleanſing, lighting, and watching the town: and duties of ſixpence in the pound on every houſe, a ſhilling on every chaldron of coals, and a toll on all carriages equal to that given by the turnpike act, payable at the gate on the London road, were granted to defray the neceſſary expences; the paving and lighting are, however, but very indifferent. The upper road to Folkſtone having become very dangerous from the falling of the cliffs, a new one was made a few years ago, paſſing through the valley by Maxwell and Farthingloe, and joining with the upper road about three miles from Dover. In 1784, an act was paſſed for the recovery of ſmall debts above 2*l.* and under 40*l.* in the liberties of Dover and Dover caſtle, and fourteen adjacent pariſhes.

Dover is ſituated 72 miles E.S.E. from London; has markets on Wedneſday and Saturday; and an annual fair, which continues three market days, and appears to have been originally granted to king Widred's foundation. The inhabitants of the two pariſhes, as returned under the late act, amounted to 7084, the number of houſes to 1788. This return conveys but an imperfect idea of the population, as the number of inmates, who have not a fixed reſidence, is generally very great; and the whole, including the garriſon of Dover caſtle, and the heights, together with thoſe diſtricts compriſed under the liberties of Dover, may, with much probability, be fixed at from 18,000 to 20,000.

Dover has, of late years, and particularly in the bathing ſeaſon, become a favourite ſummer reſidence of many reſpectable families. The attractions are numerous, and the proſpects particularly intereſting. The broad beach lying at the embouchure of the valley, the romantic view of the cliffs and caſtle, the ſingular ſituation of the buildings, the entrance of the port terminated by an extenſive ſea-proſpect, with the French coaſt in the diſtance, and the many veſſels paſſing up and down the channel, combine from various points in the compoſition of a ſeries of views, which, for grandeur and impreſſive effect, are not to be equalled by any on the ſhores of Britain.

On the ſea beach, below the caſtle hill, is a very ſingular villa, belonging to the brave ſir William Sidney Smith, by whoſe father, the late captain Smith, who had been aid-de-camp to lord George Sackville, at the battle of Minden, it was erected. It is conſtructed of flints and chalk, and conſiſts of different low buildings, incloſing a ſmall court, and in its general aſpect reſembles a fort: the roofing is compoſed of inverted ſea-boats of the largeſt ſize, ſtrongly pitched.

On the top of the hill, on the weſt ſide of Dover caſtle, are remains of a circular camp, which has been ſurrounded by a ſingle ditch and rampart, both of which are ſtill very apparent; though the former is partly filled up, and the latter much broken: the road to Eaſt Langdon croſſes the centre of the area.

The bold and high cliff that breaſts the ſurge on the ſouth-weſt ſide of Dover-harbour, in front of the heights, bears the name of the immortal Shakeſpeare, whoſe ſublime deſcription of this ſpot is almoſt without parallel: and its appoſite character muſt juſtify us in quoting it on the preſent occaſion.

"There is a cliff whoſe high and bending head
Looks fearfully on the confined deep—
Here's the place:—how fearful
And dizzy 'tis to caſt one's eyes ſo low!
The crows and choughs that wing the midway air,
Show ſcarce ſo groſs as beetles:—half-way down
Hangs one that gathers ſamphire: dreadful trade!
Methinks

Methinks he seems no bigger than his head.
The fishermen that walk upon the beach,
Appear like mice; and yon tall anchoring bark,
Diminish'd to her cock; her cock, a buoy
Almost too small for sight. The murm'ring surge,
That on the unnumber'd idle pebble chafes,
Cannot be heard so high:—I'll look no more,
Lest my brain turn, and the deficient sight
Topple down headlong." King Lear, act IV.

Among the more distinguished natives of Dover, were Dr. White Kennet, bishop of Peterborough, of literary celebrity, who was born in August, 1660, and died in December, 1728:—and that illustrious statesman, Philip Yorke, earl of Hardwicke, who was born in December, 1690, and having acquired great eminence at the bar, and filled the important situation of solicitor and attorney-general, was appointed lord chief justice of the king's bench in 1733, and lord chancellor in 1736; the functions of which high station he exercised for twenty years with such undeviating fidelity and justice, that only three of his decrees were appealed from, and even those were affirmed by the house of lords: he resigned the great seal in November 1756, and died in March, 1764.

On the high ground, about three miles south-west from Dover, are the remains of Bradsole, or St. Radigund's abbey, which was founded for Premonstratensian canons about the year 1191, but by whom is uncertain. The walls of the out-buildings, gardens, &c. include a considerable extent of ground: and the whole appears to have been surrounded by a broad ditch and rampart, inclosing an extensive circular area. Hasted's Kent. Darell's History of Dover Castle. King's Munimenta Antiqua. Beauties of England and Wales, vol. viii.

Dover, a township of America, in the state of Massachusetts and county of Norfolk, incorporated in the year 1650; containing 511 inhabitants, and lying 17 miles southward of Boston.—Also, a considerable post-town in Strafford county, New Hampshire, and the shire-town of the county; situated on the southern side of Cocheco river, about four miles above its junction with Salmon-fall river, which together form the Piscataqua; 12 miles N.W. by N. from Portsmouth. By the Indians it was called Winichaknaut Cocheco, and by the first settlers Northam. It was incorporated in 1633, and contains 2062 inhabitants. The public buildings are a congregational church, court-house, and gaol. At Dover is a high neck of land, between the main branch of Piscataqua and Black river, about two miles long and half a mile wide, rising gently along a fine road, and declining on each side like a ship's deck. It commands an extensive and variegated prospect of the rivers, bays, adjacent shores, and distant mountains, and has often been admired by travellers as an elegant situation for a city, and by military gentlemen for a fortress. The first settlers pitched here, but the trade has been long since removed to Cocheco falls; and this beautiful spot is almost deserted of inhabitants. N. lat. 43° 11'. W. long. 70° 50'.—Also, a township of Monmouth county, New Jersey, between Shrewsbury and New Stafford, and extending from the sea to the county line. It is a large township, but contains only 910 inhabitants, who mostly live upon the sea-shore. It has one church, erected by the benevolence of an individual, and open to ministers of all denominations.—Also, the metropolis, and a post-town of the state of Delaware and county of Kent, on the S. W. side of Jones creek, about 4½ miles from its mouth, in the Delaware; 12 miles from Duck creek, 48 from Wilmington, and 76 S.S.W. from Philadelphia. In contains 105 houses, distributed into four streets, which intersect one another at right angles in the centre of the town, and inclose a spacious parade, having on its east side an elegant state house. This town, which has a lively appearance, carries on a considerable trade with Philadelphia, chiefly in flour. N. lat. 39° 10'. W. long. 75° 34'.—Also, a town in York county, Pennsylvania, on Fox-run, which falls into Conewago-creek, near its mouth in the Susquehanna. It contains a German Lutheran and Calvinist church united, and about 40 houses. Morse.

Dover's *Powder*, in *Pharmacy*, *Pulvis Ipecacuanhæ Compositus*, *P. L.*, a most excellent medicine, which bears the name of the inventor, and is composed of one part of ipecacuanha, one part of opium, and eight parts of vitriolated tartar; the latter of which ingredients has probably no other use than to divide the two others, and to increase the bulk to a convenient form. In this excellent medicine the emetic property of the ipecacuanha is corrected by the opium, and the two united have a most powerful sudorific effect, which is, on the whole, more certain in its operation than any other medicine of this kind. The dose to an adult is from 15 to 20 or 25 grains, which is best given in the form of a bolus; and as, notwithstanding the opium, it produces some degree of nausea, nothing else should be taken into the stomach till about an hour afterwards. The Dover's powder is particularly used in those cases where a copious sweating is required, as in rheumatism. By repeating it about every six or eight hours the sudorific effect may be prolonged for many hours.

DOVERA, a town of Italy, in the duchy of Milan; 24 miles W. of Milan.

DOUGE, *The*, a small river of France, which has its source in the department of the Gers, flows by Baskele d'Armagnac, Roquefort de Marsan, Mont de Marsan, and Tartas, in the department of the Landes, where it discharges itself into the river Adour.

DOUGIELISKI, a town of Lithuania, in the palatinate of Wilna; 16 miles N.N.E. of Wilna.

DOUGLAS, Dr. John, in *Biography*, bishop of Salisbury, was born in Scotland, but removed, at an early age, to England for education, and entered a student at Baliol college, Oxford, where he took the degree of master of arts, in the autumn 1743. Soon after he had taken orders he was presented to the rectory of Eaton Constantine, in Shropshire, where he resided, commenced his literary career, and laid the foundation of his future advancement in his profession. Early in the year 1747, William Lauder, a Scotch schoolmaster, made a most flagitious attempt to subvert the reputation of Milton, by shewing that he was a mere copier, or translator of the works of others, and that he was indebted to some modern Latin poets for the plan, arrangement, &c. of his Paradise Lost. Many persons of considerable literary talents gave credit to the tale of Lauder, among whom was the celebrated Dr. Johnson, who, perhaps, was led away more by his prejudices than judgment. Mr. Douglas, however, examined the merits of the case, considered most accurately the evidence adduced by Lauder, and soon found that the whole was a most gross fabrication. He published a defence of Milton against Lauder, entitled, "Milton vindicated from the Charge of Plagiarism," &c. which appeared in the form of a letter addressed to the earl of Bath. Having justified the poet, he proceeded to charge the accuser with the most gross and manifest forgery, which he substantiated to the entire satisfaction of the public. The detection was indeed so clear and manifest that the criminal acknowledged his guilt. In 1754, Mr. Douglas published "The Criterion, or Miracles examined, &c." This was designed as a refutation of the specious objections of Mr. Hume and others to the reality of the miracles recorded in the

New Teſtament. The hiſtorian had maintained that there was as good evidence for the miracles ſaid to have taken place among the ancient heathens, and, in later times, in the church of Rome, as there was for thoſe recorded by the evangeliſts, and ſaid to have been performed by the power of Chriſt. Mr. Douglas, who had ſhewn himſelf an acute judge of the value of evidence, pointed out the diſtinction between the pretended and true miracles, to the honour of the Chriſtian religion. A new edition of this excellent work was lately publiſhed. In 1756, he undertook to ſhew that the hiſtory of the popes, by Bower, could not be depended upon, and that the author had ſhewn himſelf capable of much miſrepreſentation and falſehood, which he had indulged to ſecure the patronage of the proteſtants in this country. Theſe publications in the cauſe of literature and religion obtained for the author much and well merited reputation. Among thoſe who became his patrons was the earl of Bath, who, on his death in 1769, bequeathed to him his whole valuable library. In 1770 he went to Oxford, and took his degrees of B. D. and D. D. In 1762 he was made canon of Windſor, and in 1766 a canon of St. Paul's. After various other inſtances of preferment, he was made biſhop of Carliſle on the death of Dr. Law, and in 1791, on the removal of Dr. Barrington to Durham, he was tranſlated to Salſbury, and made chancellor of the order of the garter. On the return of the ſhips that had been ſent out on a voyage of diſcovery under captain Cook, he arranged and prepared for the preſs the journals and obſervations which had been made during the expedition, and to the whole he prefixed an elaborate and excellent introduction, in which he gives a ſuccinct view of the progreſs of maritime diſcovery down to the time of captain Cook, and points out the great benefits likely to reſult from the voyages of that navigator.

Dr. Douglas died at Windſor, May 13, 1807. He was unqueſtionably an enlightened ſcholar, and a warm friend to men of learning and genius, and his character ſtands very high for fidelity and a conſcientious diſcharge of the public duties of his ſtation, and for benignity and amiableneſs of temper and behaviour in the intercourſes of private life.

Douglas, Gawin, a Scotch prelate, diſtinguiſhed for poetical talents, third ſon of Archibald, earl of Angus, was born in 1474-5. Having received a liberal education in his own country, he went to Paris to finiſh his ſtudies. When he came back he entered into the church, and obtained ſome very valuable preferments. He was indeed nominated to the archbiſhopric of St. Andrew's; but a ſtrong oppoſition rendered the nomination of no effect; he, however, obtained, in its ſtead, the biſhopric of Dunkeld. The duties of this high office he performed with exemplary diligence; and was at the ſame time the promoter of many uſeful public works, and finiſhed a ſtone bridge over the river Tay, which had been begun by his predeceſſors. The biſhop, in order to avoid the diſorders which raged in Scotland, retired to England, and at that juncture war broke out between the two countries: he was accordingly repreſented by his enemies as a diſaffected perſon, and all his epiſcopal revenues were ſequeſtered. Having now no motive to return, he determined to remain in England, and king Henry VIII. granted him a penſion as a man of learning, and perhaps as a reward for his attachment to the Engliſh cauſe. He died of the plague at London, in 1521-22, and was buried in the Savoy church. The biſhop has been juſtly eſteemed as the improver of Scottiſh poetry. In early life he tranſlated Ovid, "De remedio Amoris;" but his principal work is a tranſlation of Virgil's Æneid into Scottiſh heroic verſe. According to Mr. Warton, this is the firſt metrical tranſlation of a claſſic in the language of Great Britain, unleſs one of Boethius be an exception. It was written in a few months about the year 1512, and is executed with ſpirit and fidelity. To each of the books is prefixed a prologue in verſe, of which ſeveral are highly poetical. Two of them, ſays his biographer, which deſcribe the month of May, and the winter ſeaſon, abound in lively and characteriſtic imagery. Biſhop Douglas likewiſe compoſed an original poem entitled "The Palace of Honour," which is a moral viſion in the manner of the table of Cebes, and an allegorical poem called "King Hart," firſt publiſhed in Pinkerton's ancient Scottiſh poems. The biſhop has ever been regarded as a man of a mild and temperate character, more attached to letters than to the turbulent politics of the time. Brit. Biog.

Douglas, James, M D. fellow of the Royal Society, and reader of anatomy to the company of Surgeons, was born in Scotland in 1675. After completing his education, he came to London, and applied himſelf diligently to the ſtudy of anatomy and ſurgery, which he both taught and practiſed ſeveral years with ſucceſs. Haller, who viſited him when he was in England, ſpeaks of him in high terms of approbation. He ſaw, he ſays, ſeveral of his anatomical preparations, made with great art, and ingenuity, to ſhew the motion of the joints, and the internal ſtructure of the bones. He was then meditating an extenſive anatomical work, which, however, he did not live to finiſh, and has not been ſince publiſhed.

When Mr., afterwards Dr. William Hunter, came to London, he called upon Dr. Douglas, to conſult with him on the method that would be moſt adviſeable for him to follow to improve himſelf in anatomy; Dr. Douglas took him into his houſe, to aſſiſt him in his diſſections, at the ſame time he gave him an opportunity of attending St. George's hoſpital. This was towards the end of the year 1741. The year following Dr. Douglas died. Beſides ſeveral communications to the Royal Society, which are publiſhed in their Tranſactions, containing the anatomy of the uterus, with the neighbouring veſſels, and ſome caſes in ſurgery, the doctor publiſhed, in 1707, "Myographiæ comparatæ ſpecimen," or a comparative deſcription of all the muſcles in a man, and in a quadruped (a dog), 12mo. It contains the moſt correct deſcription of the muſcles that had been ſeen to that time. "Bibliographiæ anatomicæ ſpecimen, ſeu catalogus pene omnium auctorum qui ab Hippocrate ad Harveium rem anatomicam illuſtrarunt." London, 1715, 8vo. It contains a tolerably correct account of all the books that had been written on the ſubject, with ſhort notices of the authors. An improved edition of this uſeful work was publiſhed at Leyden in 1734. "A deſcription of the peritoneum, and of that part of the membrana cellularis which lies on its outſide, &c." London, 1730. 4to. This is a very accurate and valuable work. "A hiſtory of the lateral operation for the ſtone," 1726, 8vo. republiſhed with an appendix in 1733. It contains a compariſon of the methods uſed by different lithotomiſts, particularly of that practiſed by Cheſelden.

Dr. Douglas collected, at a great expence, all the editions of Horace, which had been publiſhed from the year 1476 to the year 1739. Dr. Harwood, who mentions this circumſtance, in his view of the Greek and Roman claſſics, obſerves, that this one author, thus multiplied, muſt have conſtituted a very conſiderable library. A very accurate detail of thoſe different editions is prefixed to the firſt volume of Watſon's Horace. Haller Bib. Anat. et Chir. Gen. Biog.

Douglas, John, brother to James, ſurgeon to the Weſtminſter infirmary, was author of ſeveral controverſial pieces; in one of them, which he called "Remarks on a late pompous work,"

work," London, 1735, 8vo; he cenſures, with no ſmall degree of ſeverity, Cheſelden's anatomy of the bones; in another, ſome account of the ſtate of midwifery in London, publiſhed in 1736; he criticiſes with equal aſperity the works of Chamberlen and Chapman, on the ſubject of midwifery; and in a third he decries the new invented forceps of Dr. Smellie. He alſo wrote a work on the high operation for the ſtone, which he practiſed, a diſſertation on the venereal diſeaſe, publiſhed in 1737, and "An account of mortifications, and of the ſuprizing effects of the bark in putting a ſtop to their progreſs," London, 1729. The practice recommended in this little work is ſtill followed. Haller Bib. Ch. Eloy. Dict. Hiſt.

Douglas, in *Geography*, or, according to its ancient orthography, Duſglaſs is now the moſt extenſive and populous town in the Iſle of Man. This iſland is ſituated in the Iriſh ſea, between the counties of Down in Ireland and Cumberland in England. The town riſes in a triangular form from the ſouthern part of the bay, and commands a fine view of the neighbouring country, as well as a moſt extenſive proſpect of the ſea, and many parts of Cumberland and Lancaſhire. Scarcely a century paſt, it was little more than a group of clay-built huts, though it now enjoys the greateſt portion of the commerce of the iſle. The ſtreets are yet extremely irregular, many of the beſt houſes being environed with miſerable cottages. The reſidence of the duke of Athel, near the town, is a ſpacious and ſtately building: it was erected at a conſiderable expence, by a merchant, a ſhort time previous to the ſale of the iſland; but ſoon after that tranſaction, was ſold to the duke for 300*l.*, the general conſternation which then prevailed having excited an apprehenſion that all property was inſecure. The advance of Douglas to importance may be eſtimated by its convivial ſociety, aſſemblies, race courſe, and theatre: the latter was erected a few years ago by captain Teniſon, with the benevolent deſign of contributing to the relief of the poor. During the herring fiſhery, Douglas is a ſcene of general feſtivity. This ſeaſon is a jubilee for the fiſhermen when the Manks-man ſhakes off his wonted ſloth and melancholy, and aſſumes an air of gaiety and mirth. The day is paſſed in banquetting, and flowing cups go round; gladneſs ſmiles in every eye; the ſong echoes from every corner; and, not unfrequently, dances conclude the feſtivity of the night. In Douglas is a free-ſchool, and a ſmall chapel, dedicated to St. Matthew; and on an eminence weſt of the town, is St. George's chapel, a ſpacious and elegant modern building, with galleries and an handſome organ. This was propoſed to be erected by ſubſcription, and the funds were lodged in the hand of Dr. Maſon, late biſhop of the dioceſe; but the prelate dying inſolvent, the perſons employed in its conſtruction have never been paid. The town is in the pariſh of Kirk-Bradden: the parochial church is two miles diſtant, beautifully ſituated amidſt a group of aged trees. Douglas is 15 leagues from Whitehaven, and 24 from Liverpool: the number of houſes is about 900; the population nearly 3000, of which the labouring claſſes derive their chief ſubſiſtence from an extenſive linen manufactory, ſome tan-yards, ſnuff and tobacco factories, breweries, &c. The town is defended by a ſtrong fort, which renders it almoſt impregnable by ſea. In the vicinity was anciently a convent; the ruins of its chapel and monuments are ſtill remaining.

The *Bay of Douglas* is in the form of a creſcent, about three miles in extent from Clay-head to Douglas-promontory. The neighbouring high-lands render it an aſylum for veſſels from the tempeſts of the north-weſt and ſouth; but to the ſtorms of the eaſt it is much expoſed: both points preſent a dangerous and rocky ſhore. The bay is viſited by abundance of fiſh, particularly cod and ſalmon: the latter are ſmall but of extremely fine flavour. Gobbock, or dog-fiſh, are alſo found in great plenty, and are frequently eaten by the lower claſſes. At low water the bay is entirely dry, and is conſidered the beſt dry harbour in St. George's channel; its depth is ſufficient for veſſels of 500 tons. A very handſome new pier and lighthouſe (the ancient having been deſtroyed by a ſtorm in 1786) have been lately erected, at an expence of upwards of 20,000*l.* granted by government: the firſt ſtone was laid by the duke of Athol in 1793. The walks round the pier and bay are exceedingly pleaſant. Near the mouth of the harbour are the ruins of an old round tower, now uſed as a temporary priſon for criminals. Robertſon's Tour through the Iſle of Man. Felthem's Tour to the Iſle of Man. Beauties of England and Wales, vol. iii.

Douglas, a townſhip of America, the ſouthernmoſt in Worceſter county, Maſſachuſetts, having the ſtate of Rhode iſland on the ſouth, and that of Connecticut on the ſouth-weſt; and though it paſſes the middle road from Boſton to New York, it is very rocky, contains 1140 inhabitants, and lies 18 miles S. of Worceſter and 48 S. of Boſton. It was incorporated in 1746, and received its name in honour of William Douglas, M. D. of Boſton, a native of Scotland, and a conſiderable benefactor to the town.—Alſo, a townſhip in Montgomery county, Penſylvania, on the north ſide of the Schuylkill, and has 1297 inhabitants.—Alſo, a cape on the N. W. coaſt of North America, ſo called by Capt. Cook in his third voyage in 1778, in honour of Dr. Douglas, late biſhop of Saliſbury, and forming the weſt ſide of the entrance into Cook's river oppoſite to point Bede, which forms the eaſt ſide. This is a very lofty promontory, whoſe elevated ſummit formed two exceedingly high mountains, which appeared above the clouds. It is ſituated in N. lat. 58° 56′, and E. long. 206° 10′; ten leagues to the weſtward of "Barren iſles" in N. lat. 59°, and 12 from "Point Banks," in the direction of N. W. by W. ½ W. Between this point and cape Douglas, the coaſt ſeemed to form a large and deep bay, which, from ſome ſmoke that had been ſeen on Point Banks, obtained the name of "Smokey bay."

Douglas *River*, or *Arland River*, in Lancaſhire. This river is made navigable for barges from its afflux into the Ribble river at Haſketh to the Leeds and Liverpool canals at Briers Mill, and the ſame is now incorporated with that concern. See Canal.

DOUGLASSIA, in *Botany*, (in memory of James Douglas, M. D. author of a deſcription of the Guernſey Lily, and a hiſtory of the Coffee-tree,) Schreb. Gen. 809. Mart. Mill. Dict. v. 2. Aiouea; Aubl. Guian. v. 1. 310. t. 120. Juſſ. 80. Claſs and order, *Hexandria Monogynia*. Nat. Ord. *Lauri*. Juſſ.

Gen. Ch. *Cal.* Perianth of one leaf, turbinate, permanent, regular, with ſix ovate, acute, coloured ſegments. *Cor.* none, except, with Linnæus in *Laurus*, we reckon the calyx ſuch. *Nectaries* ſix, ovate, fringed at their baſe, alternate with the ſtamens. *Stam.* Filaments ſix, capillary, inſerted into the rim of the calyx, alternately with the nectaries, but oppoſite to the ſegments of the calyx, which rather exceed them in length; anthers vertical, elliptical, of two cells, burſting by two valves on their inſide which ſhrivel up and remain at the top; pollen large, yellow. *Piſt.* Germen ſuperior, ovate; ſtyle thread-ſhaped, the length of the ſtamens; ſtigma in ſix ſegments. *Peric.* Berry ovate, acute, of one cell. *Seed* ſolitary, with a brittle coat.

Eſſ. Ch. Calyx ſix-cleft. Nectaries ſix glands between the ſtamens. Anthers burſting by two valves. Berry ſuperior, with one ſeed.

The analogy of *Laurus*, near to which Juſſieu refers this genus,

genus, and a ſimilar ſtructure of anthers in *Epimedium* and *Leontice*, help us to underſtand its characters, which Aublet and Schreber have made more wonderful than nature will juſtify, the latter writer having taken the pollen for anthers, which led him to refer it to the claſs *Polyadelphia*.

1. D. *laurina* is the only ſpecies, (Aiouea guyanenſis; Aublet t. 120.) a native of the woods of Guiana, 30 miles from the ſea. It forms a ſmall tree; its *trunk* five feet high crowned with ſix, ſeven, or more *branches*. *Leaves* alternate, ſtalked, ever green, lanceolate, ſmooth, firm, entire. *Flowers* ſmall, yellowiſh, in axillary, red liſts, corymboſe panicles. *Berry* black, with viſcid pulp. *Seed* oily and aromatic. It flowers in October, and is called by the natives of the country *Aiouri*. The wood is white and compact. *Aubl.*

DOUGLEDY, or Dougledye, in *Geography*, a river of South Wales, which joins the Clethy, about three miles S. from Haverford-weſt, in the county of Pembroke. This river is navigable from Milford haven, at a place called Landſhipping, to the ſtone bridge of ſeveral ſmall arches, over the ſame in the town of Haverford-weſt, up to which place the tide flows. (See our article Canal.) Ships go no further up than Little-Milford and Frayſtrap, where they take in coals, brought in carts and waggons from the coal mines near thoſe places. Lime-ſtone and deals are among the principal imports by this navigation.

DOULA Bassendar, a town of Aſia, in the country of Kemaoon; 17 miles N. of Lucknow.

DOULAINCOURT, a town of France, in the department of the Upper Marne, and diſtrict of Joinville; 10 miles S. W. of Joinville.

DOULEIA, Δουλεια, among the Athenians, a kind of puniſhment, by which the criminal was reduced into the condition of a ſlave. It was never inflicted upon any but the ξενοι, *ſojourners*, and *freed ſervants*. Potter's Archæol. Græc. lib. i cap. 27. tom. i. p. 130.

DOULEVENT, in *Geography*, a ſmall town of France, in the department of the Upper Marne, chief place of a canton, in the diſtrict of Waſſy, with a population of 643 individuals. The canton has an extent of 247½ kiliometres, 19 communes, and 7798 inhabitants.

DOULLENS, Doulens, or *Dourlens*, a ſmall town of France, with an ancient caſtle on the river Authie, in the department of the Somme, 18 miles N. of Amiens, and 21 miles W. of Arras. It has a population of 2946 individuals, and is the chief place of a diſtrict, conſiſting of four cantons, 89 communes, 725 kiliometres in extent, and containing 45,627 inhabitants. Its chief manufactures are thoſe of linen cloth; its principal articles of trade are corn, cattle, hemp, and cyder.

As chief place of a diſtrict, Doullens has a ſub-prefect, a court of juſtice, a regiſter office, and a ranger. Its canton contains 12,786 inhabitants in 15 communes, on a territorial extent of 155 kiliometres.

DOULON, a river of France, which runs into the Alier, near Brioude.

DOUR, a town of France, in the department of Jemmape, chief place of a canton in the diſtrict of Mons, with 4290 inhabitants. The canton has an extent of 100 kiliometres, 17 communes, and a population of 14,148 individuals.

DOURDAN, a town of France, in the department of Seine and Oiſe on the river Orge, in the diſtrict of Etampes, 27 miles N. E. of Chartres, nine miles N. W. of Etampes, and 57 miles S. E of Paris. Its whole population amounts to 2870 individuals; but it is divided into two parts, each of which is the chief place of a canton. The northern part has 143 and its canton 11,540 inhabitants, diſperſed into 18 communes; the ſouth reckons alſo 1435, but its canton has only 8,944, inhabitants diſperſed in 23 communes. The territorial extent of both cantons is 552¾ kiliometres.

Pourdan has a very conſiderable manufacture of ſilk hoſiery. Its knitted ſilk ſtockings are of a ſuperior quality.

DOURGNE, a ſmall town of France, in the department of the Tarn, 18 miles S. E. of Lavaur. It is the chief place of a canton in the diſtrict of Caſtres. The number of its inhabitants is 1661, and of the canton 11,636. The latter live in 17 different communes, on a territorial extent of 212½ kiliometres.

DOURLACH. See Durlach.

DOURLENS. See Doullens.

DOURLERS, or Doulers, a town of France, in the department of the North and diſtrict of Avesnes; two leagues S. of Mauberge.

DOURO, a river of Spain, which ſprings near the ruins of ancient Numantia, the courſe of which may be computed at 350 geographical miles. See Duero.

DOUSA, Janus, in *Biography*, an intimate friend and zealous admirer of George Buchanan, was born at Noortwyck in Holland, in the year 1545, and, like Buchanan, was a poet and a ſtateſman. He enjoyed ſome of the higheſt civil offices which his country could beſtow; and having been appointed governor of Leyden, he defended it, during a memorable ſiege, with diſtinguiſhed bravery. He was one of the firſt curators of the univerſity founded in that city in 1575. He died in the year 1604, much lamented by the republic of letters. His moral character was blameleſs, and he held a very reſpectable ſtation among the ſcholars of that learned age. His merits are highly celebrated in the poems of Joſ. Scaliger, Grotius, Heinſius, and Baudius. His reading, according to Meurſius, was multifarious: his memory almoſt incredible. He was the Varro of Holland, and the common oracle of the univerſity; nor was he more conſpicuous for his learning than for his humanity, candour, urbanity, and modeſty. His amiable family was ſingularly attached to letters. Five of his ſons, *viz.* Janus, Franciſcus, George, Stephen, and Theodore, are well known as author's; and the Latin poems of the firſt, who died before he had completed his 26th year, have been preferred by Grotius to thoſe of his father. Irving's Memoirs of George Buchanan.

Douse, *To*, in *Sea Language*, is to lower ſuddenly, or ſlacken; and it is applied to a ſail in a ſquall of wind, an extended hawſer, &c.

DOUSES, or Locks, among *Miners*, are cavities or open places in a rock or vein, having their inſides lined with cryſtallized incruſtations; from locks it is that moſt of the beautiful ſpars of Derbyſhire are obtained. See Loch.

DOUTY's Falls, in *Geography*, ſituated in the county of York, and ſtate of Maine in North America, where a poſt-office is kept; 7 miles from Berwick, and 8 from Sanford; 563 N. from Waſhington.

DOUVAINE, a ſmall town of France, in the department of the Léman, chief place of a canton, in the diſtrict of Thonon; 9 miles S.W. of Thonon, 7 miles N. E. of Geneva, and 87 miles N.N.E. of Chambery. It has a population of 742 individuals. Its canton occupies a territorial extent of 117½ kiliometres, and contains 15 communes, with 6357 inhabitants.

DOUVEN, John Francis, in *Biography*, a painter of landſcapes, animals, portraits, and hiſtory, was born at Ruremonde, in 1656, and having received ſome inſtruction from Gabriel Lambertin, at Liege, and Chriſtopher Puitlink, owed his chief improvement to the collection of Don John de Velaſco for Charles II. king of Spain. At the court of

of Dusseldorp, to which he was invited, he was employed in painting portraits, and succeeded so well that he made this branch of the art an object of particular attention. At the age of 28 years he was appointed principal painter to that court. He afterwards attended the duke to Vienna; and he was likewise employed at the courts of Portugal, Denmark, Modena, and Tuscany. The pictures of this master are well coloured and well pencilled; and possess much force and spirit, with a striking likeness, and an amiable as well as majestic air. In the style of painting history in small, which he frequently practised, his composition is good, his design correct, and very much in the taste of the Italian school. He died in 1727. Pilkington.

DOUVRES, in *Geography*, a small town of France, in the department of Calvados, chief place of a canton, in the district of Caen, with a population of 2239 individuals. The canton contains 18 communes, and 13,783 inhabitants, on a territorial extent of 127½ kiliometres.

DOUW, Gerhard, in *Biography*, a painter of portraits, conversations, and subjects of fancy, was born at Leyden in 1613, and after receiving some previous instructions in drawing and design, he became, at the age of 15 years, a disciple of Rembrandt; from whom, in three years, he learned the true principles of colouring, and obtained a complete knowledge of the chiaro-scuro; adding to this knowledge a delicacy of pencil, and a patience in working up his colours to the highest degree of neatness, superior to any other master. His pictures are usually of a small size, with figures so exquisitely touched, and so wonderfully delicate, as to excite astonishment as well as pleasure. He designed every object after nature, so that it appears a just resemblance of nature itself, in colour, freshness, and force. In painting portraits he generally used a concave mirror, and sometimes looked at the object through a frame with many exact squares of fine silk. The pictures of Douw fetch at this day a very high price, not only in his own country, but even in Italy, and every part of Europe, where any attention is paid to the fine arts. His patience in finishing the most inconsiderable parts of his pictures was most astonishing. As an instance of this it is mentioned, that a broom in one of his pictures was particularly noticed and admired for its neatness; upon which he told them, that he proposed to spend three days more in working on that broom, before he should think it complete. In another picture he spent five days for finishing the hands of a lady that leaned on her arm chair. Persons of less patience than himself were indisposed to sit to him for their portraits, and, therefore, he chiefly indulged himself in works of fancy. It is said that his great patron, Mr. Spiering, allowed him 1000 guilders a year, as a compensation for the option of every picture painted by him, besides the full price at which it was rated. The colouring of Douw's pictures, possessing all the true and lovely tints of nature, without any seeming labour and stiffness, is much admired; his pictures are remarkable, not only for retaining their original lustre, but for having the same beautiful effect at a proper distance, as they bore when brought to the nearest view. The most capital picture of this master in Holland, 3 feet high by 2½ feet broad, represents two rooms with a variety of objects. At Turin are several of his pictures, particularly one of a doctor attending a sick woman, and surveying an urinal. In the gallery of Florence there is a night-piece by candle-light, exquisitely finished; and also a mountebank attended by a number of figures, which is admirable. Pilkington.

DOU-WAR, among the *Arabs*, a collection of tents, usually pitched in a circle, with their doors opening towards Mecca, which were the habitations of those Arabs, called *Bedoweens*, who were commonly the inhabitants of the plains; whereas the Kabyles usually live upon the mountains, in little villages called *daskrahs*, composed of mud-walled hovels. The tents of the Bedoweens are called *Hhymas*, from the shelter which they afford the inhabitants, and *bert el shar*, *i. e.* houses of hair, from the materials or webs of goats' hair, of which they are made. They are the same which the ancients called *Mapalia* (Liv. l. xxix. § 31. Tacit. Annal. l. iv. § 25.); and being then, as they are to this day, secured from the weather by a covering only of such hair-cloth, as our coal-sacks are usually made of, might very justly be described by Virgil to have (*rara tecta*) thin roofs. The colour of them is beautifully alluded to, (Cant. I. 5.) "I am black, but comely, like the tents of Kedar." For nothing can afford a more delightful prospect than a large extensive plain, either in its verdure or even scorched up by the sun beams, with those moveable habitations pitched in circles upon them. The fashion of each tent is of an oblong figure, not unlike the bottom of a ship turned upside down, as Sallust (Bell. Jugurth. § 21.) has long ago described them. They are of different sizes, and are supported by either a single pillar, or with two or three pillars, if their bulk require them; and a curtain, or carpet, occasionally let down from each of these divisions, turns the whole into so many separate apartments. The pillars, which are straight poles, 8 or 10 feet high, and 3 or 4 inches in thickness, serve not only to support the tent, but being full of hooks, the Arabs hang upon them their cloaths, baskets, saddles, and accoutrements of war. The tents are kept steady by cords stretched down their eaves and tied to hooked wooden pins, driven into the ground with a mallet. Shaw's Travels, p. 220.

DOVY, in *Geography*, a river of Wales, which rises in the S. E. part of Merionethshire, passes by Machynlleth, &c. and runs into the sea about 7 miles N. of Aberystwith.

DOUX, in *Geography*. See Doubs.

Doux, *Fr.* soft, the same as *dolce* and *piano*, in Italian. *Dolce*, however, in Italian, means something more than soft, or the echo of a short musical phrase, as *piano* at first implied. But purists among the Italians say, that the indiscriminate use of *dolce* for *piano*, is an abuse of words. Besides the diminution of force, dolce indicates a more sweet and expressive manner of playing, by sustaining the tones, and marking the first note of a bar somewhat more forcibly than the rest.

Doux in French, as well as *piano* in Italian, has three shades, which ought to be distinguished; as *doux*, *plus doux*, and *très doux*; *piano*, *più piano*, and *pianissimo*.

DOUXIEME, the 12th, or octave of the 5th. Every sonorous body gives with the principal, the 12th rather than the 5th, because the 12th is produced by an aliquot part of the whole string, which divides itself into three parts, or octaves of the 5th of the entire string; whereas the two 3ds, which constitute the 5th, are not aliquot parts of the same string.

DOUZE, in *Geography*, a small town of France, in the department of the Dordogne; 9 miles S. E. of Perigueux.

Douze, a river of France, which runs into the Adour, near Tartas.

DOUZENS, a small town of France, in the department of the Aude; 12 miles E. of Carcassonne.

DOUZEAVE, in *Music*, signifies the common system of 12 sounds within an octave, in which case each interval is not very distant from equal among themselves, and are called half notes; whereas by considering the scale as a septave (or octave) five of the intervals are nearly double in value to the other two respectively, called notes and half-

notes.

notes: for ſome of the chief properties of douzeaves, ſee our article TEMPERAMENT: ſee alſo the Philoſophical Magazine, vol. xxvii. p. 316. xxix. p. 348, &c.

DOUZY, in *Geography*, a ſmall town of France, in the department of the Ardennes; 6 miles S. E. of Sedan.

DOWAGER, DOTISSA (*q. d.* a widow *endowed*, or that has a jointure), a title, or addition, applied to the widows of princes, dukes, earls, and perſons of high rank only.

DOWAGER, *queen*. See QUEEN.

DOWER, DOTARIUM, *Doarium*, or *Dos*, a portion of lands, or tenements, which a widow enjoys for term of life, from her huſband, in caſe ſhe ſurvives him; for her own ſuſtenance and the nurture and education of the younger children. (Bract. l. ii. c. 39. Co. Litt. 30.)

Dower out of lands ſeems to have been unknown in the early part of our Saxon conſtitution; for in the laws of king Edmund (Wilk. 75.) the wife is directed to be ſupported wholly out of the perſonal eſtate. Afterwards, as in gavel-kind tenure, the widow became entitled to a conditional eſtate in one-half of the lands, with a proviſo that ſhe remained chaſte and unmarried (Somner. Gavelk. 51. Co. Litt. 33. Bro. Dower. 70.); as is uſual alſo in copyhold dowers, or free bench. Yet ſome (Wright. 192.) have aſcribed the introduction of dower to the Normans, as a branch of their local tenures, though we cannot expect any feodal reaſon for its invention, ſince it was not a part of the pure, primitive, ſimple law of feuds, but was firſt of all introduced into that ſyſtem (in which it was called *triens*, *tertia*, and *dotalitium*) by the emperor Frederick the ſecond, contemporary with our king Henry III. (Crag. l. ii. t. 22. § 9.) with us it might poſſibly be the relic of a Daniſh cuſtom; ſince, according to the hiſtorians of that country, dower was introduced into Denmark by Swein, the father of our Canute the Great, out of gratitude to the Daniſh ladies, who ſold all their jewels to ranſom him when taken priſoner by the Vandals. (Mod. Un. Hiſt. v. xxxii. 91.)

Judge Blackſtone, in treating of this eſtate, (Comm. b. ii.) conſiders, *who* may be endowed; of *what* ſhe may be endowed; the manner *how* ſhe ſhall be endowed; and how dower may be *barred* or prevented.

The perſon who may be endowed muſt be the actual wife of the party at the time of his deceaſe, not divorced *à vinculo matrimonii;* but a divorce *a menſa et thoro* only doth not deſtroy the dower, not even for adultery itſelf by the common law. (Bract. l. ii. c. 39. Co. Litt. 30. 32.) But by the ſtat. Weſtm. 2. (13 Edw. I. c. 34.) if a woman voluntarily leaves, or elopes from her huſband, and lives with an adulterer, ſhe ſhall loſe her dower, unleſs her huſband be voluntarily reconciled to her. As an ideot cannot marry, the former doctrine, that his wife might be endowed, cannot now take place. By the ancient law the wife of a perſon attainted of treaſon or felony could not be endowed; however, the ſtatute 1 Edw. VI. c. 12. abated the rigour of the common law, and allowed the wife her dower. But a ſubſequent ſtatute (5 & 6 Edw. VI. c. 2.) revived this ſeverity againſt the widows of traitors, who are now barred of their dower (except in the caſe of certain modern treaſons relating to the coin), but not the widows of felons. An alien cannot be endowed, unleſs ſhe be queen conſort, for no alien is capable of holding lands. (Co. Litt. 31.) The wife muſt alſo be above nine years of age, at the time of her huſband's death, otherwiſe ſhe ſhall not be endowed. (Litt. § 36.)

To the inquiry of what a wife may be endowed, it is replied that ſhe is now by law entitled to be endowed of all lands and tenements, of which her huſband was ſeiſed in fee-ſimple or fee-tail at any time during the coverture; and of which any iſſue, which ſhe might have had, might by poſſibility have been heir. (Litt. § 36. 53.) In ſhort, a widow may be endowed of all her huſband's lands, tenements, and hereditaments, corporeal or incorporeal, under certain reſtrictions, unleſs there be ſome ſpecial reaſons to the contrary. Thus, a woman ſhall not be endowed of a caſtle, built for defence of the realm (Co. Litt. 31. 3 Lev. 401.); nor of a common without ſtint, for as the heir would then have one portion of this common, and the widow another, and both without ſtint, the common would be doubly ſtocked. (Co. Litt. 32. 1 Jon. 315.) Copyhold eſtates are alſo not liable to dower, being only eſtates at the lord's will; unleſs by the ſpecial cuſtom of the manor, in which caſe it is uſually called the widow's free-bench. (4 Rep. 22.) But, where dower is allowable, it matters not though the huſband aliene the lands during the coverture; for he alienes them liable to dower. (Co. Litt. 32.)

With regard to the manner in which a woman is to be endowed, there were formerly five kinds of dower ſubſiſting in this kingdom: *viz.* 1. *Dower by the common law* which is a third part of ſuch lands or tenements above deſcribed, which the widow is to enjoy during her life. 2. *Dower by cuſtom*, ſo that the wife may have half the huſband's lands, or in ſome places the whole, and in ſome only a quarter. (Litt. § 37.) 3. *Dower ad oſtium eccleſiæ*, which is where tenant in fee-ſimple of full age, openly at the church door, where all marriages were formerly celebrated, after affiance made and troth plighted between them, doth endow his wife with the whole, or ſuch quantity as he ſhall pleaſe, of his lands; at the ſame time ſpecifying and aſcertaining the ſame; on which the wife, after her huſband's death, may enter without farther ceremony. (Litt. § 39.) 4. *Dower ex aſſenſu patris*, which is only a ſpecies of dower *ad oſtium eccleſiæ*, made when the huſband's father is alive, and the ſon, by his conſent, expreſsly given, endows his wife with parcel of his father's lands. In either of theſe caſes, in order to prevent frauds, they muſt be made *in facie eccleſiæ et ad oſtium eccleſiæ*. (Litt. § 40. Bract. l. 2. c. 39. § 4.) *Dower de la plus belle*, which was where the wife was endowed with the faireſt part of her huſband's eſtate. But this was aboliſhed together with the military tenures of which it was the conſequence.

Judge Blackſtone traces the ſeveral revolutions, which the doctrine of dower has undergone ſince its introduction into England. It ſeems firſt to have been of the nature of gavel-kind, *viz.* a moiety of the huſband's lands, but forfeitable by incontinency or a ſecond marriage. By the charter of Henry I. this condition, of widowhood and chaſtity, was only required in caſe the huſband left any iſſue. (Cart. Hen. I. A.D. 1101.) Under Henry II. the dower *ad oſtium eccleſiæ* was the moſt uſual ſpecies of dower; nor was the huſband, in thoſe days of feodal rigour, allowed to endow his wife *ad oſtium eccleſiæ* with more than the third part of the lands, whereof he was then ſeiſed, though he might endow her with leſs; but if no ſpecific dotation was made at the church-porch, when ſhe was endowed by the common law of the third part, called her *dos rationabilis*, of ſuch lands and tenements as the huſband was ſeiſed of at the time of the eſpouſals, and no other, unleſs he ſpecially engaged before the prieſt to endow her of his future acquiſitions: and, if the huſband had no lands, or endowment in goods, chattels, or money at the time of eſpouſals, it was a bar of any dower of lands, which he afterwards acquired. (Glanv. c. 2.) In king John's magna carta, and the firſt charter of Henry III. (A. D. 1216. c. 7.) no mention is made of any alteration of the common law, in reſpect of lands ſub-

ject to dower; but in those of 1217 and 1224, it is particularly provided, that a widow shall be entitled for her dower to the third part of all such lands as the husband had held in his life-time; yet in case of a specific endowment of less *ad ostium ecclesiæ*, the widow had still no power to waive it after her husband's death. This continued to be the law during the reigns of Henry III. and Edward I. In the time of Henry IV. it was denied to be law, that a woman can be endowed of her husband's goods and chattels; (P. 7. Hen. IV. 13, 14.) and under Edward IV., Littleton, (§ 39.) lays it down expressly, that a woman may be endowed *ad ostium ecclesiæ* with more than a third part; and shall have her election, after her husband's death, to accept such dower, or refuse it, and betake herself to her dower at common law. This state of uncertainty was probably the reason, that these specific dowers, *ad ostium ecclesiæ*, and *ex assensu patris*, have since fallen into total disuse.

As to the method of endowment or assigning dower, by the common law, which is now the only usual species, see ASSIGNMENT *of dower*.

A widow may by *barred* of her dower not only by elopement, divorce, being an alien, the treason of her husband, and other disabilities already mentioned; but also by detaining the title deeds, or evidences of the estate from the heirs, until she restores them (Co. Litt. 39.); and by the statute of Gloucester, (6 Edw. I c. 7.) if a dowager alienes the land assigned her for dower she forfeits it *ipso facto*, and the heirs may recover it by action. A woman may be also barred of her dower, by levying a fine or suffering a recovery of the lands, during her coverture. But the most usual method of barring dowers is by jointures, as regulated by the statute 27 Hen. VIII. c. 10. See JOINTURE.

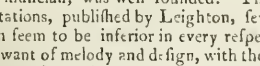
DOWER, *admeasurement of*. See ADMEASUREMENT.

DOWER, *assignment of*. See ASSIGNMENT.

DOWER, *tenant in*. See TENANT.

DOWLAND, JOHN, in *Biography*, an English musician, and an eminent performer on the lute, was born in 1562, and admitted to a bachelor's degree in music at Oxford in 1588, at the same time as Morley. He is styled doctor by Tomkins, Peacham, and Ravenscroft; but Ant. Wood is silent concerning his ever having obtained that honour. He was so much celebrated for his performance on the lute, that Ant. Wood (Fasti 1588.), who never could have heard him, scrupled not to say, that "he was the rarest musician that his age did behold."

After being at the pains of seeing several of Dowland's compositions, we have been equally astonished and disappointed at his scanty abilities in counterpoint, and the great reputation he acquired with his cotemporaries, which has been courteously continued to him, either by the indolence or ignorance of those who have had occasion to speak of him, and who took it for granted that his title to fame, as a profound musician, was well founded. There are among the Lamentations, published by Leighton, several by Dowland, which seem to be inferior in every respect to the rest; for, besides want of melody and design, with the confusion and embarrassment of a principiante in the disposition of the parts, there are frequently unwarrantable, and, to our ears, very offensive combinations in the harmony; such as a sharp third, and flat sixth; an extreme flat fourth and sixth, &c.



We make no doubt but that Dowland was a captivating performer on the lute, to which Shakspeare has borne testimony in his "Passionate Pilgrim," (No. VI.) where, addressing his friend, he says:

If Music and sweet Poetry agree,
As they must needs, the sister and the brother,
Then must the love be great 'twixt thee and me,
Because thou lov'st the one, and I the other.

DOWLAND to thee is dear, whose heav'nly touch
Upon the lute doth ravish human sense;
SPENSER to me, whose deep conceit is such,
As passing all conceit needs no defence.

Thou lov'st to hear the sweet melodious sound
That Phœbus' lute, the Queen of Music makes;
And I in deep delight am chiefly drown'd,
When as himself to singing he betakes.

One god is god of both, as poets feign;
One knight loves both, and both in thee remain.
Suppl. to Shakspeare, vol. i. p. 713.

It has frequently happened that a great performer has been totally devoid of the genius and cultivation necessary for a composer; and, on the contrary, there have been eminent composers whose abilities in performance have been very far from great. Close application to the business of a composer equally enfeebles the hand and the voice, by the mere action of writing, as well as want of practice; and if the art of composition, and a facility of committing to paper musical ideas, clothed in good harmony, be not early acquired, even supposing that genius is not wanting, the case seems hopeless; as we never remember the difficulties of composition thoroughly vanquished, except during youth, and we think we may venture to own, from the works of Dowland, which we have had an opportunity of examining, that he had not studied composition regularly at an early period of his life; and was but little used to writing in many parts. In his prefaces, particularly that to his "Pilgrim's Solace," he complains much of public neglect; but these complaints were never known to operate much in favour of the complainants, any more than those made to a mistress or lover whose affection is diminishing, which seldom has any other effect than to accelerate aversion. As a composer, the public seem to have been right in withdrawing that favour from Dowland, which had been granted on a bad basis; but with regard to his performance, we have nothing to say: as at this distance of time there is no judging what proportion it bore to that of others who were better treated.

The king of Denmark was so much pleased with Dowland, that he requested king James to permit him to leave England. He accordingly went to Denmark and died there. Malone's note to a Sonnet in the 1st Vol. of the supplement to Shakespear's plays.

DOWLATABAD, in *Geography*, a province of Hindoostan, formerly called *Amednagur*, which see. Mr Fraser, in his life of Nadir Shah, states the revenue of this province under Aurungzebe at 259 lacks of rupees.

DOWLATABAD, a town and fortress of Hindoostan, which has given name to a considerable province in the Deccan, and superseded that of Amednagur. The fortress is situated on a steep rock, not to be ascended by a horse or camel; the town is at the foot of the rock, and was once very flourishing, but the wars have ruined it; 9 miles N. W. Aurungabad, and 92 S. of Burhampour. Lieutenant Wilford, in his examination of Arrian's Periplus, has shewn that the position of the modern Dowlatabad is the same with that of the ancient Tagara, and that the high grounds

acrofs which goods were conveyed to Baroach, are the Ballagant mountains. Af. Ref. vol. i 369.

DOWLE and DEAL, in our *Old Writers*, are ufed to fignify a divifion. The word comes from the Saxon *dal*, i. e. *divifio*, and that from *dælan, dividere;* whence our Englifh word *dealing* is formed.

In this fenfe it is, that the ftones laid to the boundaries of lands are called dowleftones.

DOWN, in *Botanical Phrafeology*, is not only ufed in its common acceptation for any foft woollinefs or pubefcence clothing any part of a plant, but technically for the *Pappus*, Seed-down, which crowns the feed of compound flowers, as well as for the hairy appendages of feveral feeds enclofed in capfules, as in the Willow, Poplar, Cotton, Willow-herb, and many others. Gærtner, however, reftrains the term *pappus* to the feed-down of compound flowers, ufing *coma* for the hairy crown of any feeds in a capfule, and *pubes* for hairs fpringing from the bafe or fides of fuch feeds. The feed-down of compound flowers is either hairy, feathery, chaffy, briftly, fimple, or compound, and is of the greateft ufe for generic difcrimination. It is truly of the nature of a partial calyx. *Valeriana* too, though a fimple flower, has as genuine a *pappus* or feed-down as any plant whatever. "The ufe of this organ is to tranfport feeds to a diftance from their native fpot, either by refigning them to the power of the wind, or by attaching them to the fhaggy coats of animals. In due time the feathery crown feparates, and leaves the feed behind it." Sm. Introd. to Bot. 300.

DOWN, in *Geography*. See DOON.

DOWN, a large and populous county, in the province of Ulfter, Ireland. It lies on the fouth of Antrim, from which it is feparated, except for a fmall part, by Belfaft lough, and the river Lagan. Lough Neagh touches upon its north-weftern extremity, and the valley through which the Newry canal is carried forms the greater part of the weftern boundary, dividing it from the county of Armagh. The Irifh fea and Carlingford lough are on the eaft, fouth, and fouth-weft. Its greateft length from north to fouth is 40 Irifh (51 Englifh) miles, and its greateft breadth from eaft to weft 31 Irifh (39½ Englifh) miles. The figure, however, is very irregular, and in fome parts has not half this extent. The area of this county is 348 550 Irifh acres, or 544 fquare miles, which is equal to 559.995 acres, or 874 fquare miles, Englifh meafure. There are 60 parifhes, partly in the diocefe of Dromore, and partly in that of Down and Connor. The population is very confiderable. In 1792, the number of houfes was 36,636, which, at fix to a houfe, gives about 220,000 inhabitants, a number which has probably increafed fince that time.

In confidering the face of the country, we may divide it into three diftricts, the peninfula of Ardes in the eaftern part, the land between Strangford lough, and the county of Armagh, extending northwards to the boundaries of Antrim, and forming the principal divifion; and the mountainous country in the fouth extending towards the centre. The Ardes, as it is ufually called, is a level country, having a deep clayey foil, which being well manured is very productive. Lime is brought for this purpofe by water from Carlingford; and marle, fhell fand, and fea weed, are alfo much ufed. The grain produced is excellent. In this diftrict there are no bleach greens, through want of water proper for the purpofe. There are fome bogs, but here, and in every part of the county, they are not fufficient to anfwer the demands for fuel, turf being much preferred to fea coal, even where the latter can be procured at a moderate price, on account of its greater cleanlinefs. In the more extenfive diftrict, weft of Strangford lough, the foil is various, but is chiefly loam mixed with a confiderable quantity of ftones, fometimes having clay below it, and fometimes gravel, in which latter cafe it requires conftant manure. It may, however, be reckoned on the whole fertile. Except on the banks of rivers the land is moftly arable, and is, in general, badly managed. The produce is chiefly flax, potatoes, and oats, the latter of which is a principal article of food. In the north-weftern part there is limeftone gravel, and in the neighbourhood of Moira the white limeftone, which is fo prevalent in the adjoining county of Antrim. Near the banks of rivers, where the waters naturally overflow and promote fertility, the ground is chiefly under meadows, or laid out in bleach greens. The dairies, in thefe parts, prepare a confiderable quantity of butter for exportation. This is not a well-wooded country, though fome particular fpots fhew how favourable it is to the growth of timber. It is, however, in moft parts, delightful to the eye, efpecially in the neighbourhood of the rivers Bann and Lagan. The irregularity of the ground, well-watered, abounding in bleach greens, and full of neat and cleanly habitations, with an orchard to almoft every cottage, affords a moft cheerful and pleafing profpect, as it proves the opulence and comfort of the inhabitants. Such are the happy effects of the linen manufacture, which extends through every part of it; though much may alfo be attributed to a number of refident proprietors, paying attention to improvement, which does not happen in moft counties of Ireland. The remaining diftrict, which confifts of the Mourne and Sliebh-droob mountains, though very rough, affords fupport in moft places to a hardy race of cattle, which are fold at the fairs in the adjoining towns. There is here a native breed of fheep, which is much prized for the delicacy of the mutton, and fome of which have wool of a very fine texture, Thefe fheep are fmall and hardy, and moft of them horned. The vallies amidft thefe mountains fometimes afford grafs, and fometimes turf bogs, which are very valuable to the proprietors. Some fmall tracts have been lately planted, and the larch is found to grow luxuriantly in fpots which can be applied to no other purpofe. Thefe mountains confift of granite interfected by beds of flate. The higheft of them, called Sliebh-Donard, is ftated to be 2800 feet high. Some mountainous plants have been difcovered on them, fuch as vaccinium vitis idæa, (the whortle berry) faxifraga ftellaris, papaver cambricum, &c.; but it does not appear that they have yet been fufficiently examined either by the botanift or mineralogift. With refpect to the county at large, its mineral productions, hitherto difcovered, are few and of little importance. Some valuable quarries of freeftone, and the flate, which is found of excellent quality, are the moft profitable ones. Copper and lead ores are faid to have been found, but they have not yet been applied to ufe, and there are no collieries which offer much encouragement. There are fome fulphureous and chalybeate waters, of which that near Ballinahinch is moft frequented. The ufeful vegetable productions are probably much the fame as in other parts of Ireland. The graffes moft generally efteemed, and other plants fit for cattle, are found in great variety and abundance; fo that, notwithftanding bad management, the general character of the whole ifland for pafture is applicable to this part of it. A fpecies of rofe has lately been difcovered in the northern parts of it, which differs from any before defcribed, and to which the name of rofa Hibernica has been applied. It was difcovered by Mr. Templeton. The Lagan is one of the principal rivers of this county. It rifes in the Sliebh-droob mountains, and making a fweep to the weft by Dromore, becomes the northern boundary,

boundary, from the neighbourwood of Moira until it flows into Belfast lough. The Bann, celebrated for the purity of its waters, whence it obtained the epithet of *Silver*, rises in the Mourne mountains, and taking a north-western direction enters the county of Armagh, a little beyond Gillford. The waters of this river are esteemed superior to any other for the purpose of bleaching; and its banks are accordingly crowded with bleach greens. This is generally called the South or Upper Bann, to distinguish it from that which flows from Lough Neagh to the northern ocean. A muscle found in this river, and the river Lagan, produces pearls, some of which have been much valued. The Newry river is a small stream which rises in the same mountains of Mourne, and after a short course falls into the bay of Carlingford. The canal, however, which connects it with the Bann, and which has thus opened a connection with Lough Neagh, has rendered it of importance. Vessels of 50 or 60 tons are thus enabled to pass through the heart of Ulster, and the benefits which have resulted are a striking proof of the advantages of inland navigation. There are other streams which, though not deserving the name of rivers, contribute greatly to the prosperity of the country. There are also several small lakes abounding with fish, which form one of the many natural beauties of this county. There is also one large salt-water lake, communicating with the Irish sea by a narrow gut, through which the tide rushes with great rapidity. This lake is called Lough Conn, or Strangford Lough, and covers upwards of 25,000 acres. (See STRANGFORD and CONN LOUGH).

The assise town is Downpatrick, but Newry is the place of greatest importance. Four members represent this county in parliament, two knights of the shire, and one member each for the towns of Newry and Downpatrick. This county was early possessed by the English, and was formerly divided into two, called Down and Newtown; it appearing that John de Mandeville was made sheriff of Down and Newtown in the year 1325. It was formerly called Ulladh, or Ullagh. It was invaded in 1177 by John de Courcey, afterwards earl of Ulster, who built many castles, but his descendants were soon dispossessed of it. At that time, it would appear from an old writer in Hollingshed's collection, to have been called Ardes, which is at present the name of a district of it. Dubourdieu's account of Down. Beaufort's Memoirs, &c. &c.

DOWN, a bishopric in Ireland, united with Connor, and in the province of Armagh. These bishoprics were both founded in the 5th century, and united in 1454. The extent of the united sees, from the north of Antrim to the southernmost point of Down, is 70 Irish miles. It contains 597,450 Irish acres, divided into 114 parishes, but from unions there are only 65 benefices. The church of Lisburn was by the patent of James I. constituted the cathedral for the united bishoprics; but an act of parliament having been passed for restoring the cathedral of Down, in the city of Downpatrick, it has been repaired in a style of Gothic architecture, conformable to the venerable remains of the ancient building. Beaufort's Memoir of a Map of Ireland.

DOWN, in *Natural History*, denotes the first feathers of geese, with which beds and pillows are stuffed. The cottony substance on the tops of thistles, &c. is also thus called.

DOWN *Dinner*, in *Rural Economy*, a word provincially employed to signify the afternoon luncheon.

DOWN-*Cast*, a term among *Miners* and *Colliers*, for the sinking down of the measures or strata on one side of a fault, fissure, or vein; and that side of the same where the measures are lowest, is said to be down-cast: it has generally been noticed (see COAL and COLLIERY) that the fissure overhangs or hades from the down-cast side, or towards the upcast measures, which see.

DOWNE, or DOUNS, in *Geography*, a township of America, in Cumberland county, New Jersey.

DOWNHAM, or MARKET *Downham*, a market town and parish, included in the hundred of Clackeclose, in the county of Norfolk, England; is seated on the declivity of a hill, which slopes to the river Ouse, over which is a bridge at this place, and another very considerable structure called Danver-Sluice, where the waters of the Cam unite with those of the former river, and jointly flow through a flat, marshy tract of land to Lynn, and on to the German ocean. Spelman says that a market was confirmed to this town by Edward the Confessor, and it appears that the principal manor here, with the whole hundred, were given by king Edgar to Ramsay abbey, in Huntingdonshire. King John granted to this abbot a fair, and in the time of Henry III. he was authorized to try and execute malefactors at his "gallows of Downham." Here are now two annual fairs, and two weekly markets, one of which, on Mondays, is chiefly appropriated to the sale of butter, which is conveyed by water to Cambridge, and thence to London, where it is known by the name of Cambridge butter. The sale of this article was formerly averaged at 3000 firkins *per* week in spring and summer; but at present the sale is not so great. Contiguous to the church were formerly some monastic buildings, particularly a priory of Benedictine monks. Downham is 11 miles south of Lynn, and 84 north from London. In the year 1801 it contained 278 houses, and 1512 inhabitants. Blomefield's History of Norfolk, vol. vii. 8vo. edit. 1807.

DOWN-HAULER, in *Sea Language*, a rope which hoists down the stay-sails, studding-sails, and boom-sails, to shorten sail, &c.

DOWNINGS, in *Geography*, a post town of America, in the state of Pennsylvania and Chester county, on the east side of Brandywine creek; 33 miles west by north of Philadelphia.

DOWNPATRICK, the chief town of the county of Down, in the province of Ulster, Ireland. It is a place of great antiquity, being said to have been noted before the time of St. Patrick. There is a rath or mount on the north side of the town, the conical height of which is sixty feet, and its circumference 2100 feet: it is surrounded by three great ramparts, one of which is thirty feet high, the whole works being three quarters of a mile in circuit. As the Danes were frequently on this coast in the 7th, 8th, and 9th centuries, it is probable this may have been raised by them. The name of the town, (which signifies Mount of Patrick,) is supposed to have been derived from it. The celebrated De Courcey, the first earl of Ulster, took possession of Downpatrick in the 12th, and Edward Bruce destroyed it at the beginning of the 14th century. The destruction of the cathedral of Down, in 1538, was one of the articles of impeachment against Leonard, lord Grey, but it has been lately re-built. The town is at present tolerably large and populous, and is one which sends a member to the imperial parliament. It has a good linen market, and its public buildings are respectable. It is 74 miles N. by E. from Dublin, and near 24 E.N.E. from Newry. W. long. 5° 38′. N. lat. 54° 18′.

DOWNS, a bank, or elevation, of sand, which the sea gathers and forms along its shores; and which serves it as a barrier.

The word is formed from the French *dune*, of the Celtic *dun*, a mountain. Charles de Visch, in his Compend.

Chronolog. Exord. et Progrefs. Abbat. Clariff. B. Mariæ, de Dunis, fays "Vallem reperit arenarum collibus (quos incolæ Duynen vocant) undique cinctam."

Downs are particularly ufed for a famous road for fhips, along the eaftern coaft of the county of Kent; from Dover to the North Foreland.

This road has excellent anchorage, and is well defended by the caftles of Sandwich, Deal, and Dover.

Here it is the Englifh fleets generally meet.

DOWNTON, a market and borough town of Wiltfhire, England, is fituated on the banks of the river Avon, at the diftance of fix miles S. of Salifbury, and 90 miles S. W. of London. It is an ancient borough by prefcription, and fent members to parliament from 23 Edward I. to 38 Edward II.; after which no member was returned (except once in 1 Henry V.) till 20 Henry VI. The returning officer is the deputy fteward of the leffee of the manor; and the right of election is in burgage holders, in number about one hundred. The church is a neat edifice, the tower of which has lately been raifed more than thirty feet at the expence of the earl of Radnor. The poor have the benefit of a free-fchool, which was founded by Gyles Eyre, efq., and of a well regulated workhoufe. The principal employment of the poor is lace-making and malting. Here are alfo a good paper-mill, a grift-mill, and tan-yard; alfo a confiderable branch of the tick-weaving bufinefs is carried on in this town. Here was formerly a caftle; part of the walls were ftanding within the memory of the oldeft inhabitants, but are now totally decayed. Downton has two annual fairs, and a weekly market; but the latter is now merely nominal, from its contiguity to the more important market of Salifbury. The parifh of Downton is returned as containing 529 houfes and 2426 inhabitants. The living is a vicarage, to which Nunnetton chapel is annexed. In this town was born Dr. Raleigh, (brother of the celebrated fir Walter) who was fignalized by his fufferings in the civil wars of Charles I.

DOWNY, fomething partaking of the nature of down. Thus fome leaves and fruit, &c. are faid to be covered with a downy matter.

DOWRY Dos, is properly the money, or fortune, which the wife brings her husband in marriage, to have the ufe of it, during her marriage, towards fupporting the charge thereof.

It is otherwife called *maritagium*, marriage goods; by the Romans *dos*; and it differs from dower. See DOWER.

Among the Germans, it was anciently cafomary for the husband to bring a dowry to his wife. "Romanos non in ufu fuit uxoribus dotes retribuere; ideo verbo germano carent quo hoc dignofcitur; & rem ipfam in Germanorum moribus miratur Tacitus: dotem inquit, non uxor marito, fed uxori maritus affert." Spelman.

DOWRY is alfo ufed, in a monaftic fenfe, for a fum of money given along with a maid, upon entering her in fome religious order.

In France, the dowry of perfons entering a monaftery, to make profeffion of a religious life, is limited by law. That, *e. gr.* given upon entering a monaftery of Carmelites, Urfulines, and others, not regularly founded, but eftablifhed fince the year 1600, by letters patent, muft not exceed the fum of 8000 livres, in towns where parliaments are held; nor 6000 in other places.

DOWSEINES, a fort of kerfeys made in Devonfhire, in length twelve yards; whence alfo their name, which is otherwife writ dofens, dozens, or dozeins.

DOXOLOGY, an appellation given by the Greeks to the angelic hymn, or canticle of praife, fung by the Romans in the mafs; and which, in conformity to the fourteenth verfe of the fecond chapter of St. Luke, *Glory be to God in the highefs*, &c. they call *Gloria in excelfis*, becaufe it begins in Greek with the word δόξα, *glory*.

This they diftinguifh in their liturgies by the name of *great* doxology; and the *Gloria Patri et Filio*, &c., *Glory be to the Father*, &c., they call the *lefs* doxology, as beginning with the fame word δόξα: with this the chant or pfalm ends.

Philoftorgius, lib. iii. n. 13. gives three formulas of the leffer doxology. The firft is, *Glory be to the Father, and to the Son, and the Holy Ghoft*; the fecond, *Glory be to the Father by the Son, in the Holy Ghoft*; and the third, *Glory be to the Father in the Son, and the Holy Ghoft*.

Sozomen and Nicephorus give a fourth; *viz. Glory be to the Father, and the Son, in the Holy Ghoft*.

The firft of thefe doxologies is that in common ufe throughout the weftern church. It was firft inftituted about the year 350. by the Catholics of Antioch, then called Euftathians. The three others were compofed by the Arians; the fecond was that of Eunomius and Eudoxus, and which was approved by Philoftorgius. The three were all made about the year 341, in the council of Antioch, when they firft began to difagree among themfelves. Philoftorgius affures us, that Flavian, afterward patriarch of Antioch, was the author of the firft, or Catholic doxology; but Sozomen and Theodoret fay nothing of it; and Philoftorgius's fingle authority is hardly fufficient.

There were anciently very great difputes, and principally at Antioch, as to the form of doxology; that moftly ufed among the orthodox was the fame as ftill obtains; the reft were affected by the Arians, and other Antitrinitarians; yet St. Bafil, in his book on the Holy Spirit, defends the fecond as orthodox and legitimate; and it is certainly more agreeable to fcripture authority; to which we muft ultimately appeal, as the only infallible rule of our devotion, as well as of our conduct: and it has been urged, that no inftance of the former doxology occurs in the New Teftament: and "it matters not much to inquire," fays Dr. Lardner, "when this doxology was firft ufed, or how long it has been in ufe, if it be not in the New Teftament." It has been faid, that we have feveral different doxologies in the epiftles of the New Teftament, but none of the former kind; and thofe that occur in the moft early Chriftian writers are agreeable to thofe we find in the fcripture.

Some authors write hymnology as fynonymous with doxology; but there is a difference; hymnology is applied to pfalms, or the recitation of pfalms; and doxology only to the little verfe, *Glory be to the Father*, &c. repeated at the end of each pfalm.

In Italy the moft elaborate mufical compofitions for the church have been produced by the greateft maffers to the *Gloria Patri*; and, in England, befides Handel's fublime and reverential ftyle of compofition to the doxologies, our own countrymen, Purcell, Blow, and Crofts, have furpaffed their ufual force and energy in fetting thefe facred words.

DOYACACE, in *Geography*, a town of Poland, in the palatinate of Lemberg; 36 miles E.S.E. of Lemberg.

DOYET, a town of France, in the department of the Allier and diftrict of Montmarault; feven miles W. of Montmarault.

DOYLSTOWN, a village of America, having a poft-office, in the ftate of Pennfylvania and county of Bucks; 15 miles N. of Newton, and 33 W. by N. of Philadelphia.

DOZARY, a town of Lithuania, in the palatinate of Minfk; 36 miles N.N.E. of Minfk.

DOZEIN, DECENNA. In the ftatute for view of frankpledge,

pledge, made 18 Edw. II. one of the articles for ſtewards in their leets to enquire of, is, if all the dozeins be in the aſſize of our lord the king, and which not, and who received them. Art. 3. See DECINERS.

DOZEIN is alſo uſed for a ſort of Devonſhire kerſeys. Anno 5 and 6 Edw. VI. cap. 6. See DOWSEINE.

DOZELLINA, in *Ichthyology*, a name by which ſome authors have called the muſtela of the common ſpecies, which we in Engliſh term the ſea-loche and whiſtle fiſh. See GADUS *Muſtela*.

DOZZAND, in *Agriculture*, a term uſed provincially to ſignify ſhrivelled, or not full and plump.

DRA, in *Geography*, a province of Morocco, E. of the province of Suz and N. of Vled-de-Nun, adjoining to the province of Geſula; both of which are in the neighbourhood of mount Atlas, which, in this ſouthern part of the country, extends almoſt to the ſea.

DRAABURG, or OBER-TRAABURG, a town of Germany, in the duchy of Stiria; 56 miles E. of Clagenfurt and 42 E.N E. of Brixen. N. lat. 46° 48′. E. long. 12° 49′.

DRAABURG, or *Unter Traaburg*, a town of Germany, in the duchy of Carinthia; 112 miles S S.W. of Vienna, and 48 W.N.W. of Pettaw.

DRABA, in *Botany*, Δραβη of Dioſcorides, Whitlow-graſs. Linn. Gen. 333. Schreb. 436. Willd. Sp. Pl. v. 3. 424. Juſſ. 240. Gærtn. t. 141. Claſs and order, *Tetradynamia Siliculoſa*. Nat. Ord *Siliquoſæ*, Linn. *Cruciferæ*, Juſſ.

Gen. Ch. *Cal.* Perianth of four ovate, concave, ſlightly ſpreading, deciduous leaves. *Cor.* cruciform, of four oblong, ſomewhat ſpreading, petals, with very minute claws. *Stam.* Filaments fix, about the length of the calyx, of which four oppoſite ones are rather longer than the other two, and ſlightly ſpreading; anthers ſimple. *Piſt.* Germen ovate; ſtyle ſcarcely any; ſtigma capitate, flat. *Peric.* Pouch elliptic-oblong, compreſſed, entire, deſtitute of a ſtyle, of two cells, with a partition parallel to the valves, which are ſlightly concave. *Seeds* ſeveral, ſmall, roundiſh.

Eſſ. Ch. Pouch entire, long-oval: valves flattiſh, parallel to the partition. Style ſcarcely any.

Obſ. In ſome ſpecies the petals are ſeparated into two parts, even to their very claws; in others they are merely notched at the ſummit; while in others again they are entire. The form of the pouch, as above expreſſed, is the important character.

Willdenow enumerates 16 ſpecies of *Draba*, of which 11 have a naked ſtem, or ſtalk, and the reſt a leafy ſtem. D. *aizoides*, Curt. Mag t. 170, Engl. Bot. t. 1271, is a very hardy perennial, forming tufts of cluſtered leaves, and bearing bright yellow bloſſoms in March and April, very fit for the ornamenting of rock-work. D. *verna*, Curt. Lond. faſc. 1. t. 49. Engl. Bot. t. 586, an annual white-flowered ſpecies, common on walls and dry barren ground, is one of our firſt harbingers of ſpring. Both theſe have naked ſtalks, and there are ſeveral alpine ſpecies akin to them. D. *pyrenaica*, Jacq. Auſtr. t. 228, decorates the loftieſt mountains of Europe with its pale purple diminutive flowers, in the ſpring and early ſummer, and vies with the neighbouring *Androſaces* and *Aretiæ* in beauty. Of the leafy-ſtalked kinds, D. *muralis*, Engl. Bot. t. 912, and D. *incana*, t. 388, are the principal. They have a rough herbage, and ſmall white flowers. The flavour of the whole genus is acrid and muſtard-like. The name Whitlow-graſs has been applied to this genus, becauſe D. *verna* is one of the plants that have been taken for the Παρονυχια of the ancients, but its virtues in curing whitlows are not much relied on at preſent. Sheep are ſaid to be fond of it.

DRABA, ſee COCHLEARIA, ſp. 9.

DRABESCUS, in *Ancient Geography*, a town of Thrace, which belonged to Macedonia, when this kingdom extended to the eaſt; W. of Philippi, towards the river Strymon.

DRABICIUS, in *Biography*, a divine of note, was born about the year 1587, at Stranſnitiz in Moravia, and, after the uſual preparatory ſtudies, he was admitted a miniſter among the Proteſtants in the year 1616. The duties of his ſtation he continued to exerciſe till the year 1629, when the imperial edicts againſt thoſe who profeſſed and taught the reformed religion, forced him from his native country to Lednitz, a town in Hungary, where he engaged in trade, in order to furniſh the means of ſupporting his family. This ſtep, which was as honourable to an active mind as prudent, gave offence to his brethren, who regarded it as diſgraceful to the miniſterial character. Soon after this he was reproved, and, at length, ſuſpended from the duties of his profeſſion, for the vice of drunkenneſs. Openly he exhibited marks of penitence and reformed manners, but it was ſuppoſed that he ceaſed not, in private, to indulge in propenſities that had been habitual to him; and to this courſe of intemperance was imputed a derangement of his intellects, which induced him to believe, at leaſt to avow, that he was favoured with divine communications, and that he was choſen by Almighty God to ſuſtain the character of a prophet. Under this kind of influence, he denounced vengeance againſt the houſe of Auſtria, and predicted to himſelf, and his brother refugees, a ſpeedy reſtoration to their country and their rights, by means of armies which ſhould come from the north and from the eaſt, the latter of which was to be commanded by Ragotſki, prince of Tranſylvania. Unfortunately for the credit of the prophet, almoſt all his predictions were falſified by ſubſequent events: and thoſe who had hoped rather than expected the deliverance which he held out, abandoned him to contempt. Drabicius was not, however, cured of his folly, he continued to threaten on the one hand, and to promiſe ſalvation on the other; and, about the year 1650, Comenius, being brought into Hungary by buſineſs, was viſited by the prophet, who explained to him all his expectations. Comenius ſeems to have been ſatiſfied with the pretenſions of his friend to divine inſpiration, was admitted into his confidence, and declared coadjutor in the miſſion. They united in invoking the aid of Sigiſmund Ragotſki to carry into effect the divine judgments. Finding him unwilling to co-operate with their deſigns, they entreated, they even threatened him with the vengeance of Almighty God; ſtill he refuſed to act, and continued in peace till his death, in the year 1652. To George Ragotſki, the brother and ſucceſſor of Sigiſmund, they now applied, and were in ſome degree countenanced by his authority. Drabicius was reſtored to the exerciſe of his miniſtry, and his viſions became more frequent in proportion to the rank which he held in the eſtimation of the public. To Comenius he communicated all his projects, who was now in Poland, and who had orders to proclaim the reſult of every new viſion to all nations, but particularly to the Turks and Tartars. Comenius, however, publiſhed the account only at Amſterdam, and there with a diffidence which ill accorded with a ſound and firm faith in the verity of the tranſactions. But when Ragotſki actually commenced war againſt the emperor, by making an irruption into Poland, he felt confident that the criſis was actually arrived when the predictions of Drabicius would be all accompliſhed, and he announced their publication with much confidence, in a work entitled "Lux in Tenebris." Succeeding events gave the lie to all their promiſed dreams, but the credit of the prophet was not deſtroyed, and he continued to announce new viſions, and Comenius, encouraged by a deluded public, gave an abridgment of his work, and afterwards publiſhed the

whole, with additions, down to 1666. From this time we hear little of Drabicius, and the event of his succeeding days is not at all ascertained. According to some writers he was burnt as an impostor, but according to others he was obliged to fly from Transylvania into Turkey. Bayle. Moreri.

DRABLER, in the *Sea-Language*, a small sail in a ship, which is the same to a bonnet that a bonnet is to a course, and is only used when the course and bonnet are too shoal to clothe the mast. See Bonnet and Course.

DRABOWICE, in *Geography*, a town of Poland, in the palatinate of Kiov; 36 miles S.W. of Czerkasy.

DRABS, in the English *Salt-Works*, a name given to a sort of wooden cases in which the salt is put as soon as it is taken out of the boiling-pan. These are partitions like stalls made for horses; they are lined on three sides and at the bottom with boards, and at the front have a sliding board to put in or take out occasionally. Their bottoms are made shelving, being highest at the backside, and gradually inclining forwards; by which means the saline liquor that remains mixed with the salt easily drains out from it, and the salt in three or four days becomes sufficiently dry, and is then taken out and laid up in large heaps for sale. In some places they use cribs instead of the drabs. See Crib.

DRAC, Le, in *Geography*, one of the principal rivers of the department of the Isere, in France, which has its source in the department of the Upper Alps. After heavy rains, the water pouring down from the mountains swells it to a torrent, which overflows its banks and overthrows every obstacle to its violence. It abounds with fine trouts.

DRACÆ, in *Ancient Geography*, a people of Asia, who inhabited the parts adjoining to mount Caucasus.

DRACÆNA, in *Botany*, (Δρακαινα, *a female dragon*, so applied by Vandelli, because the original species had been named *Draco arbor* by the old botanists, and *Draco* was preoccupied, as the appellation of a genus in *Zoology*.) Vandelli Diss. et Fasc. Plant. t. 2. Linn. Mant. 1. 9. Syst. Nat. ed. 12. v. 2. 246. Schreb. 224. Willd. Sp. Pl. v. 2. 155. Juss. 40. Mart. Mill. Dict. v. 2. Gærtn. t. 16. (Dianella; Lamarck Encycl. v. 2. 276. Juss. 41. Redouté Liliac. t. 1.) Class and order, *Hexandria Monogynia*. Nat. Ord. *Sarmentaceæ*, Linn. *Asparagi*, Juss.

Gen. Ch. *Cal.* none. *Cor.* Petals six, oblong, rather spreading, equal, cohering by their claws. *Stam.* Filaments six, inserted into the claws, awl-shaped, thickened in the middle, membranous at the base, scarcely so long as the corolla; anthers oblong, incumbent. *Pist.* Germen ovate, with six furrows; style thread-shaped, the length of the stamens; stigma three-cleft, obtuse. *Peric.* Berry ovate, with six furrows and three cells. *Seeds* mostly solitary, ovate-oblong, incurved at the summit.

Ess. Ch. Petals six, upright, cohering at their base. Filaments swelling in the middle. Berry of three cells. Seeds mostly solitary.

The first species, D *Draco*, Syst. Veg. ed. 14. 333, (Asparagus Draco, Sp. Pl. 451; Draco yuccæformis, seu Dracæna, Vand Fasc. Plant. 12. t. 2; Draco arbor, Bauh. Pin. 503 Clus. Hist. v. 1. 1) is a native of the East Indies, with an arboreous thick *stem*, branched and level-topped, crowned with tufts of lanceolate pungent large *leaves*. *Flowers* white, in large, terminal, compound spikes. The stem and roots exude a crimson resin, one of those kept in the shops under the name of Dragon's blood. D. *terminalis*, Syst. Veg. 334. Jacq. Ic. Rar. v. 2. t. 448, (Asparagus terminalis, Sp. Pl 450.) a native of the East Indies and South sea islands, was found by captain Cook very useful in making a kind of beer. The juices of its root are sweet and mucilaginous. A variety with purple leaves, as figured by Jacquin, is common in our stoves. This is considered as a sort of sacred plant, and an emblem of peace and friendship among the natives of the South sea islands, and is planted about their places of worship and burial. D. *ensifolia*, (Dianella nemorosa of Lamarck, and Jacq. Hort. Schoenbr. v. 1. t. 94; Dianella ensifolia, Redout. Liliac. t. 1,) grows in the islands of Mauritius and Bourbon, as well as in the East Indies and New South Wales. It is now not rare in our greenhouses. Its *stem* is herbaceous, *flowers* panicled, green *berries* blue. D. *borealis*, Ait. Hort. Kew. v. 1. 454. t. 5, a rare plant in gardens, though very hardy, is a native of Hudson's bay. It has elliptical *leaves*, and an almost naked herbaceous *stem*. The whole herbage is somewhat pubescent, which in this genus is remarkable.

Dracæna, in *Zoology*, is the name of a species of American lizard. See Draco.

DRACANIUM, or Dracanon, in *Ancient Geography*, a mountain of Asia Minor, in Caria.

DRACHENFELS, in *Geography*, a town of Germany, in the circle of the Lower Rhine, and capital of a district in the electorate of Cologn, with a citadel; four miles S. E. of Bonn, and seven N. N. W. of Linz.

DRACHM, Δραχμη, an ancient silver coin, used among the Greeks; equal to the eighth part of an ounce, both in weight and coinage, and at a medial value nine pence sterling. See Coin.

This they divided into six oboli; and their larger coins above the drachm were the didrachm, or double drachm, worth 18*d.*, tridrachm, or three drachms, or 2*s.* 3*d.* of our money, and tetradrachm, or stater, worth four drachms or 3*s.* sterling; and this is the largest form of Greek silver coins, except the tetradrachm of the Eginean standard, which is worth five shillings.

There are many subdivisions of the drachm in silver. The highest is the *tetrobolion*, or coin of four oboli, being in proportion to the drachm as our groat to a six pence; it weighs about 44 grains, and is worth 6*d.* The next is the *hemidrachm*, or *triobolion*, a piece of half the drachma, or about 33 grains; worth four-pence half-penny. The silver *diobolion*, or third of the drachm, weighing about 22 grains, is worth 3*d.* The *obolus* of silver weighs about 11 grains, and in ancient currency bore the value of $1\frac{1}{2}$*d.* There is likewise the *hemiobolion* in silver, or half the obolus, of $5\frac{1}{2}$ grains, worth a half-penny farthing; and the *tetartobolion*, *dichalcos*, or quarter obolus, which is the most minute coin yet found, being of $2\frac{3}{4}$ grains, and its current worth a farthing and a half. The last coins are so very small, that it is no wonder they have perished; but there is one of Athens in Dr. Hunter's cabinet; and Mr. Stuart is said to have brought some from Athens. Mr. Pinkerton (Essay on Medals, vol. i.) is of opinion that they also occur of Tarentum.

The drachm was likewise a weight as well as a piece of money; and the mina contained a hundred drachmæ, both as a sum and a weight; and their talent sixty minæ, and six thousand drachmæ, both by weight and tale; and this method of reckoning was common to all Greece; so that if the drachma of one city differed from that of another, their talents differed in the same proportion.

Although in coinage, as well as in medical weight, eight drachms went to the ounce, and the mna or mina or pound of 12 ounces in course had 96; yet four were given to the round sum to supply defects in alloy, conformably to a common practice in all ages and countries of giving some addition to a large weight. Thus the pound in weight had but 96 drachmæ in fact, while the pound in tale had 100; as the Roman libra in weight had but 84 denarii, in tale 100;

and

and as one pound in tale, by an inverſe progreſs, is not a third of our pound in weight.

We ſhall here obſerve, that the coins of Ægina were famous among the Greeks for antiquity and peculiarity; Ægina having long maintained her glory and independence, for in the war of Xerxes againſt Greece, ſhe was miſtreſs of the ſea by means of a numerous navy; and Herodotus tells us that of all the cities engaged in that arduous conflict, ſhe bore away the palm. Some authors inform us, that the firſt money coined at all was that ſtruck in the iſland of Ægina by Pnidon, king of the Argives; and his reign is fixed by the Arundelian marbles to an æra, correſponding to about 820 years before Chriſt.

The coinage of Ægina was different from the common Greek ſtandard; inſomuch that the drachma of Ægina was worth 10 Attic oboli, while the Attic drachma was worth only ſix. Hence the Greeks gave the drachmas of Ægina the name of παχειαν, or thick, a name peculiarly applicable to the very coins of which we ſpeak. According to a juſt proportion, the drachma of Ægina ſhould weigh about 110 grains; and one of the coins, preſerved in Dr. Hunter's cabinet, very much rubbed, weighs 90. The others of larger ſize, which ſeem to be didrachms of Ægina, weigh from 181 to 194 grains; but an allowance of about 10 grains being made for the waſte of 2400 years in ſo ſoft a metal as ſilver, the drachma of Ægina would be brought to nearly its proper ſtandard. The obolus of Ægina was in proportion to its drachma of ſix oboli, and is the piece of $15\frac{1}{2}$ grains, and of 13, when rubbed very much; the hemiobolion is that of eight, which, if perfect, ſhould weigh nine. Gronovius labours to prove, that the Corinthians uſed the ſtandard of Ægina, but the oldeſt coins of Corinth, as well as the lateſt, are all upon the common Attic model.

The Attic drachma has been ſuppoſed by moſt authors, before Greaves, who firſt ſuggeſted the contrary, to have been the ſame, among the Greeks, with the denarius, among the Romans; which was equivalent to four ſeſterces. Of this opinion is Budæus, De Aſſe; who confirms it from the authorities of Pliny, Plutarch, Strabo, and Valerius Maximus, with whom δραχμη is ſynonymous with denarius. Plin. Nat. Hiſt. lib. xxi. fin.

A. Gellius, who reſided long at Athens, and could not be ignorant of the value of the current money of that city, ſays, that ten thouſand drachms were in Roman money ſo many denarii. Lib. i. cap. 8. See alſo Val. Maxim. lib. vii. cap. 6. and Strabo Geog. lib. v. the former of whom writes, that a certain commodity was ſold for two hundred denarii; and the latter, in ſpeaking of the ſame thing, ſays, that it was bought for two hundred drachmæ. But this is no ſtrong conviction, that the two coins were preciſely of the ſame value; thoſe authors, not treating expreſsly of coins, might eaſily render the one for the other, provided there were no conſiderable difference between them. Greaves's Miſc. Works, by Birch, vol. i. p. 287. &c. 8vo.

Scaliger, in his diſſertation, De Re Nummaria, does not ſay abſolutely that the denarius and drachma were the ſame thing; but from the Greek paſſage in an ancient law, c. xxvi. Mundati, where the drachma is ſaid to be compoſed of ſix oboli, he concludes, that in the age of Severus, at leaſt, they were the ſame. But Agricola, De Menſ. & Ponder. lib. xiv. ſhews from Pliny, Celſus, and Scribonius Largus, that the denarius contained only ſeven ounces; and from Livy, Appian, Cleopatra, &c. that the drachma contained eight; and maintains, that when ſome Greek authors ſpeak of the ounce as only containing ſeven drachms, they do not mean the Attic drachm, but the Roman denarius, which Greek authors render by δραχμη. We learn from Galen, that the writers on weights and meaſures differed in the number of drachms or denarii, which they aſſigned to an ounce; moſt of them making it to contain ſeven and a half, ſome but ſeven, and others eight. De Med. Comp. ſec. Genera, lib. iii. cap. 3.

Gronovius agrees with Agricola, that the drachma was the eighth part of an ounce; and the opinion is confirmed by Iſidore, lib. xiv. cap. 24. by Fannius, who ſays as much in expreſs terms, and by Voluſius, who divides the ounce into twenty-four ſcriptuli, or ſcruples, of which the drachm comprehended three.

It is probable, that, when the Romans became maſters of Greece and Aſia, the Athenians might find it their intereſt to lower their drachm to the weight of their denarius, long before they were reduced into the form of a Roman province by Veſpaſian. When they did this is uncertain; but it appears by the treaty between the Romans and Antiochus, recorded by Polybius, Excerp. Leg. ſect. 35. and by Livy, lib. xxxviii. cap. 38. which ſtates the Euboic talent at eighty Roman pounds; and ſuppoſing this to be equal to the Attic, and to contain ſix thouſand Attic drachms, and eighty Roman pounds to contain ſix thouſand ſeven hundred and twenty denarii, that the weight of the Attic drachm muſt have been to that of the denarius as 6720 to 6000; and this proportion is confirmed by an anonymous Greek fragment, publiſhed by Montfaucon, which makes a hundred Attic drachmæ equal to a hundred and twelve denarii. Anal. Græc. p. 393. Paris 1688.

Greaves concludes, after weighing a number of Attic tetradrachms, and ſtating the weight of the tetradrachm at two hundred and ſixty-eight grains, that the Attic drachm was ſixty-ſeven grains. J. Caſpar Eiſenſchmid, in his book De Pond. & Menſ. Vet. from an ancient tetradrachm weighing three hundred and thirty-three Paris grains, and by eſtimating the proportion between the Roman pound and Attic talent, mentioned by Livy, lib. xxxviii. makes the drachm $83\frac{1}{3}$ Paris grains, or almoſt $68\frac{7}{10}$th Troy.

Mr. Raper has eſtimated the weight of the Attic drachm, by comparing it with the gold coins of Philip and Alexander, which were probably formed upon that ſtandard. They both coined gold of 4, 2, 1, and $\frac{1}{2}$ an Attic drachm; and from a mean of twenty-one Philippics, which were equivalent to two drachmæ, preſerved in the Britiſh Muſeum, and in private collections, or mentioned by other writers, he infers, that the ſtandard weight of the Philippic was not leſs than 133 troy grains; which agrees very nearly with the weights of ſome preſerved ſilver drachms of Philip and Alexander, and with the mean weight of ſeven perfect ſilver tetradrachms of Alexander, which give a didrachm a little more than $132\frac{1}{2}$ grains. He obſerves, that the gold Philippics, both of Alexander and his father, are ſo correctly ſized, and ſo perfect, that the mean didrachm, derived from them of 133 troy grains, muſt be very near its juſt weight; and its half, $66\frac{1}{2}$ grains, that of the Attic drachm. Then, for the value of it, as ſixty-two Engliſh ſhillings are coined out of eleven ounces two penny-weight troy, of fine ſilver, and eighteen penny-weight of allay, the troy grain of fine ſilver is worth $\frac{62}{11}$ths of a farthing; and ſince the Greeks and Romans uſed no allay in their money, but eſteemed what they coined to be fine ſilver, the Attic drachm of $66\frac{1}{2}$ grains will be found worth a little more than $9\frac{1}{4}d.$ or, for the eaſe of reduction:

	£.	s.	d.
The Attic drachm may be ſtated at	0	0	9.286
The obolus a little more than	0	0	$1\frac{1}{2}$
The chalcus about	0	0	0 $\frac{1}{7}$ of a farthing,

The

	£.	s.	d.
The mina	3	17	4.6 or 3.869 *l.*
The talent	232	3	0 or 232.15 *l.*

Phil. Tranſ. vol. lxi. part ii. art. 48.

Others eſtimating the ancient Roman ounce equal to the modern one, or to 536 French grains, and the Attic drachma at 67 grains, and ſuppoſing the ſilver at Athens of the ſame fineneſs with ours, make it equal to $7\frac{3}{4}$*d.* ſterling. See COIN.

DRACHM, or *Dram*, is alſo a weight uſed by our phyſicians, containing juſt ſixty grains, or three ſcruples, or the eighth part of an ounce troy, and the ſixteenth of an ounce avoirdupois.

DRACHM was likewiſe an ancient Jewiſh money; having on one ſide a harp, and on the other ſide a bunch of grapes.

This coin was a half ſhekel; and was ſo called by the Jews. It is only the Greeks called it δραχμη. It was equal to two Attic drachmæ See SHEKEL.

DRACHONTIUS, in *Ancient Geography*, an iſland of the Mediterranean ſea, near Africa; placed by Ptolemy N. of the promontory of Apollo, and S.E. of the iſle of Sardinia.

DRACIA, in *Geography*, a river of Boſnia, which runs into the Drin; 5 miles N.E. of Orach.

DRACKEMBOURG, or DRAKEMEURG, a ſmall town of Germany, on the Weſer, 6 miles N. of Nienburg, famous for a battle which was fought in its neighbourhood in 1547, between the Auſtrians and the Saxons.

DRACMÆ, in *Ancient Geography*, a people of Aſia, in Aria. Ptolemy.

DRACO, DRAGON, in *Aſtronomy*, a conſtellation of the northern hemiſphere; whoſe ſtars, according to Ptolemy, are 31: according to Tycho, 32; according to Hevelius, 40; according to Bayer, 33, and according to Mr. Flamſteed, 80. See CONSTELLATION.

DRACO, in *Biography*, ſucceeded Triptolemus as legiſlator at Athens, in the 39th olympiad, 324 years B.C. When the laws of Triptolemus were become obſolete, or found inſufficient for the regulation of the ſtate, Draco inſtituted a new code, which was ſo extremely rigorous, that his laws were ſaid to be written in blood. Under his ſyſtem of legiſlation, death was the penalty for every kind of offence, in vindication of which he alleged, that as ſmall faults ſeemed to him worthy of death, he could find no ſeverer puniſhment for the greateſt crimes. Such, however, was his abhorrence of the crime of taking away life, that he directed a proſecution to be inſtituted even againſt inanimate things, which had been inſtrumental to this purpoſe, and ſentenced a ſtatue, which had fallen upon a man and killed him to be baniſhed. This circumſtance, if the report of tradition be well founded, affords ſufficient evidence of the rude ſtate of legiſlation in his time. His laws, however, were the reſult of age and experience, and they owed their effect to the opinion that was entertained of his virtue and patriotiſm. The Athenians could not endure their rigour, and the legiſlator himſelf was obliged to withdraw to the iſland of Ægina. Here his popularity was ſuch that he was ſuffocated at the public theatre, amidſt the applauſes of the people. The rigour of his diſcipline was, in ſome meaſure, relaxed by Solon, in the 46th olympiad. See ATHENS.

DRACO, in *Ancient Geography*, a mountain of Aſia Minor, which, according to Pliny, abutted on mount Tmolus on one ſide, and on the other on mount Olympus.

DRACO, in *Zoology*, a genus of amphibious animals of the reptile kind, the body of which is four-footed, tailed and furniſhed at each ſide with a wing-like membrane Linnæus ſpeaks of two diſtinct ſpecies, the *volans* and *præpos*, the laſt of which he deſcribes on the authority of Seba, and theſe appear as two ſpecies in the Gmelinian edition. There are nevertheleſs writers who conſider the latter as a variety only of the other, and thus admit only a ſingle ſpecies in this genus. On the contrary the French naturaliſts, Daudin eſpecially, maintain that there are three kinds at preſent known, and which are diſtinguiſhed by the appellation of the green, the rayed, and the brown. The principal and beſt authenticated ſpecies, however, appear to be the following:

VOLANS. Anterior legs unconnected with the wings. Linn. *Lacerta volans indica*, Raj. *Lacerta africana volans*, *s. Draco volans*, Seba. *Dracunculus*, Bont. Jav. *Flying dragon*, Shaw.

The length of this curious creature is about nine or ten inches, the tail being very long in proportion to the body, which does not exceed four inches in length. The head is of a ſingular form, being furniſhed on the under part with a very large triple pouch, one portion of which deſcends beneath the throat, while the two remaining parts project on each ſide; all are ſharp pointed, and ſeem analogous in ſome degree to the gular creſts of the Guana lizard. The head is of moderate ſize, the mouth rather wide; the tongue large and thick at the baſe, the teeth ſmall and numerous; the neck rather ſmall; the body and limbs ſomewhat ſlender, and entirely covered with ſmall, pointed, and cloſely ſet ſcales. The colour is an elegant pale blue, or bluiſh grey, the back and tail marked by ſeveral tranſverſe duſky undulations, and the wings with variouſly formed patches of black, deep brown, and white; the lower ſurface of the animal entirely pale, or whitiſh brown.

The flying dragon is an inhabitant of Africa and Aſia, and like moſt of the ſmaller kinds of lizards delights in wandering about trees in ſearch of inſects and worms on which it feeds. From the peculiar ſtructure of the lateral proceſſes it is enabled to ſpring from bough to bough in purſuit of its inſect food with the greateſt facility, or even for a ſhort time to follow them on the wing like the bat or flying ſquirrel. On the ground it walks indifferently, and therefore ſeldom deſcends from the boughs of the trees, or if it does, takes as ſpeedily as poſſible to the water, in which element it moves and ſwims with great celerity. It is oviparous, and depoſits its eggs in the hollows of trees, where they remain to be hatched by the heat of the ſun, and claim no further regard from the parent animals.

PRÆPOS. Wings coaleſcing with the arms. Linn. *Draco volans americanus*, Seba.

This is admitted by Linnæus and Gmelin as a diſtinct ſpecies from volans on the teſtimony of Seba, who repreſents it as a native of America: at preſent this kind appears to be unknown to naturaliſts, and the deſcription of it may poſſibly have been formed only from an accidental variety or imperfect example of the firſt mentioned ſpecies.

Linnæus in the Amoen. Acad. and alſo in the earlier editions of the Syſtema Naturæ refers this animal (volans) to the lacerta tribe, but from this he was afterwards induced to ſeparate it, becauſe though in the general form this animal agrees with others of the lacerta, it differs altogether in the remarkable peculiarity of the lateral membranes. Linnæus therefore inſtituted a new genus for its reception, and from a fanciful reſemblance which he conceived it bore to the deſcription of the dragon tranſmitted to us in the fables of antiquity, gave it the appellation of Draco.

It is ſcarcely to be imagined, in the preſent period, that the reader can poſſibly, from a ſimilarity of names, aſſimilate in any manner

manner the fabulous hiſtory of that ſuppoſed monſter, the dragon, with that of the little inoffenſive animal now under conſideration. Neither need any one, it is preſumed, be told that the dragon of antiquity is a creature ſolely of poetic birth. The tales related of this aſtoniſhing being may amuſe our infant years, but are too remote from reaſon for a moment to intereſt the ſerious attention of the naturaliſt. There is nothing in the wide expanſe of creation's range apparent to our knowledge that can incline us to believe even that the conception of the "dragon" originated from any natural object: it is aſſuredly the ſpontaneous offſpring of a glowing imagination created in immediate ſubſervience to the mythology of remote antiquity, and in which it conſtitutes a pre-eminent character. The exiſtence of the dragon was firmly accredited among the ancients of almoſt every nation both in the eaſtern and weſtern regions of the earth, as may be clearly deduced from numberleſs authorities: it occurs in the ſacred allegories of the Jews, and in the legends of the Chineſe, from the earlieſt times of which any record is preſerved, and even to this period is an object of worſhip in China; the like may be alſo ſaid of Japan, and indeed of moſt oriental countries. The claſſic poets of Greece and Rome afford abundant repreſentations of this formidable monſter; the dark retreats of their gods, and their ſacred groves were defended by dragons, and the Romans, Perſians, and various other nations, fought under its banners and protection. The chariot of Ceres was drawn by dragons, and a dragon kept the garden of the Heſperides. In the Scandinavian myſteries the dragon was the miniſter of vengeance under their vindictive gods, and the Britons, like the Gauls, entertained a ſimilar idea of its vengeful powers, while enſlaved in the trammels of Druidic ſuperſtition. The dragon of the ancients was repreſented as poſſeſſing attributes ſometimes even approaching divinity: his form was that of a ſerpent with wings and feet: his ſize was affirmed to be ſtupendous, and the powers he poſſeſſed deſtructive and irreſiſtible: his agility in flight was compared ſometimes with that of an eagle, or ſometimes with the velocity of lightning; and it was furthermore declared, that the brilliancy of his eyes was alone ſufficient to diſſipate the darkneſs of midnight!—The exiſtence of ſuch a marvellous monſter was believed—and may perhaps by ſome be ſtill admitted!—It is not to be denied that the vulgar belief in dragons, as in mermen and mermaids, has the ſanction of the older naturaliſts; and, in truth, we muſt alſo ſay, of ſome credulous writers in the preſent as well as earlier days. There can be no doubt that all the animals deſcribed and figured by thoſe authors, whether ancient or modern, under the ſpecious names of dragons, &c. are merely fictitious beings, either artificially compoſed of the ſkins of different animals; or made by diſtorting ſome of the ray tribe into a dragon-like ſhape, by bending back the two ſides, drawing out the mouth into a beak-like form, ſplitting the lower appendages into the form of feet, or ſubſtituting the legs of a bird or quadruped, and twiſting the tail in a formidable manner over the head, and which, when the creature is perfectly dried, will retain the poſition and appearance in which it is firſt placed. The monſtrous repreſentations to be found in Geſner and Aldrovandus, of a ſeven-headed dragon with gaping mouths, long body, ſnake-like necks, and tail, and feet reſembling thoſe of birds, are of a like kind. Theſe deceptions appear to have been formerly practiſed with much ſucceſs, and miſled not only the vulgar, but even men of ſcience: of this a curious example is ſaid to have occurred towards the cloſe of the ſeventeenth century, and is thus commemorated by Dr. Grainger, from a note of Dr. Zachary Grey, in his edition of Hudibras.

"Mr. Smith, of Bedford, obſerves to me on the word dragon as follows: Mr. Jacob Bobart, botany profeſſor of Oxford, did, about forty years ago, find a dead rat in the phyſic garden, which he made to reſemble the common picture of dragons, by altering its head and tail, and thruſting in taper ſharp ſticks, which diſtended the ſkin on each ſide till it mimicked wings. He let it dry as hard as poſſible. The learned immediately pronounced it a dragon; and one of them ſent an accurate deſcription of it to Dr. Magliabechi, librarian to the grand duke of Tuſcany; ſeveral fine copies of verſes were wrote on ſo rare a ſubject; but at laſt Mr. Bobart owned the cheat: however it was looked upon as a maſter-piece of art, and as ſuch depoſited in the muſeum, or anatomy ſchool, where I ſaw it many years after."

Another remarkable inſtance, in later times, is that of a dragon of a ſimilar kind, which was once the property of a merchant of Hamburgh, and was valued at an immenſe ſum. When Linnæus viſited that city, in his travels in 1735, this monſtrous production was in the poſſeſſion of Spreckelſen, ſecretary of the council, and a conſiderable naturaliſt, and till that time was eſteemed the moſt valuable curioſity in Europe, being received as a pledge for the loan of ten thouſand marks, a ſum equal to ſeven hundred and fifty pounds. This celebrated article, upon an accurate examination, Linnæus diſcovered to be an impoſture, and as he terms it "non naturæ ſed artis opus eximium," the whole being an artful combination of the ſkins of ſnakes, jaw-bones of weaſels, and the legs of birds, ingeniouſly contrived to repreſent a ſeven-headed dragon. A diſcovery ſo injurious to the owner and the credit of the univerſity, excited Linnæus many enemies, and the enraged proprietor determined on a proſecution againſt him, for having deſtroyed the reputation of his property; to avoid which, through the advice of his friend Dr. Jaeniſch, Linnæus thought proper to leave the city.—This monſtrous production is repreſented in the work of Seba.

In the Encyclopædia Britannica another production of the ſame monſtrous kind is deſcribed at ſome length, and repreſented in the 449th plate, under the name of Sea Dragon. An account of this it appears was firſt inſerted in the Gentleman's Magazine for the year 1749; the creature was ſaid to be taken between Orford and Southwould, on the coaſt of Suffolk, and afterwards carried round the country as a curioſity by the fiſhermen who caught it. "Its head and tail (ſays the writer) reſemble thoſe of the alligator; it has two large fins which ſerve it both to ſwim and to fly, and though they were ſo dried that I could not extend them, yet they appear by the folds to be ſhaped like thoſe which painters have given to dragons, and other winged monſters, that ſerve as ſupporters to coats of arms. Its body is covered with impenetrable ſcales; its legs have two joints, and its feet are hoofed like thoſe of an aſs; it has five rows of very white and ſharp teeth in each jaw, and is in length about four feet, though it was longer when alive, it having ſhrunk as it became dry.—It was caught in a net with mackarel; and being dragged on ſhore was knocked down with a ſtretcher, or boat-hook. The net being opened, it ſuddenly ſprung up and flew about fifty yards; the man who firſt ſeized it had ſeveral of his fingers bitten off, and the wound mortifying, he died. It afterwards faſtened on the man's arm who ſhows it, and lacerated it ſo much that the muſcles are ſhrunk, and the hands and fingers diſtorted; the wound is not yet healed, and is thought to be incurable."

A ſlight examination of this amazing prodigy will inconteſtibly prove that the whole is a deception; the article deſcribed is nothing more than the ſkin of the angel ſhark, ſqualus ſquatina, rudely diſtorted, and with very little contrivance diſpoſed into the figure in which we ſee it. With

regard to the disastrous circumstances attendant on its capture, there is reason to admit their plausibility at least; the bite of a shark of the size described, would certainly be dangerous, and might easily deprive a man of his fingers: the shark is also both fierce and powerful, and this species in particular, by the action of its lateral fins in its struggle to escape, might glide along a flat sandy beach to a considerable distance; but the story of its flight deserves no credit. The number of its teeth in the figure and description are at variance; the latter is apparently correct, for the angel shark, like the rest of its tribe, have both jaws furnished with several rows of teeth, and in a specimen, the length of four feet, or rather more, would amount to about five rows in each: the head has been compressed laterally, to give it a more elongated form: the broad lateral fins have been tortured into the semblance of wings, by being stretched considerably, and then folded in plaits; and the ventral fins, which in the fish are oblong, pressed into the form of legs as above described. The whole of the skin, thus distorted and braced up with wire, or with any other kind of bandage till dry, would naturally afterwards retain the grotesque form the preserver had given it.—A similar cheat, we believe, but with the fish in a more recent state, has been very lately attempted by some artful fishermen on one of the learned institutions in Ireland.

Perhaps we have already digressed too far on the art of manufacturing dragons, and the specious frauds that have been practised on the unwary virtuosi, but we cannot consider it altogether unimportant, and sincerely trust that what has been advanced, may operate as a caution to those who, in the study of nature, are attracted only by the marvellous, to be on their guard against similar impositions.

Draco, *Dragon*, in *Natural History*, a fabulous animal, which has been represented under the form of a serpent with wings and feet. The ancients have given various descriptions of this animal, with respect to its size, shape, and colour, and have attributed many ill qualities to it, without foundation. Their accounts of it are very various and contradictory. They were probably led to the idea they formed of it by some extraordinary animals of the genus of serpents, lizards, or crocodiles, &c. which were singular either on account of their figure or size. See Draco *Volans*.

Draco, or *Dragon*, in *Mythology*, the animal consecrated to Bacchus and Minerva. It is also the symbol of Janus, and also of Bacchus Bessarus. Dragons are likewise employed to draw the chariot of Ceres; and a dragon keeps the garden of the *Hesperides*, which see.

It has been suggested that the same Phœnician root of the word *Nabhasch* might equally stand for a keeper, or a dragon; and therefore when this word occurred to denote the keeper of something of value, it was called a dragon. Hence were derived all those fables of the famous dragons, who were set to keep the garden of the Hesperides, the Golden fleece, the cave at Delphi, and the famous fountain of Thebes. Instead of men they substituted monsters; and what has authorised the freedom they took in applying the Phœnician word to that sense is, that to be the guardian of any thing of worth, and to watch for its preservation, it was necessary to be sharp sighted and vigilant; which is imported in the Greek words δφις and δεακων, which Le Clerc upon Hesiod deduces from ὄπομαι and δεκομαι, to see. "Igitur credibile est eandem vocem Phœnicia lingua et Serpentem et Custodem significasse." The winged dragons that drew the chariot of Medea, are supposed to have had their rise from the ship in which Jason and Medea embarked, which was called the "Dragon."

Draco *Arbor*, in *Botany*. See Dracæna.

Draco *Marinus*, in *Ichthyology*, synonymous with the weever fish, or stingbull. See Trachinus.

Draco *Regis*, in *Antiquity*, the standard ensign, or military colours, borne in war by our ancient kings, having the figure of a dragon painted on them. Rog. Hoved. sub ann. 1191.

Draco *Volans*, in *Zoology*, a species of *Draco*; which see.

Draco *Volans*, among *Meteorologists*, is used for a fat, heterogeneous, earthy meteor, appearing long and sinuous, something in the shape of a flying dragon.

This shape is supposed to arise from the hind part of the matter of this meteor being fired with greater impetuosity than what comes first out of the cloud, and it is supposed, that the broken parts of the cloud, and the sulphureous matter which adhere to them, form the apparent wings of this imaginary dragon.

This sort of exhalation is principally seen on the borders of rivers, and in marshy places, and seldom rises very high from the ground, but plays and dances about the surface in an agreeable manner; and if people go up to it, it will stick to their hands or cloaths without burning or doing them any injury. They are more common in the summer months than in the winter, and are more frequently seen in thick weather than in clear.

DRACOCEPHALUM, in *Botany*, (from Δρακων, a *dragon*, and κεφαλη, the *head*, because of the large swelling form of its ringent corolla,) Linn. Gen. 298. Schreb. 395. Willd. Sp. Pl. v. 3. 149. Juss. 116. Gærtn. t. 66. Class and order, *Didynamia Gymnospermia*. Nat. Ord. *Verticillatæ*, Linn. *Labiatæ*, Juss.

Gen. Ch. *Cal.* Perianth of one leaf, tubular, permanent, very short. *Cor.* of one petal, ringent; tube the length of the calyx; throat very large, oblong, inflated, gaping, a little compressed at the back; upper lip direct, vaulted, folded, obtuse; lower three-cleft, its lateral segments erect, as if belonging to the throat, its central one pendulous, small, prominent at the base, roundish, cloven. *Stam.* Filaments four, awl-shaped, concealed under the upper lip of the corolla, two of them rather shorter than the rest; anthers nearly heart shaped. *Pist.* Germen four-lobed; style thread-shaped, situated like the stamens; stigma cloven, acute, slender, reflexed. *Peric.* none, except the permanent calyx. *Seeds* in the bottom of the calyx, four, ovate-oblong, three-angular.

Ess. Ch. Corolla with an inflated throat, and concave upper lip.

Obs. The calyx in this genus is variously formed in different species, but always more or less perfectly two-lipped.

Willdenow has eighteen species, ten of which bear their whorls crowded into a spiked form, the rest have them axillary. The flowers are violet, pale purple, or reddish. The herbage in general is aromatic; in D. *canariense*, a common green house plant vulgarly called Balm of Gilead, highly and most agreeably scented, as also in D. *Moldavica*, Moldavian Balm, a hardy annual species; while D. *sibiricum* is fœtid, and compared by Willdenow, not unaptly, to rancid oil. D. *austriacum*, Jacq. Ic. Rar. v. 1. t. 112, a rare and magnificent species, was first figured by Clusius, (Hist. v. 2. 185. Chamæpitys austriaca,) but from his time not observed by botanists, till it was detected by Host again in Austria a few years ago, and by others in Hungary, &c. Its flowers are large, of a rich violet. D. *grandiflorum*, another fine alpine species, is well figured in Curt. Mag. t. 1009, where it is justly observed that

that this and the *altaiense*, with Willdenow's *palmatum*, are all probably but one species.

DRACON, in *Ancient Geography*, a river of Italy, which ran near Vesuvius; now *Dragone*.

DRACONARIUS, in *Antiquity*, *Dragon-bearer*. Several nations, as the Persians, Parthians, Scythians, &c. bore dragons on their standards; whence the standards themselves were called dracones, dragons. The Romans borrowed the same custom from the Parthians, or, as Casaubon has it, from the Dacæ; or, as Codin, from the Assyrians.

The Roman dracones were figures of dragons painted in red on their flags; as appears from Ammianus Marcellinus; but among the Persians, and Parthians, they were like the Roman eagles, figures in full relievo; so that the Romans were frequently deceived, and took them for real dragons.

The soldier, who bore the dragon or standard, was called by the Romans draconarius: and by the Greeks δρακοναριος, and δρακοντεισφορος; for the emperors carried the custom with them to Constantinople.

Pet. Diaconus, Chron. Casin. lib. iv. cap. 39. observes, that the bajuli, cercostatarii, staurophori, aquiliferi, leoniferi, and draconarii, all marched before king Henry when he entered Rome.

DRACONIS, Caput. See Caput and Dragon.

Draconis, *cauda*. See Cauda and Dragon.

Draconis, *sanguis*. See Dragon's *blood*.

Draconis, *venter*. See Venter.

DRACONITES, John, in *Biography*, a learned German theologian, was born at Carlstadt in the year 1494. By his great talents, and industry he acquired great reputation, was employed in many important negotiations, and attained to the high rank of bishop of Marspurg, and Rostock, and Sameland in the Prussian dominions. He published Commentaries on various parts of the sacred writings, in which were displayed much learning, and critical acumen. He began a Polyglott of the bible in five languages, which however, he did not live to finish. He died suddenly April 18th 1566. Moreri.

DRACONON, in *Ancient Geography*, a promontory, mountain, and town of the island of Icaria.

DRACONTEAS, in *Botany*, a name given, by Neophytus, and some others of the later Greek writers, to two plants distinguished by the epithets of the great and the little kinds. The great draconteas is the plant we call dragons, and the small draconteas is the arum. Neophytus says, that the roots of some species of the small draconteas were eatable, which we also know to be true at this time; for though with us the juice of this plant is fiery and corrosive, yet we know that there are esculent arums in other parts of the world. The Greek writers, from the earliest times we have accounts of, were not ignorant of this; and Theophrastus in particular has described an esculent rooted arum under the name of arum edodimum.

DRACONTHEMA, a name used by some of the old writers in medicine for what we call sanguis dragonis, or dragon's blood, a red vegetable resin.

DRACONTIA, in *Ancient Geography*, *Cani*, two small islands upon the coast of Africa, over against the gulf of Hippone. They are mentioned by Ptolemy; and were situated N.N.W. of the promontory of Apollo, and E. of the promontory *Candidum*.

Draconia, or *Dracontia lapis*, in *Natural History*, a name given by authors to a roundish or oval pellucid stone, which seems no other than a crystal cut into that form, and polished by the savage inhabitants of several nations before the Roman conquests, and intended to be worn as ornaments. Authors tell a number of idle and fabulous stories about this stone, imagining it to be naturally of this figure and polish, and to be found in the head of a dragon. They are not indeed all agreed about the species of the stone; Ficinus describing an astroites under this name, and others some other coloured stone; but the generality of writers, especially the old ones, make it colourless and pellucid.

DRACONTIC Month, the space of time wherein the moon going from her ascending node, called caput draconis, returns to the same.

DRACONTIUM, in *Botany*, a genus founded by Linnæus in his Corollarium Generum Plantarum, 19, to which, on account of its affinity to *Arum*, he applied this name. The Δρακοντιον of Dioscorides, and probably of Theophrastus, is indeed *Arum Dracunculus* of Linnæus, and of all recent authors. Hermann applied the name of *Dracontium* to all of this natural order with divided leaves, such being the case with *A. Dracunculus*; but this character neither indicates a natural generic distinction, nor does it accord with any technical marks in the fructification. Linn. Gen. 471. Hort. Cliff. 434. Schreb. 745. Willd. Sp. Pl. v. 2. 288. Juss. 24. Class and order, *Gynandria Polyandria*, according to Linnæus, but much more correctly *Heptandria Monogynia*, as Schreber and Willdenow have judged. Nat. Ord. *Piperitæ*, Linn. *Aroïdeæ*, Juss.

Gen. Ch. *Cal.* Sheath boat-shaped, coriaceous, very large, of one leaf. Spadix short, simple, cylindrical, entirely covered with florets collected into a head, each of which has no proper perianth, unless the corolla be taken for such. *Cor.* Petals five, inferior, concave, ovate, obtuse, nearly equal, coloured. *Stam.* in each floret. Filaments seven, linear, depressed, erect, equal, longer than the petals; anthers square, two-lobed, oblong, obtuse, erect. *Pist.* Germen superior, nearly ovate; style round, straight, the length of the stamens; stigma small, triangular. *Peric.* Berry roundish. *Seeds* numerous.

Ess. Ch. Sheath boat-shaped. Spadix entirely covered with florets. Petals five, inferior. Berry with many seeds.

Linnæus enumerates six species, Willdenow seven. They are destitute of pubescence, with round stems or stalks, having the habit of an *Arum*. D. *pertusum*, Plum. Amer. t. 56, 57, is remarkable for numerous elliptical perforations in its leaves. D *polyphyllum*, Herm. Parad. t. 93, has repeatedly compound and pinnatifid *leaves*. Its *flowers* grow on short radical, solitary stalks, each having a large dark-purple sheath. Linnæus in Hort. Cliff. says, "when the sheath opens, it exhales a smell like that of the most putrid carcase, capable of taking away any person's senses and understanding; but it is remarkable that after a few days, when the anthera begin to shed their pollen, this poisonous fœtor in an hour's time absolutely ceases." It grows between the tropics, in various countries, but is scarcely known in our stoves. Forster mentions it as cultivated in the Society Islands for the sake of its root, which, though acrid, is eaten in times of a scarcity of bread-fruit, being, no doubt, rendered eatable by cookery. Thunberg hints that it is used in Japan to procure abortion, and Forster more openly declares that it serves the same iniquitous purpose among the members of the detestable associations of those islands, where child-murder is authorized. What an acquisition would this root prove to some of our quacks, who in the public papers advertise, as openly as they dare, to render their patients the same pious service! Happy for the community if their ignorance in some measure circumscribes their powers of mischief! S.

DRACONTUS, in *Ancient Geography*, an island of Africa, on the coast of Libya.—Also, a place of Asia, in Armenia Minor, according to the Itinerary of Antonine.

DRACUNCULI, in *Medicine*, a name used by authors for a sort of long and slender worms, which breed in the muscular flesh of the arms, legs, &c. and from their being more frequent in some parts of Guinea than elsewhere, are called by many Guinea-worms. They have been long known in the world; and Plutarch quotes Agatharcides for an account of these animals, which, he says, the people about the Red-sea were at a certain time very much afflicted with. It is more particularly a disease in children, wherein they feel a vebement itching, supposed to arise from these worms, called dracunculi, generated of a viscid humour under the skin, about the back, shoulders, and arms.

Children seized with the dracunculi become hectic, and scarce receive any nourishment at all, though they eat plentifully. The disease, however, is not so peculiar to children, but that grown persons have been sometimes affected with it. The emperor Henry V. is said to have died of it; having had it from his birth.

The women in Poland cure their children of the dracunculi after the following manner: the child is washed and bathed in warm water, wherein a quantity of crummed bread, and a handful of ashes have been cast. The water being poured off, and the bread gathered into a mass; when they come to break it again the next day, they find in it an infinite quantity of fine hairs, which some call dog's hairs, and others, worms; and it is those hairs, or worms, which are supposed to be the cause of the disease.

After thus batbing the children, they rub their shoulders and arms with flour steeped in vinegar, or honey; upon which immediately there rises on the skin a great number of tubercles, like poppy-seed; supposed to be the heads of worms. These they scrape off as fast as they appear; otherwise they withdraw beneath the skin again. The operation is repeated till such time as no more tubercles arise.

The dracunculi is a disease little known in England. The editors of the Leipsic Acts, speaking of it, in the tome for the month of October, 1682, call the bodies, which put forth at the pores after bathing, thick hairs, "corpuscula pilorum crassiorum instar densa et spissa," and not fine slender hairs, as Degori calls them. They add, that these little corpuscles are hence called crinones; and by reason of their devouring the food, which should nourish the children, comedones. Velschius, in a curious dissertation on the subject, calls them capillary worms: "exercitatio de vermibus capillaribus infantum."

As to the nature and figure of these little bodies, the same editors observe, that the microscopes have put it past doubt, that they are real living animals, of an ash colour, having two long horns, two large round eyes, and a long tail, terminated with a tuft of hair; but that it is difficult to draw them out whole, by scraping the child's body; because being very soft, the least rubbing bruises them, and breaks them.

They are no where so frequent as on the Gold-coast in Guinea about Anamaboe and Cormantyn. The worm is white, round, long, and uniform, very much resembling a piece of white round tape or bobbin. It is lodged between the interstices of the membranes and muscles, where it insinuates itself to a prodigious length, sometimes exceeding five ells. It occasions no great pain in the beginning; but when it is about to shew its head a swelling and inflammation appear on the part, which is usually the ankle, or some part of the leg or thigh.

The countries where this creature is thus produced are very hot, and subject to great droughts, and the inhabitants make use of stagnating and corrupted water, in which it is probable the ova of these animals lie: the white people and negroes, who drink this water, are equally subject to these worms.

The surgeons seldom attempt to extract this worm by incision; but when the tumour appears, they endeavour to bring it to a suppuration as soon as they can; and when they have broke the swelling, and the head of the worm appears, they fasten it to a stick, and continue gradually winding it round at the rate of an inch or two in a day, till they by this means, have wound it all out. If it be wound too hastily, it is apt to break in the operation; and if it does, the end is not easily recovered again; and if not, there are abscesses formed, not only at the place where it breaks, but all along the whole winding of the muscles where the dead worm remains; so that often from one worm thus broken, there are produced a number of obstinate ulcers in different parts. When the worm has not been broken, the ulcer out of which it was extracted heals easily, and there is no farther trouble about it. Town's Diseases of the West Indies, p. 561.

The daily use of aloes, or of any other anthelmintic medicine, is proper, during the extraction of the worm in order to facilitate its discharge. See CHÆTIA.

DRACUNCULOIDES, in *Botany*, the name given by Boerhaave to the Blood-flower, or *Hæmanthus*, which see.

DRACUNCULUS, see ARTEMISIA, sp. 40, and ARUM, sp. 2; also ACHILLEA PTARMICA, sp. 12; which last was named by C. Bauhin *Dracunculus pratensis, serrato folio*. See likewise CALLA PALUSTRIS, sp. 2, the *Dracunculus aquaticus* or *palustris* of some authors. *Polygonum Bistorta* has been called by Buxbaum *Dracunculus minor*.

DRACUNCULUS, in *Ichthyology*. See DRAGONET.

DRACUNCULUS, in *Zoology*. See DRACO *volans*.

DRACUS, in *Ancient Geography*, a river of Gaul, which discharged itself into the Isara, near *Calaro* (Grenoble.)

DRACUT, in *Geography*, a post town of America, in Middlesex county, on the northern bank of Merrimack river, opposite to Patuchet's falls, lying 30 miles N. by W. of Boston, and containing 1274 inhabitants.

DRAFF, a name given in some places to the wash given to hogs; and the grains given to cows.

DRAG, in *Building*. A door is said to drag; when in opening or shutting it hangs or grates upon the floor.

DRAG, in *Agriculture*. Drags are implements employed both for the purposes of clearing land, and preparing it for putting in the seed. They are made with considerable difference in different parts of the kingdom. The common drag is most generally made use of, but the duck-footed one, with four rows of teeth, is preferable in many cases, as it does its work more effectually. A late writer recommends an instrument of this kind, in which the teeth are fixed in by wedges instead of screws, so that they can be put in and taken out readily, and be set to any depth, as a very useful tool.

Implements of this sort are commonly made of a triangular form, being about seven feet in width behind, and having thirteen or fourteen teeth in each of their sides, but in such directions as to cross each other, being fastened at top either by screws or some other convenient means. Where such implements are made use of, occasionally as scarifiers, the teeth should be wedged in somewhat in the manner of coulters, and a proper set must be had for the purpose.

DRAG, in *Sea-Language*, is a machine, consisting of a sharp, square, iron ring, encircled with a net, and commonly used to take the wheel off from the platform or bottom of the decks.

DRAG-*Ropes*. See ROPE.

DRAGA,

DRAGA, in *Ancient Geography*, a town of Arabia Felix. olemy

DRAGE, in *Geography*, a town of Germany, in the duchy of Holſtein, 4 miles N. of Itzchoa.—Alſo, a river of Germany, in the circle of Upper Saxony, which runs into the Netza, ſix miles E. N. E. of Drieſen, in the New Mark of Brandenburg.

DRAGEMEL, a town of Germany, in the duchy of Carniola, on the Save; ſix miles N. of Laubach.

DRAGGING *the* ANCHOR. See ANCHOR.

DRAGHI, GIO. BATTISTA, in *Biography*, an Italian muſician, who came to England about the time of Charles II.d's marriage with the infanta Catherine of Portugal, and was appointed his majeſty's organiſt and maeſtro di cappella. He aſſiſted Lock in compoſing Shadwell's Engliſh opera of Piyche, and was muſic maſter to queen Anne. He preſerved his ſtation at Somerſet houſe to the time of that queen's death. We believe him to have been the brother of Antonio Draghi, who was opera compoſer to the court of Vienna during 40 years.

DRAGMA, in *Pharmacy*, a name uſed by the ancients for a handful of any herb or other medicine.

DRAGMIS, a word uſed by the ancients to ſignify a pugil, or as much of any thing as can be taken up at a pinch, between the thumb and two fingers.

DRAGMUS, in *Ancient Geography*, a town of the iſland of Crete.

DRAGO, BOCCADEL, in *Geography*, a ſtrait between the iſland of Trinidad and Andaluſia, in the province of Terra Firma, South America.

DRAGO, a village ſouth of Copenhagen, in the iſland of Zealand, inhabited chiefly by pilots, who, in time of peace, pilot all ſhips paſſing the Sound through the entrance of the Baltic, or the Cattegat.

DRAGOE, in *Geography*, a town of Denmark, in the iſland of Amack; ſix miles from Copenhagen

DRAGOGI, in *Ancient Geography*, a people of Aſia, placed by Arrian with the Drangi.

DRAGOMAN, DROGMAN, or *Drogueman*, is the name of ſecretaries attached to Chriſtian miniſters and conſuls reſiding at Conſtantinople, or in Aſia and Africa, who act as interpreters between them and the officers of the court or town where they reſide.

The word dragoman is ſaid to be derived from the Arabic *targeman*, or *taragem*, he has interpreted. From this the Italians formed *dragomano*, and the French *dragoman*, *truchemen*, or *truchement*. The latter denomination, however, might perhaps be deduced from *turcoman*, an inhabitant of Turcomania, an Aſiatic province, which may have produced the firſt, or the greateſt number of interpreters in the Eaſt.

It is only ſince the year 1669 that the French, with a policy worthy to be imitated by other Chriſtian nations trading with the Eaſt, ſent every three years ſix young boys, who chuſe to go, from eight to ten years of age, to be educated at the expence of the ſtate, in a convent of Capuchin friars at Conſtantinople, and to be early inſtructed in the different idioms of the Eaſt, in order to be afterwards appointed dragomans, or interpreters, to the French miniſters and conſuls, who thus were not left at the mercy of Greeks and other foreigners little attached to their nation, and frequently ſeduced to betray its deareſt intereſts.

DRAGOMAN, in *Geography*, a town of European Turkey, in the province of Bulgaria; 22 miles W.N.W. of Sofia.

DRAGOMESTRO, a town of European Turkey, in Livadia; 44 miles W.N.W. of Lepanto.

DRAGOMIRNA, a town of European Turkey, in Moldavia; 8 miles N. of Suczava.

DRAGON, in *Aſtronomy*. See DRACO.

Dragon's head, and tail, *caput & cauda draconis*, are the nodes of the planets; or the two points, wherein the ecliptic is interſected by the orbits of the planets, and particularly that of the moon; making with it angles of five degrees and eighteen minutes.

One of theſe points looks northward; the moon beginning then to have northward latitude, and the other ſouthward: where ſhe commences ſouth.

This her deviation from the ecliptic ſeems (according to the fancy of ſome) to make a figure like to that of a dragon, whoſe belly is where ſhe has the greateſt latitude; the interſection repreſenting the head and tail, from which reſemblance the denomination ariſes.

But note, that theſe points abide not always in one place, but have a motion of their own in the zodiac, and retrograde-wiſe, 3 minutes 11 ſeconds *per* day; completing their circle in 18 years 225 days; ſo that the moon can be but twice in the ecliptic, during her monthly period; but at all other times ſhe will have a latitude, or declination from the ecliptic.

It is about theſe points of interſection that all eclipſes happen.

They are uſually denoted by theſe characters, ☊ dragon's head, and ☋ dragon's tail.

DRAGON, in *Natural Hiſtory*. See DRACO.

DRAGON, *Allegorical*, the emblem of the devil, in alluſion to Pſalm xci. 13. Hence a dragon pierced or trampled upon is, in painting and ſtatuary, the attribute of different ſaints, particularly of St. Michael, St. George, and St. Margaret the Martyr.

DRAGON *Beams*, in *Architecture*, are two ſtrong braces or ſtruts, which ſtand under a breaſt-ſummer, and meet in an angle on the ſhoulder of the king-piece.

DRAGON'S *Blood*, *Sanguis Draconis*. This ſubſtance is a blood red reſin, obtained from certain large palm-trees, growing in the Eaſt Indies, (*Calamus Rotang & Pterocarpus Draco*,) and alſo in South America; but the Eaſt Indies furniſh all that is uſed in this country.

The dragon's blood is of a deep red colour; and the beſt ſort is brought over in oval drops, obviouſly the exſudations from the tree; but the ordinary ſort is in large ſhapeleſs cakes or maſſes, generally impure, to the eye containing a good deal of foreign matter. There are beſides to be met with in trade ſeveral artificial compoſitions of ordinary gums, and other matters, coloured like the true dragon's blood, and paſſed off for it.

This reſin, when finely pulveriſed, becomes a fine crimſon. It is totally inſoluble in water, inſipid and without ſmell when cold, but if heated it gives a fragrant odour, like benzoin. Alcohol diſſolves it almoſt totally, eſpecially when aſſiſted by heat, and the ſolution is of a fine deep red, which will ſtain heated marble readily and permanently, and has often been uſed for this purpoſe. Dragon's blood diſſolves alſo in oils: like all the other reſins it burns readily, and with a bright flame and much ſmoke: when burning it emits a ſtrong ſmell of benzoic acid. Some of this acid, though in very minute quantity, may be obtained from this reſin, by means of lime, as from BENZOIN, in the way mentioned under that article.

The dragon's blood is uſed a little in medicine, and is ſuppoſed to be gently reſtringent, and the ſolution in alcohol does ſhew ſome degree of aromatic and aſtringent taſte. It is, however, but little employed in medicine, and might very well be expunged from the Pharmacopœia.

It the arts, however, this reſin is of very conſiderable utility, as a fine deep-bodied colour, totally unacted on by

moiſture, and very permanent. It is employed in ſtaining marble, leather, wood; in lacquering and varniſhing, and for ſimilar uſes, and is ſo much valued by artiſts, that the fineſt ſamples bear a pretty high price.

Dragon *Fly*, in *Entomology*. See Libellula.

Dragon, *Gum*. See Tragacanth.

Dragon's *Head*, in *Botany*. See Dracocephalum.

Dragons. See Arum and Dracontium.

Dragon *reverſed*, *Knights of*, an order of knighthood inſtituted by the emperor Sigiſmund, about the year 1418, after the council of Conſtance, in memory of the condemnation of John Huſs and Jerome of Prague. This order, which once flouriſhed in Germany and Italy, is now extinct.

Dragon, *Sea*. See Draco.

Dragon, *Snap*. See Antirrhinum and Ruellia.

Dragon *of Wantley*; the title of an old Yorkſhire ſatirical ballad of much wit and humour. It is ſuppoſed to have been written early in the reign of James I., and in burleſque of romances and the wonders of chivalry. We have a very ample and curious hiſtorical account of the origin of this ballad, in the laſt edition of "Percy's Reliques of Ancient Poetry," in which a tyrannical and rapacious landlord is figured under the "Dragon;" and "More of More Hall" was either the attorney or the counſellor who conducted a ſucceſsful ſuit againſt him on the ſubject of tithes. But this ballad is mentioned here among muſical articles, having been the foundation of Harry Carey's celebrated burleſque opera of the "Dragon of Wantley," ſo admirably ſet to muſic by Lampe, in 1737, "after the Italian manner." This excellent piece of humour had run twenty-two nights, when it was ſtopped, with all other public amuſements, by the death of her majeſty queen Caroline, November 20th, but was reſumed again on the opening of the theatres in January following, and ſupported as many repreſentations as the "Beggar's Opera" had done, ten years before. And if Gay's original intention in writing his muſical drama was to ridicule the opera, the execution of his plan was not ſo happy as that of Carey; in which the mock heroic, tuneful monſter, recitative, ſpendid habits, and ſtyle of muſic, all conſpired to remind the audience of what they had ſeen and heard at the lyric theatre, more effectually than the moſt vulgar ſtreet tunes could do; and much more innocently than the tricks and tranſactions of the moſt abandoned thieves and proſtitutes. Lampe's muſic to this farcical drama was not only excellent fifty years ago, but is ſtill modern and in good taſte.

Dragons *Water*. See Calla.

Dragon, *Wild*. See Artemisia.

Dragon's *Wort*. See Artemisia.

DRAGONERA, in *Geography*, a town of Italy, in the kingdom of Naples, and province of Capitanata; 15 miles N. of Volturara.—Alſo, a ſmall uncultivated iſland in the Mediterranean, not more than a mile from the weſt coaſt of the iſland of Majorca. N. lat. 39° 35′. Long. 19° E. Peak of Teneriffe.

DRAGONET, in *Ichthyology*, the Engliſh name of the fiſhes belonging to the Linnæan genus Callionymus. The character of this genus conſiſts in having the upper lip doubled up: eyes approximate: gill membrane ſix-rayed, with the covers cloſed and breathing aperture in the neck: body naked: ventral fins very remote.

Species.

Lyra. Anterior ray of the firſt dorſal fin as long as the body. Linn. Donov. Brit. Fiſhes, &c. Gemmous Dragonet.

A native of the Northern and Mediterranean ſeas; about 12 inches in length, and feeds on echini or ſea eggs, ſtar-fiſh, &c. Scarce on the Engliſh coaſt. The colours of this fiſh are various and beautiful.

Dracunculus. Rays of the firſt dorſal fin ſhorter than the body. Linn. Donov. Brit. Fiſhes, &c. Sordid Dragonet.

About the ſame ſize as the former or rather ſmaller, the general colour livid above, beneath whitiſh. It is a native of the European ſeas, and has been incorrectly named by ſome Engliſh writers the yellow gurnard.

Indicus. Head longitudinally wrinkled; gill covers open at the ſides. Bloch. Indian Dragonet.

A native of Aſia. The body is much depreſſed and of a livid colour.

Baikalensis. No ventral fins: firſt dorſal fin very ſmall: ſecond with ſerrated rays. Baikal Dragonet.

Inhabits the deepeſt parts of the lake Baikal, and in ſummer approaches the ſhore in great numbers. The length of this fiſh is about nine inches, the body, ſoft, ſlender, gradually tapering from the head, and oily to the touch.

Ocellatus. Membrane of the firſt dorſal fin ſtriped with brown, and marked with four brown ocellate ſpots. Ocellate Dragonet.

A native of the ſea round Amboyna; ſmall, varied with cinereous and brown, and ſprinkled with white ſpecks: beneath whitiſh, roundiſh, tapering, head much depreſſed: body fatter than the reſt of the tribe.

Sagitta. Head triangular: gill membrane three-rayed: rays of the dorſal fins equal. Arrow-headed Dragonet.

Found in the ſea about Amboyna: length three inches: above browniſh clouded with grey, beneath whitiſh grey; body thin, depreſſed near the head, and tapering downwards: form ſomewhat convex and four-ſided.

Japonicus. Firſt dorſal fin with a black ocellate ſpot, the firſt ray terminating in two hairs half an inch long. Japan Dragonet.

Length about nine inches; the head depreſſed: eyes large and approximate, the firſt dorſal fin with black rays, the poſterior whitiſh: the body is ſmooth, roundiſh and variegated.

DRAGONNE'E, in *Heraldry*. A lion dragonnée, is where the upper half reſembles a lion; the other half going off like the hind part of a dragon.

The like may be ſaid of any other beaſt as well as the lion.

DRAGOON, in *Ornithology*, the name of a ſmall kind of carrier-pigeon called columba tabellaria minima by Moore. It is a baſtard-breed between the two ſpecies of pigeons called the horſeman and the tumbler. They are very good breeders, and as they are lighter than the horſeman, they are ſuppoſed more expeditious in flight for a few miles, but the horſeman outdoes them at greater lengths. One of theſe pigeons flew from St. Edmundſbury to London, being a diſtance of ſeventy-two miles, in two hours and a half.

Dragoon, in *War*, implies a horſe ſoldier, who is at the ſame time, capable of acting with effect when diſmounted. Formerly the heavy dragoons were armed with muſkets and bayonets, as well as with ſword and piſtol, and were often poſted in woods, having their horſes in their rear, ſo as to deceive an enemy, and to gallop out whenever any break in his line might favour their evolutions. But as the mode of warfare throughout Europe became leſs ceremonious, and, that in lieu of meeting, as it were by common conſent, on ſome extenſive plain, to fight it out according to the manœuvres formerly in vogue, more active, and enterprizing practices have been adopted, the dragoons, with the exception of the dragoon guards, commonly called the life guards, are completely metamorphoſed. Their heavy accoutrements are

are supplanted by those of a compact light construction; and in lieu of muskets, very light carabines are in use. But even this class has been considerably diminished; there being now very few regiments of heavy dragoons in the service. The British cavalry consists, for the most part, of light cavalry, something on the principle of the Austrian hussars, and armed only with sword and pistols. The superior effects produced in the field by troops so admirably calculated for celerity, and for promptness in remote attacks, added to the important advantages of the sword exercise, as now taught in our cavalry regiments, must give a permanence to this part of the establishment. Our light dragoons may, indeed, be competitors with those of any nation: They are picked men, well mounted, well taught, and led on by officers of the greatest ability and spirit. Hence we invariably find their efforts eminently successful. It will, however, be observed that the old principle of making the dragoons dismount has, in a great measure, become obsolete. The etymology of the word may be easily traced to the French derivation Dragon, which was originally given to these troops on account of the fierceness of their attack. The charge of heavy cavalry is certainly forcible to an extreme; but the light corps possess infinite advantages in other respects.

DRAGOT, in *Geography*, a town of European Turkey, in Albania, on the Crevasa; 36 miles S. S. E. of Durazzo.

DRAGS, in *Agriculture*. See Drag.

Drags in *Rope making*, are formed like the after-part of the Sledge, to which they are fastened by ropes, and are lined with a board on the upper side. They contain weight, as a press; when the rope requires more than the sledge can carry to keep the strands of a proper stretch, and prevent their shrinking, as they get hard, and as the rope is brought to its intended size.

Drags, in the *Sea-Language*, are used for whatever hangs over the ship in the sea, as shirts, coats, or the like; and boats when towed, or whatever else that, after this manner, may hinder the ship's way when she sails.

Drags, denote also floating pieces of timber so joined together, that by swimming in the water they may bear a burden or load down a river. Stat. 6 Henry VI. c. 15.

Drags. See Drowning.

DRAGUIGNAN, in Latin *Drazenum* and *Draguinianum*, in *Geography*, a town of France, chief place of a district of the same name, and of the department of the Var, situated on the river Pis in a fruitful and agreeable country, 12 miles N. W. of Frejus, as many N. by W. of Saint Tropez and 45 miles N. E. of Toulon. It has a population of 6561 individuals, and its canton contains 5 communes and 12,355 inhabitants upon a territorial extent of 257 kiliometres and a half. Draguignan is at a distance of 808 kiliometres, or about 605 English miles, from Paris.

As chief place of a district, and of the whole department, Draguignan has a prefect, a court of justice, a register office, and is a military station for the brigadier who commands in the department. The soil of its district is uncommonly fertile. The hills are covered with vineyards which produce excellent, but very strong, wine.

The district of Draguignan contains 10 cantons, 58 communes and 71,383 individuals upon a territorial extent of 2757½ kiliometres.

DRAGUSCANI, a town of European Turkey, in Moldavia, 48 miles E. of Jassi.

DRAGUT, in *Biography*, was born of obscure parents at a village of Natolia opposite the isle of Rhodes. At an early age he shewed an attachment to the business of warfare, and entered when he was only 12 years of age under an officer of artillery in the grand signior's galley. Here he became expert in all the business connected with his station, and was enabled from his gains to save as much money as would purchase a galley of his own, with which he made several successful cruises. The skill and prowess which he exhibited on every occasion of difficulty and danger obtained for him the patronage of Barbarossa, the admiral of the Turkish fleet, who in a short time raised him to the command of a squadron of twelve galleys. With this force he did incredible mischief on the coasts of Italy and the neighbouring islands, till he was attacked by Giannetino Doria in 1548. To him Dragut was forced to surrender prisoner. Offers to a great amount were made as a ransom, which were refused, and Dragut suffered a most rigorous confinement for four years, when he was delivered to H. Barbarossa, who reinstated him in his former command. Dragut now looked for revenge; he renewed his ravages with augmented fury, and in 1552 his good fortune prevailed over the celebrated Andrew Doria, from whom he took several ships, sent out to oppose him. On the death of Barbarossa, Dragut succeeded to the full command of the Barbary corsairs, with which he performed prodigies of valour. He was afterwards enable, by his utmost efforts, to defend himself in the strong fortress of Mehodia which he had seized, and made use of as the repository of his treasures and stores; all which fell into the hands of the Christians. At the siege of Malta he was wounded in the head which proved fatal to him. In history Dragut is considered rather as a pirate than a regular commander. Moreri. Univ. Hist.

DRAIN, or Drein, in the *Military Art*, a trench made to draw the water out of a moat, which is afterwards filled with hurdles and earth or with fascines, or bundles of rushes and planks, to facilitate the passage over the mud. See Trenches.

Drain, a name given in the fen countries to certain large cuts, or ditches, of twenty, thirty, nay sometimes forty feet wide, carried through the marshy ground to some river, or other place capable of discharging the water they carry out of the fen-lands. Most of these drains are made in our fen-countries by a body of men called the Undertakers, whose reward is one third of the ground they drain. They also erect sluices at a great expence, often not less than two thousand pounds each. Yet these, with all the care they employ in erecting them, are subject to be blown up by the vast weight of water that lies upon them when the lands are overflown. Some of these sluices have two or more pair of doors, of six, eight, or ten, feet high, which shut when the water in the river is higher than in the drains, by the weight and force of it; and so *à contra*, throw out a body of eight feet square of water for about six or seven hours during the ebb. The real use of these drains is very evident from the present state of the land where they are cut, and that of it before. In Camden's time all this was bog, and now it is all firm land. The country about Crowland was in that author's time so soft, that it was not passable by carriages, and thus grew a witticism upon it, that all the carts that entered this town were cased on the wheels with silver; but this is now so firm ground, that carriages of any kind pass over it. The duck-ponds used to be called the fen corn-fields, and they now are such in reality, their bottoms being dry, and producing oats, and rape-feed, or cole-feed, with great increase. Phil. Trans. N° 223.

Drains are also more generally used to carry off the superfluous moisture from wet and marshy lands. See Draining.

DRAINE, in *Ornithology*, the name given by Buffon to the Turdus *viscivorus*, which see.

DRAINING *of* Lands, in *Agriculture*. Although it has

has been clearly ſhewn by the various experiments and obſervations that have been made on the nature of vegetation, that a large proportion of water is eſſentially neceſſary for the ſupport of the healthy growth of plants, and which will be ſtill further explained in ſpeaking of the application of it to graſs lands; it is evident that it may exiſt in ſuch over-quantities, or be ſo retained in or upon ſoils, as to prove not only highly injurious to the growth of the crops, whether of grain or graſs, but likewiſe prejudicial to the health of thoſe who inhabit the diſtricts where it is ſuffered thus to become ſtagnant; it therefore becomes the buſineſs of the farmer, in ſuch caſes, to attempt the removal of thoſe prejudicial exceſſes of moiſture before he commences any other operations for the purpoſe of improving ſuch lands; as, without fully accomplihing this object in the firſt inſtance, all his future exertions will be of but little avail. This may, in ſome inſtances, be accomplihed by means of draining; a practice, the ſucceſsful execution of which in a great meaſure depends on a proper knowledge of the ſtructure of the earth, and of the various ſtrata of which it is compoſed, as well as of their relative degrees of poroſity or capability of admitting or rejecting the paſſage of water through them; and likewiſe the modes in which water is formed and conducted from the high or hilly elevations that preſent themſelves on the ſurface of the globe, where originally formed. It has been clearly ſhewn, by ſinking large pits and digging into them, that they are moſtly compoſed of materials lying in a ſtratified order and in oblique or ſlanting directions downward; ſome of which ſtrata, from their nature and properties, are capable of admitting water to percolate or paſs through them, while others do not allow it any paſſage, but force it to run or filtrate along their ſurface without penetrating them in any degree, and in that way to conduct it to the more level grounds below till it becomes obſtructed or dammed up by meeting with impervious materials of ſome kind or other; when it is readily forced up into the ſuperincumbent layers, where they happen to be open and porous, ſoon rendering them too wet for the purpoſes of agriculture. But where they are of a more tenacious and impenetrable quality, they only become gradually ſoftened by the ſtagnant water below them, by which the ſurface of the ground is however rendered equally moiſt and ſwampy, though ſomewhat more ſlowly than in the former caſe. It may alſo be obſerved, that ſome of the ſtrata which conſtitute ſuch hilly or mountainous tracts are found to be continued with much greater regularity than others, thoſe which are placed neareſt to the ſurface, at the inferior parts of ſuch hills or elevations, being moſtly broken or interrupted before they reach the tops or higher parts of them, while thoſe which lie deeper or below them at the bottom ſhew themſelves in theſe elevated ſituations; thus that ſtratum which may lie the third or fourth, or ſtill deeper, at the commencement of the valley, may be the moſt ſuperficial, or form the uppermoſt layer, on the ſummits of hills or mountainous elevations. This arrangement or diſtribution of the different ſtrata may have been produced partly by the circumſtances attending the original elevation of ſuch mountainous regions, and partly from the materials of the original exterior ſtrata being diſſolved and carried down into the valley by ſucceſſive rains, and other cauſes, and thus leaving ſuch as were immediately below them in an expoſed and ſuperficial ſtate in theſe elevated ſituations.

But in whatever way, or from whatever cauſes it may have happened that thoſe ſtrata which are placed at conſiderable depths at the bottoms of hills, and other more elevated regions, preſent themſelves and become ſuperficial upon their ſurface, it is evident they frequently prove the means of rendering the grounds below wet and ſwampy. For, from the night dews and the general moiſture of the atmoſphere, being condenſed in much greater quantities in ſuch elevated ſituations, from their greater coldneſs, or other cauſes, than in thoſe level ſurfaces which are below, the water thus formed, as well as that which falls in rain and ſinks through the ſuperficial porous materials readily inſinuate themſelves, and then paſs along between the firſt and ſecond, or ſtill more inferior ſtrata which compoſe the ſides of ſuch elevations, until their deſcent is retarded or totally obſtructed, as has been juſt ſhewn, by ſome impenetrable ſubſtance, ſuch as clay; then becomes dammed up, and the water is ultimately forced to filtrate ſlowly over it, or to riſe to ſome part of the ſurface and conſtitute, according to the particular circumſtances of the caſe, different watery appearances in the grounds below, ſuch as oozing ſprings, bogs, ſwamps, moraſſes, weeping rock, from the water ſlowly iſſuing from various places, or a large ſpring or rivulet, from the union of ſmall currents beneath the ground. This is obvious from the ſudden diſappearance of moiſture on ſome parts of land, while it ſtagnates or remains till removed by the effects of evaporation on others; as well as from the force of ſprings being ſtronger in wet than dry weather, breaking out frequently after the land has been impregnated with much moiſture in higher ſituations and, as the ſeaſon becomes drier, ceaſing to flow except at the loweſt outlets. The force of ſprings or proportion of water which they ſend forth depends likewiſe, in a great meaſure, on the extent of the high ground on which the moiſture is received and detained, furniſhing extenſive reſervoirs or collections of water, by which they become more amply and regularly ſupplied. On this account what are termed bogſprings, or ſuch as riſe in vallies and low grounds, are conſiderably ſtronger and more regular in their diſcharge, than thoſe that burſt forth in the more elevated ſituations on the ſides of eminences. The waters condenſed in the manner deſcribed above on the tops of elevated regions, are ſometimes found to deſcend, for a very conſiderable diſtance among the porous ſubſtances between the different conducting layers of clayey or other materials, before they break out or ſhew themſelves in the grounds below; but it is more frequently the caſe to find them proceeding from the contiguous elevations into the low grounds that immediately ſurround.

The nature and regularity of the ſtratum of materials on which the water proceeding from the ſummits of hills has to filtrate and ſlide upon, muſt conſiderably influence its courſe, as well as the effects which it may produce on ſuch lands as lie below, and into which it muſt paſs; as where it is of the clayey, ſtiff, marly, or impervious rocky kinds, and not interrupted or broken by any other kind of materials of a more porous quality, it may paſs on to a much greater diſtance, than where the ſtratum has been frequently broken and filled up with looſe porous materials, in which it will be detained, and of coure riſe up to the ſurface. It is for the moſt part on the clayey, ſtiff, cloſe, marly, and unfractured ſtony ſtrata, that water is conducted from the hills and more elevated grounds into the plains and valleys which are below them. Theſe ſorts of ſtrata extend to very different depths in different ſituations and diſtricts, as has been frequently noticed in the digging of pits and the ſinking of deep wells, and other ſubterraneous cavities. The clayey ſtrata are, however, in general, found to be more ſuperficial than thoſe of the compact, tenacious, marly kinds, or even thoſe of a firm uninterrupted rocky nature, and ſeldom of ſuch thickneſs. They have, nevertheleſs, been obſerved to vary greatly in this reſpect; being met with in ſome places of a conſiderable thickneſs, while in others they ſcarcely exceed a few inches. The intervening porous ſubſtances or ſtrata,

ſtrata, where clay prevails, are found for the moſt part to be of either a gravelly or loſe nature. Stiff, marly ſtrata, which approach much to the quality of clay, though in ſome inſtances they may preſent themſelves near the ſurface, in general, lie concealed at conſiderable depths under the true clayey, and other layers of earthy or other materials: they have been diſcovered of various thickneſſes, from eight or ten feet to conſiderably more than an hundred. The intervening materials, where ſtrata of this nature are predominant, are moſt commonly of the more ſandy kinds, poſſeſſing various degrees of induration, ſo as in ſome caſes to become perfectly hard and rocky, but with frequent breaks or fiſſures paſſing through them. The looſe, friable, marly, ſtrata, are capable of abſorbing water, and of admitting it to filtrate and to paſs through them.

It may be concluded from this view of the nature and arrangement of the various ſtratified materials that conſtitute the earth, and the manner in which water is formed on the more elevated and hilly ſituations, and brought down from them, that the vallies, and more level grounds below, muſt conſtantly be liable to be overcharged with moiſture, and, as has been already ſhewn, to become in conſequence ſpouty, boggy, or of the nature of a moraſs, accordingly as they may be circumſtanced in reſpect to their ſituation, the nature of their ſoils, or the materials by which the water is obſtructed and detained in or upon them.

Where lands have a ſufficient degree of elevation to admit of any over-proportion of moiſture readily paſſing away, and where the ſoils of them are of an uniform ſandy or gravelly and uninterrupted texture, ſo as to allow water to percolate and paſs through them with facility, they can be little inconvenienced by water coming upon or into them, as it muſt of neceſſity be quickly conveyed away into the adjacent rivers or ſmall rivulets in their vicinity. But where grounds are in a great meaſure flat, and without ſuch a degree of elevation as may be ſufficient to permit thoſe over-proportions of moiſture that may have come upon them from the higher and more elevated grounds, either in the way that has been ſhewn above, or from the overflowing of rivers and ſmaller ſtreams of water that may paſs through or near them, and from the falling of heavy rains, to readily paſs away and be carried off; and where the ſoils of the land are compoſed or conſtituted of ſuch materials as are liable to admit and retain the exceſſes of moiſture that may in any of theſe ways come upon them; they muſt be expoſed to much injury and inconvenience from the retention and ſtagnation of ſuch quantities of water, and conſequently require artificial means to drain and render them capable of affording good crops, whether of graſs or grain; and, laſtly, lands of valleys and other low places, as well as in thoſe caſes where the level tract on the ſides or borders of large rivers and of the ſea, from the peculiarity of their ſituations, and their being compoſed in a great meaſure of porous or ſpungy materials, formed by the diſſolution and decay of various coarſe vegetable and other matters, which are produced on them, or which have been gradually, for a vaſt length of time, waſhed down and brought into them from the hills and riſing grounds by rains and other cauſes, or depoſited by means of floods ſo as to form different degrees of accumulation according to the difference of ſituation or other circumſtances, muſt alſo frequently be ſubject to great injury and inconvenience from their imbibing and retaining the water that may be thus forced to flow up or into, or upon them, either through the different conducting ſtrata from the hills and mountainous elevations in the neighbourhood, or the porous materials of the ſoils; as in theſe ways they may, as we have already ſeen, be rendered ſwampy, and have bogs or moraſſes produced in them in proportion to the predominancy of the materials by which the water is abſorbed and dammed up, and the peculiarity of the ſituation of the lands in reſpect to the means of conveying it away. On theſe grounds, beſides a knowledge of the nature and inclinations of the various ſtrata that compoſe the interior parts of the earth, it is clear that, in order to properly perform the buſineſs of draining, attention ſhould not only be paid to the diſcrimination of the differences in regard to the ſituation of the lands, or what is commonly denominated drainage level, but alſo to the nature, diſtribution and depths of the materials that conſtitute the ſoils or more ſuperficial parts of them, as upon each of theſe ſome variety in reſpect to the effects ariſing from water retained in them may depend.

But though there may be conſiderable diverſity in the effects which water produces in or upon lands from theſe different cauſes, wetneſs of land, ſo far as it reſpects agriculture, and is an object of draining, may generally depend on the two following cauſes: firſt on the water which is formed and collected on or in the hills or higher grounds, in the manner which has been explained, filtrating and ſliding down among ſome of the different beds of porous materials that lie immediately upon the impervious ſtrata, forming ſprings below and flowing over the ſurface, or ſtagnating underneath it: ſecondly, on rain or other water becoming ſtagnant on the ſurface, from the retentive nature of the ſoil or ſurface-materials, and the particular nature of the ſituation of the ground. The particular wetneſs which takes place in different ſituations, in the forms of bogs, ſwamps, and moraſſes, for the moſt part proceeds from the firſt of theſe cauſes, but that ſuperficial wetneſs which takes place in the ſtiff, tenacious, clayey ſoils with little inclination of ſurface, generally originates from the latter. From the ideas which have been ſuggeſted reſpecting the nature and formation of the different ſtrata that compoſe the earth, and of the manner in which water ſlides filtrates, or paſſes down, among or between them, and forms ſprings, which, according to circumſtances, render the grounds below boggy, ſwampy, or too wet for the purpoſes of agriculture, it is evident that the beſt and moſt certain, as well as the moſt expeditious method of draining, in ſuch caſes, muſt be that of intercepting the deſcent of the water or ſpring, and thereby totally removing the cauſe of wetneſs. This may be done when the depth of the ſuperficial ſtrata, and conſequently of the ſpring, is not great, which may be previouſly known by the uſe of a draining augre, by making horizontal drains of conſiderable length acroſs the declivities of the hills, about where the low grounds of the valleys begin to form, and connecting theſe with others made for the purpoſe of conveying the water thus collected, into the brooks or rivulets that may be near; and as the ſtrata between which the water paſſes down to produce ſuch ſprings, have, for the moſt part, nearly a ſimilarity of inclination with that of the ſurface of the hill or riſing ground, the augre holes of the drains ſhould not, as is the general practice, be made directly downwards, but perpendicularly to the ſurface of the elevation, as in this way, the ſtratum on which the water paſſes down may be more readily dug to, and the water drawn off; or where the ſpring has naturally found itſelf an outlet, it may frequently only be neceſſary to render it larger, and of more depth, which, by affording the water a more free and open paſſage, may evacuate and bring it off more quickly, or ſink it to a level ſo greatly below that of the ſurface of the ſoil, as to prevent it from flowing into or over it.

But where the ſprings, from the great thickneſs of the upper ſtratum, are confined at ſuch a depth beneath the ſurface as that they injure it, by rendering it conſtantly moiſt,

or by imperceptibly oozing through it, but afford no marks of any particular outlets; and where a drain cannot be cut so deep as to come to them, either on account of the great difficulty of doing it, or the expence that must attend it, or where the level of the outlet will not allow of its being cut to that depth, it will be necessary, after cutting ditches in the way that has been just explained, to perforate the soil beneath by means of a boring instrument considerably deeper, so as to reach the spring, and thus give free vent to the water collected below; a method of practice which seems long ago to have been ingeniously suggested by Dr. Anderson, and since more fully and particularly applied by Mr. Elkington. Where this can be effectually accomplished, such a number of perforations should be made, as will allow the confined water to pass readily into the drains, and be conveyed by the connecting ditches to the adjoining streams of the neighbourhood: in these cases the water coming freely into the drains, several feet below the moist surface of the land, and being then conducted away, will not be forced up through the superincumbent materials of the soil, to the surface which is so much higher.

As in cases of this kind, where after boring in this manner, the water breaks forth with considerable violence, it may sometimes be apt to bring up with it such quantities of sand or other substances, as may block up the holes and prevent the free exit of the water, it may be necessary to apply the augre frequently in order to remove it. A striking instance of this kind is related in the Philosophical Transactions, where on the sinking of a well four feet wide, and 236 feet deep, and then boring some feet deeper with a five inch borer, so much sand was forced up by the impetuosity of the water that broke forth as to fill the well, and which on being cleared away by buckets in its liquid state, suffered the water to flow over the surface in the quantity of forty-six gallons in a minute.

There may be still other situations of lands, as where the uppermost stratum is so thick as not to be easily penetrated, or where the springs formed by the water passing from the higher grounds, may be confined beneath the third or fourth stratum of the materials that form the declivities of hills or elevated grounds, on account of so many of them becoming deficient on their tops, or more elevated parts, and by this means lie too deep to be penetrated to, by the cutting of a ditch, or even by boring: and still from the water being obstructed by the different materials forming the plains below, it may be forced up to the surface, and produce different kinds of injurious wetness.

In such cases, the common mode of cutting a great number of drains to the depth of five or six or more feet across the wet moraffy grounds, and afterwards covering them in such a manner, as that the water may suffer no interruption in passing away, may be practised with advantage, as much of the prejudicial excess of moisture may by this means be collected and carried away, though not so completely as by falls.

As water is sometimes found to be conveyed from the hills and high grounds at no great depth beneath the surface of the land upon thin layers of clay which have underneath them sand stone, or other porous or fissured strata to a considerable depth, by perforating these thin layers of clay in different places, the water which flows along them may frequently be let down into the open porous materials that lie below them, and the surface land be thus completely drained. In these situations of land where morasses and other kinds of wetnesses are formed in such low places and hollows as are considerably below the beds of the neighbouring rivers, they may probably in many instances be effectually drained by arresting the water as it passes down into them from the higher grounds, and after collecting it into them, conveying it away by pipes or other contrivances at such high levels above the wet lands as may be necessary: or where the water that produces the mischief can by means of drains cut in the wet ground itself, be so collected as to be capable of being raised by means of machinery, it may in that way be removed from the land. The drainage of those extensive tracts of land that in many districts lie so greatly below the level of the sea can only be effected by the public, and by means of locks erected for the purpose of preventing the entrance of the tides, and by wind-mills and other expensive kind of machinery, constructed for the purpose of raising the stagnant water.

It is well observed by a philosophical author, that it might be a noble work, worthy of the attention of a government that wishes to increase the quantity of nutriment, and consequent population and happiness of the country, to employ proper engineers, with labourers in such number, as to environ with ditches, every moraffy district of whatever extent, as lies below the level of the tides, as the fens of Lincolnshire and Cambridgeshire; such ditches, he further remarks, should be cut at the feet of the adjacent rising grounds, or of eminences surrounded with fens, like islands in a lake, so as to intercept the well springs and land floods, and convey the water, thus collected above the level of the morass, into the ocean.

The superficial wetness of lands which arises from the stiff retentive nature of the materials that constitute the soils, and the particular circumstances of their situation, is to be removed in most cases by means of hollow superficial drains judiciously formed, either by the spade or plough, and filled up with suitable materials where the lands are under the grass system, and by these means, and the proper construction of ridges and furrows, where they are in a state of arable cultivation. Having thus explained the manner in which soils are rendered too wet for the purposes of agriculture, and shewn the principles on which the over proportions of moisture may, under different circumstances, be the most effectually removed, we shall proceed to the practical methods which are to be made use of in accomplishing the business in each case.

Methods of draining boggy land.

In the drainage of wet or boggy grounds arising from springs of water beneath them, a great variety of circumstances are necessary to be kept in view. Lands of this description, or such as are of a marshy and boggy nature, from the detention of water beneath the spongy surface-materials of which they are composed, and its being absorbed and forced up into them, are constantly kept in such states of wetness as are highly improper for the purpose of producing advantageous crops of any kind; they are, therefore, on this account, as well as those of their occupying very extensive tracts in many districts, and being, when properly reclaimed, of considerable value, objects of great interest and importance to the attentive agricultor. Wet grounds, of these kinds, from the nature of their situations, and the modes of draining them, are arranged by a late practical writer under three distinct heads; first, such as may be readily known by the springs rising out of the adjacent more elevated grounds in an exact or regular line along the higher side of the wet surface: second, those in which the numerous springs that shew themselves are not kept to any exact or regular line of direction, along the higher or more elevated part of the land, but break forth promiscuously throughout the whole surface, and particularly towards the inferior parts, constituting shaking quags in every direction, that have an elastic feel under the feet, on which the lightest animals can scarcely tread without danger, and which, for the most part, shew

new themselves by the luxuriance and verdure of the grass about them: third, that sort of wet land, from the oozing of springs, which is neither of such great extent, nor in the nature of the soil so peaty, as the other two, and to which the term bog cannot be strictly applied; but which, in respect to the modes of draining, is the same. In order to direct the proper mode of cutting the drains, or trenches, in draining lands of this sort, it will be necessary for the operator to make himself perfectly acquainted with the nature and disposition of the strata composing the higher grounds, and the connection which they have with that which is to be rendered dry: this may, in general, be accomplished by means of levelling, and carefully attending to what has been already observed respecting the formation of hills and elevated grounds, and by inspecting the beds of rivers, the edges of banks that have been wrought through, and such pits and quarries as may have been dug near to the land. Rushes, alders, bushes, and other coarse aquatic plants, may also, in some instances, serve as guides in this business; but they should not be too implicitly depended on, as they may be caused by the stagnation of rain-water upon the surface, without any spring being present: where the impervious stratum that lies immediately beneath the porous, has a slanting direction through a hill or rising bank, the surface of the land below that level will in general be spungy, wet, and covered with rushes on every side, while the higher sides of it will be found to deviate very slightly from a level in any part round it; in this case, which is not unfrequent, a ditch, or drain, properly cut on one side of the hill or rising ground, may remove the wetness from both, as shewn in the plan: but where the impervious stratum drops or declines more on one side of the hill or elevation than the other, the water will be directed to the more depressed side of that stratum; the effect of which will be, that one side of such rising ground will be wet and spungy, while the other is quite free from wetness.

In the practical management of draining land it will be necessary, after this to determine which of the places, at which water issues forth on the surface, if there be more than one, is the real or principal spring; and that from which the other outlets are fed, as upon this must depend the direction of the ditch or drain, since by removing that the others must, of course, be rendered dry. When on the declivity, or slanting surface of the elevated grounds, from which the springs break forth, they are observed to burst out at different levels, according to the difference of the wetness of the season; and where those that are the lowest down continue to run, while the higher ones are dry, it is in general a certain indication that the whole are connected, and proceed from the same source, and consequently, that the line of the drain should be made along the level of the lowermost one, which, if properly executed, must keep all the others dry. But if, as has been the too frequent practice, the drain was made along the line of the highest of the outlets, or places where the water breaks forth, without being sufficiently deep to reach the level of those below, the overflowing of the spring would rarely be carried away, and the wetness proceeding from that cause be removed, while the main spring still continuing to run, would render the land below the level of the bottom of the drain still prejudicially wet, from its discharging itself lower down over the surface of the ground. Thus, says the author mentioned above, it was the custom, until Mr. Elkington shewed the absurdity of the practice for drainers to begin to cut their trenches wherever the highest springs shewed themselves between the wet and the dry ground, which not being of a depth sufficient to arrest and take away the whole of the water, others of a similar kind were under the necessity of being formed at different distances, to the very bottom of the declivity, which being afterwards in a great measure filled with loose stones, merely conveyed away portions of surface water, without touching the spring, the great or principal cause of the wetness.

DRAKE, *Sir* Francis, in *Biography*, a very eminent navigator, and naval commander, was born of obscure parents, near Tavistock, in Devonshire, about the year 1545. He was the eldest of twelve sons, and was devoted to the sea-service at an early period. He was taken under the care and protection of sir John Hawkins, a distant relation, and rose to the rank of captain when he had attained the age of twenty-two years. At the age of eighteen he was purser of a ship trading to Biscay: at twenty he made a voyage to Guinea, and in two years afterwards he was promoted to the command of a ship called the Judith. In this capacity he greatly distinguished himself against the Spaniards, in the gulf of Mexico, and participated largely in all the glorious actions of his commander, sir John Hawkins. With him he returned to England high in reputation, but without having improved his fortune in the smallest degree. He had, however, acquired an inveterate enmity for the Spaniards, which he harboured to the latest hour of life. He accordingly projected an expedition against that people in the West Indies, which did not afford him the advantages which he expected. This was in 1570. In the year 1572 he set out again with two ships of 75 and 25 tons burden, manned with less than four score persons; yet with this pigmy force he ventured to storm the town of Nombre de Dios, on the isthmus of Darien, in which he received a wound. He afterwards attacked and took Vera Cruz, on the same isthmus, which proved to him a source of great wealth. Among other property, he fell in with, and took 50 mules, laden with silver, of which his men carried away all that they were able, and buried the rest. In the prosecution of these enterprizes, he was assisted by the Indian nations, which, like himself, bore great enmity to the Spaniards. Satisfied, at length, with what he had acquired, he embarked with his treasures for England, and arrived safe at Plymouth in the summer of 1573. It should, however, be mentioned, that previously to his leaving the American coast, he remunerated his Indian friends, and to their prince, Pedro, he presented a handsome cutlass, which was very highly esteemed. Pedro, in return, gave him four large wedges of gold, which Drake, with true generosity, threw into the common stock, with this emphatic observation; "Those who bear the charge of such uncertain undertakings on my credity, ought to share the utmost advantages they produce." On his return, he settled in the most honourable manner with the owners of the ships, and then employed the money remaining to himself in fitting out three frigates for the service of government in Ireland. In this business Drake served as a volunteer, and by his zeal and prudence, as well as by generosity, he recommended himself at court, to which he was introduced by sir Christopher Hatton. He had long desired to make a voyage to the South sea, and now an opportunity offered, by which he trusted he should be able to attain the object of his ambition. He implored the queen to grant him her permission for the purpose: this she readily conceded to a man of so high a reputation, and Drake quickly found means to assemble a small fleet of five vessels, of from 100 to 15 tons burden, manned with 164 men. With this force, and with a mind above all common obstacles, he sailed from Falmouth Dec. 13, 1577. On the 27th, his squadron anchored off Mogadore, an island near the coast of Barbary: and a friendly intercourse was commenced with the Moors, whose good will Drake was anxious to

conciliate, as well for his own ſake, as for the good of his country. After a ſhort ſtay here, he proceeded to Cape Frio, ſeizing all the Spaniſh veſſels that fell in his way, and in the month of January he arrived at, and anchored off, the Cape de Verd iſlands.

Being diſappointed of a ſupply of proviſions, by the interdiction of the Portugueſe, Drake proceeded on his voyage, and paſſed St. Jago on the 31ſt. From this iſland three cannon were diſcharged at his fleet, but none of the ſhot proved fatal. In revenge Drake ſeized upon a Portugueſe veſſel laden with wines; from which he took the pilot Nuno de Sylva, and diſmiſſed the others. Nuno, from his knowledge of the American coaſt, proved of the moſt eſſential ſervice in the courſe of the voyage. Our commander had been furniſhed with full powers by the queen, which powers extended even to the lives of thoſe under his controul; and it has been much doubted whether in one inſtance, which we ſhall mention, he did not exerciſe the authority delegated to him with a ſeverity unworthy of a great mind. Mr. J. Doughty, the ſecond in command, on board his own ſhip, was accuſed of diſreſpect and even mutiny: he was tried and convicted of offences, which by the naval law are capitally puniſhed. Drake, however, gave him the choice of the manner in which he would ſuffer for the crimes ſaid to have been committed by him. The terms offered were either immediate execution; or to be left on the deſolate continent with the proſpect of a lingering death through want of the common neceſſaries of life; or to be carried back priſoner to England there to abide a due courſe of law. Doughty made choice of the firſt, and he was accordingly beheaded, after having received the ſacrament in company with the commander. Here, as in a thouſand other inſtances, which hiſtory records, the religion of Jeſus, which ought to conciliate men, and lead them to the ſublimeſt acts of forgiveneſs, was called to ſanction a deed which cannot but be diſcreditable to him from whoſe authority the ſentence of death iſſued; and whoſe apparent regard to juſtice in the caſe of Doughty is believed to have been dictated by revenge for a private affront. Drake was not, however, called to account for the act on his return, and may therefore be regarded as having acted juſtly, though certainly without any attention to mercy.

Drake, after the fatal deed had been executed, proceeded to, and paſſed the ſtraits of Magellan; and with his own ſhip ſolely proceeded along the coaſts of Chili and Peru, capturing all the Spaniſh veſſels that he could meet with. He then coaſted California and North America as far as the 48th degree, in the hope of finding a paſſage to the Atlantic, but being diſappointed, he landed and took poſſeſſion, in the name of his ſovereign, of the country which he named New Albion. Having careened his ſhip, he boldly ſet ſail acroſs the Pacific ocean, and in leſs than ſix weeks reached the Molucca iſlands, and touched at Ternate. Thence, by Java and the Cape of Good Hope, he proceeded homewards, and arrived at Plymouth on Nov. 3, 1580, having completed the circumnavigation of the globe in two years ten months and twenty days. He was the firſt commander in chief who had performed this exploit, Magellan having died before his return. Drake came back very rich, and the expedition became a ſubject of much intereſting diſcuſſion. The Spaniſh ambaſſador made complaints of him as a pirate, and reclaimed the plunder which he had taken: this opinion was likewiſe maintained by many of his own countrymen who thought the prizes were of much leſs conſequence to the nation than the commerce which was likely to be interrupted by the proceedure. Others, however, were too much elated with the reputation for valour and ſkill which redounded to Engliſhmen from the enterpriſe. The court ſcarcely knew which ſide to eſpouſe; at length, in the ſpring of 1581, the queen gave a ſanction to Drake's conduct by dining on board of his ſhip lying at Deptford, and conferred upon him the honour of knighthood, telling him, at the ſame time, that his actions did him more honour than his title. The populace joined in reſounding their favourite's praiſe, and his ſhip was extolled for having matched in its courſe the chariot of the ſun. Sir Francis now took for his device the terraqueous globe, and to his motto, "Divino Auxilio," he added, "Tu primus circumdediſti me." The ſhip in which he had made the expedition was preſerved many years at Deptford as a ſingular curioſity, and when almoſt rotten with age, a chair was made out of the materials and preſented to the univerſity of Oxford.

Elizabeth having come to an open breach with Spain, Drake was ſent, in 1585, with a fleet of twenty ſail, having a body of land forces on board, to attack the Spaniſh ſettlements in the Weſt Indies. Several iſlands yielded to his prowess. Two years after he was ſent to Liſbon, but receiving information that the Spaniards were aſſembling a fleet at Cadiz, for the purpoſe of invading England, he ſailed into the enemy's port, and burned and deſtroyed ten thouſand tons of ſhipping, excluſive of all their warlike ſtores. After this he engaged with ſome London merchants, and gaining intelligence of a rich carrack from the Eaſt Indies expected at Tercera, he inſtantly ſailed thither, and captured it. By this prudent act he gave as much ſatisfaction to his employers by the profits which accrued to them, as he had done to the ſtate by his various ſucceſſes. In 1588, he was advanced to be vice admiral under lord Effingham Howard, and diſtinguiſhed himſelf in the deſtruction of the Spaniſh armada. In the conflict he captured a large galleon commanded by Don Pedro de Valdez, who ſurrendered without the ſhew of reſiſtance to the terror of his name. His ſquadron had the chief glory in this action. In the next year a fleet was ſent under Drake, with a body of land forces, commanded by ſir John Norris, for the purpoſe of reſtoring Don Antonio to the throne of Portugal. Here a diſagreement between the commanders of the different ſervices proved fatal to the enterpriſe. Drake juſtified himſelf before the council, and his plea was accepted, but he unqueſtionably loſt ſome credit in the affair. After this, in conjunction with Hawkins, he propoſed another expedition againſt the Spaniards in the Weſt Indies: the project was reſolved on, and they embarked with twenty-ſeven veſſels and nearly 3000 men. During the delay, occaſioned by ſome untoward circumſtances, intelligence was received that the plate fleet had arrived in Spain, except one galleon which had put into Porto Rico, and this they ſuffered to ſlip out of their hands. Vexation threw Hawkins into a fever which terminated his life in November. On the day after his decease Drake made a deſperate attack upon the port and ſhipping of Porto Rico, which, though very deſtructive to the Spaniards, proved ultimately unſucceſsful. From this period Drake met with ſcarcely any thing but diſappointment, which preyed ſo much on his mind, as to render him incapable of almoſt every exertion, and at length to put an end to his mortal exiſtence. He died near the town of Nombre de Dios, January 1596, in the fifty-firſt year of his age. According to Fuller, "He lived by the ſea, died on it, and was buried in it." And in reference to the misfortunes by which the laſt periods of his life were marked, he adds, "We ſee how great ſpirits have mounted to the higheſt pitch of performance, afterwards ſtrain and break their credit in ſtriving to go beyond it." "He was," according to the eſtimate of a more modern biographer, "a man upon the whole of eſtimable

eſtimable private character: though ſomewhat rough and boaſtful, yet careful of thoſe under his command, courteous and humane towards thoſe whom the fortune of war threw into his power, juſt and generous in his dealings, ſober and religious. He poſſeſſed a natural eloquence, and though without the advantages of education, acquitted himſelf with credit on public occaſions. He was eminently ſkilled in all the branches of his profeſſion, and with ſo much courage and ability did he conduct his enterprizes, that ſcarcely any name among naval adventurers ſtood ſo high, not only in his own country but throughout Europe, as that of ſir Francis Drake." Biog. Brit.

Drake, James, M. D. fellow of the College of Phyſicians, and of the Royal Society, publiſhed, in 1707, what he calls "A New ſyſtem of Anatomy," in two volumes in 8vo. It is principally taken from Cowper, but as the plates, which are neatly engraved, are on a reduced plan, it was more within the reach of ſtudents, and would have been uſeful, if the work had been leſs theoretical. He lived, however, to ſee it paſs through three editions. The laſt, which was publiſhed in 1737 under the title of "Authropologia nova," is in three volumes 8vo. In impoſthumes in the maxillary ſinus, he adviſes to draw one of the dentes molares, to give vent to the matter. The deſcription of the internal noſtrils, and of the cavities entering them, are new, as are alſo the plates of the viſcera of the abdomen. Haller Bib. Anat.

Drake, in *Geography*, a harbour in California, ſo called after ſir Francis Drake, who diſcovered and took poſſeſſion of California for queen Elizabeth. N. lat. 28° 15′. W. long. 111° 39′.

Drake's *iſland*, or *St. Nicholas*, an iſland in Plymouth ſound. N. lat. 50° 21′ 30″. W. long. 4° 20′.

DRAKENA Radix, in *Botany*, Cluſ. Exot. 83, is the root of *Dorſtenia Contrayerva*, which ſee.—*Dorſtenia Drakena* of Miller, Wild. Sp. Pl. v. 1. 683, is however a different ſpecies, having oval receptacles, and entire-edged leaves. Miller informs us that the roots of both theſe and of *D. Houſtoni*, are brought over and uſed indifferently in medicine or dyeing.

DRAKENBORCH, Arnold, in *Biography*, profeſſor of rhetoric and hiſtory in the univerſity of Utrecht, was born in that city on the firſt of January 1684. He ſtudied under Grævius and other celebrated critics, after which he went to Leyden, and in 1706 took his degree of doctor of laws at Utrecht. In 1716, he ſucceeded Burmann, one of his own tutors, as profeſſor in that univerſity, and in the diſcharge of the duties of his office he diſplayed great learning, and a profound knowledge of ancient literature. He publiſhed many original works, and undertook the duties of an editor in others. Among theſe was an edition of "C. Silii Italici Punicorum," libri xvii. 4to. which he laboured to render as perfect as poſſible. Beſides the notes which he added as illuſtrative of the text, he cauſed engravings to be made of various ſubjects of antiquity, which cannot fail to throw light upon things that were regarded as obſcure. He alſo gave an edition of Livy in 7 vols. 4to. together with a life of the hiſtorian. In the biography, he takes occaſion to enumerate all the preceding editors and commentators of this ancient claſſic. This was a work of great labour, and Drakenborch was enabled to enrich his edition by reference to more than 30 MSS. which had never before been employed for the purpoſe. Every thing that could ſerve, in a critical, grammatical, or hiſtorical point of view, for improving and explaining his author, he collected with great diligence. Drakenborch died at Utrecht in 1748. Gen. Biog.

DRAKENDORF, in *Geography*, a village of the duchy of Saxe-Gotha in Germany, not far from Jena, remarkable for having been the reſidence of the celebrated German poet baron Sonnenberg, who compoſed here his epic poem, entitled "Donatoa."

DRAKENSTEIN, a diſtrict of ſouthern Africa, near the Cape of Good Hope, which forms with Stellenboſch one diſtrict under the juriſdiction of one landroſt, although they have diſtinct hemraaden or councils. After deducting the ſmall diſtrict of the cape, Stellenboſch and Drakenſtein include the whole extent of country from cape L'Aguillas, the ſouthermoſt point of Africa, to the river Kouſſie, the northern boundary of the colony; a line of 380 miles in length; and the mean breadth from eaſt to weſt is about 150 miles; comprehending an area, after ſubtracting that of the cape diſtrict, equal to 55 thouſand ſquare miles. Twelve hundred families are in poſſeſſion of this extenſive diſtrict, ſo that each family, on an average, has 46 ſquare miles of land. The greater part, however, of this extenſive ſurface, is of little value, as it conſiſts of naked mountains, ſandy hills, and Karroo plats. But a portion of the remainder compoſes the moſt valuable poſſeſſions of the whole colony; whether they be conſidered as to the fertility of the ſoil, or to the temperature of the climate, or to their proximity to the cape, which, at preſent, is the only market in the colony, where the farmer has an opportunity for the diſpoſal of his produce. Drakenſtein and its environs conſiſt of a fertile tract of country, ſituated at the foot of the great chain of mountains, at the diſtance of between 30 and 40 miles from the cape. The whole extenſive valley is well watered by the Berg river and its numerous branches: the ſoil is richer than in moſt parts of the colony, and the ſheltered and warm ſituation is particularly favourable to the growth of the vine and different kinds of fruit. A ſub-diviſion, called Little Drakenſtein, occupies the middle of the valley, and contains many ſubſtantial farms, moſt of which are freehold property; ſo that the two Drakenſteins, and the next ſubdiviſion, called Franſche Hoeck, or the French corner, ſupply two-thirds of the wine that is brought to the cape market. The ſubdiviſion laſt mentioned is ſituated in the S. E. angle of the valley among the mountains, and took its name from the French refugees who ſettled there when they fled to the country after the revocation of the edict of Nantz. To them the colony has been indebted for the introduction of the vine. The produce of the country conſiſts chiefly of wine and fruits. The village of Paarl is ſituated at the foot of a hill that ſhuts in the valley of Drakenſtein on the weſt ſide. It conſiſts of about 30 habitations, with intermediate orchards, gardens, and vineyards, forming a ſtreet from half a mile to a mile in length. About the middle of the ſtreet is the church, a neat octagonal building, covered with thatch, and near it the parſonage-houſe, with garden, vineyard, fruit-groves, and a large tract of very fine land. Dell Joſephat and Waagen-Maaker's valley are two ſmall dales enclofed between the hilly projections that branch out towards the north or upper end of the valley of Drakenſtein; in theſe dales the beſt oranges, peaches, and other fruits are produced; and the wine is of the beſt quality. Groeneberg, another ſubdiviſion, is the largeſt of the projecting hills that run acroſs the northern extremity of the valley, and the ſoil is productive in fruit, wine, and corn. The whole valley, comprehending the above detailed ſubdiviſions, is comparatively ſo well inhabited, that few animals, in a ſtate of nature, are now to be found upon it. Of hares, however, there is no ſcarcity; and two ſpecies of buſtards, the red-winged and the common partridge, and quails are in great plenty. The antelope and other animals are found on the hills towards the northern extremity of the valley.

valley. The inhabitants are annoyed with wolves, hyænas, and jackals, which descend in the night from the neighbouring mountains. Barrow's Travels in Southern Africa, vol. ii.

DRAM. See DRACHM.

DRAMS. See CORDIALS.

DRAM-*road*, in *Inland Navigation*, the same with railway or *tram*-road. See CANAL.

DRAMA, in *Geography*, a town of European Turkey, in the province of Romania; 16 miles N. E. of Emboli.

DRAMA, in *Poetry*, a piece, or poem, composed for the stage.

The word is Greek, δρᾶμα, which literally signifies *action*; because in dramas, or dramatic poems, they act, or represent actions, as if they really passed.

A drama, or as we popularly call it, a *play*, is a composition either in prose or verse, consisting, not in the simple recitation, but in the actual representation of an action.

Our dramas are, tragedies, comedies, operas, and farces.

Some critics take the book of Canticles for a drama, or dramatic poem; others maintain the same of the book of Job. See each of those articles. Some scrupulous authors would restrain drama to serious pieces, as tragedies; but with respect to the etymology, a comedy is as much a drama, as a tragedy.

The primary parts of the drama, as divided by the ancients, are the protasis, epitasis, catastasis, and catastrophe. The secondary parts are, the acts and scenes. The accessary parts are, the argument, or summary, the prologue, chorus, mimus, satura, and atellana. Lastly the epilogue, which pointed out the use of the piece, or conveyed some other notice to the audience in the poet's name.

DRAMATIC, in *Poetry*, is an epithet given to pieces written for the stage.

This kind of poetry has, among all civilized nations; been considered as a rational and useful entertainment; and as it is employed upon the light and the gay, or upon the grave and affecting incidents of human life, it divides itself into the two forms of *comedy* or *tragedy*, which see respectively. See also POETRY.

For the laws of dramatic poetry, see ACTION, CHARACTER, DISCOVERY, FABLE, UNITY, &c.

DRAMATIC *Machinery*. In the earlier ages, although dramatic entertainments were very popular, especially among the Grecians and Romans, more attention seems to have been paid to the genius and labour of the poet, than to that of the mechanist or decorator. The names of Æschylus, Aristophanes, Terence, Plautus, and many others, have reached us, while those of the mechanics employed (if there were such) have sunk into oblivion. Whether the mechanical and decorative taste of the ancients was equal to the genius of their poets, it is wholly foreign from the design of this article to inquire. In the present state of dramatic representation we find, by experience, that Cinderella, and Mother Goose, generally fascinate the spectators more than even the most eminent works of Shakspeare. If this be a proof of decay or perversion of literary taste, it is also at least a very strong one of the progress of the mechanical arts, and of the effect which they produce upon the public mind even in matters of amusement. Of all the branches of architecture, few (if any) have been esteemed more difficult or uncertain, than the construction of the interior part of a theatre. The architect, besides the general knowledge incidental to his own immediate profession, would require at least a considerable acquaintance with the principles of optics and acoustics to ensure his success; and unfortunately this task has been too frequently committed to persons who, although perhaps good architects and mechanics, were totally ignorant of both these sciences. The latter science is still so imperfectly understood, that great difficulty must remain in this part of the business; the optical part is not so arduous, and a degree of theoretical knowledge, combined with attention to its practical application, will enable the architect who constructs the interior of a theatre to avoid defects, too common in most of those which have been hitherto executed.

The interior of a theatre is generally, and apparently with justice, divided into two departments. That which is before the curtain, and which contains the audience or spectators, and that which is behind, and which ought to be so constructed as to place the whole performance in the most favourable point of view, and to afford to the performers and artists employed the greatest facilities of executing their respective professional duties with correctness and effect. To the latter of these departments this article is confined.

Before entering into any description of the moving parts of the machinery, it may be proper to notice those parts of the architectural work, which must be adapted to receive and support them. Of these the first, and perhaps most important, is the

Construction of the Stage.

The stage of a theatre is of an oblong or rectangular form, and is constructed as an inclined plane, the back part being more elevated than the front. It is usual to allow one inch of perpendicular ascent for every 36 inches of length from the front to the back of the stage. Thus the acute angle formed between the flooring or inclined plane, and a line drawn from the front to the back part, and parallel to the horizon, will be $1° 24' 29''$. This inclination is considered to be of advantage to the vision lines, supposed to come from the eye of a spectator in the front of the house, to any given point in the stage. It particularly places it in the power of the architect, to keep the back part of the pit lower, than could be done without injuring the vision, were the flooring of the stage horizontal. This must be a considerable object, especially in large theatres, where there are many tiers or rows of boxes, and where the galleries must of necessity be constructed at a great altitude, above the level of the front of the stage. As it is also found, that cloth of every description (especially woollen) has a considerable effect in diminishing the transmission of sound, it is considered proper to keep the whole audience in the pit as low as possible without impeding the vision, that their cloaths may produce less of this effect upon the sounds which issue from the stage and the orchestra. A greater declivity might perhaps be of use in this respect, but here the architect must limit himself to so much as will not prove injurious to the action of the performers upon the stage, especially the dancers.

The stage of a theatre, like other wooden floors, consists of plank laid upon cross joists, and where the dimensions of the stage are large, these joists must be supported by cross beams and upright posts to prevent the flooring from springing or yielding too much, as in the common operations of practical carpentry applied to flooring, and entirely depending on the same geometrical laws. In constructing the joists and framing, the architect must in the first place consider the number of apertures which ought to be made for the purpose of conducting the business of the stage with propriety; the dimensions and disposition of these apertures; and the easiest and most economical way of forming others to suit that succession of novelty which seems to be the prevalent taste of the present day. In adapting his joisting and frame-work to answer these purposes, will consist his chief difficulty. The constant changes and improvements

ments which take place, render it impossible to ascertain any precise mode of doing this, but the general way will be considered under the section of this article; *Apertures of the stage*, comprising the foot-lights, traps, flaps, and sliders —to these we now proceed.

Apertures of the Stage.

The first aperture in the stage immediately behind the orchestra, and in front of the proscenium and curtain, is that for raising and lowering the foot lights, both for the purposes of trimming the lamps, and of darkening the stage when required. It is marked by the letters A, A, *fig.* 1, *Plate* IX. *Miscellany*, which is a horizontal plan of a stage 60 feet in length, and 25 feet in breadth at the curtain line. In this plan, the lines which represent the side walls of the theatre are too much contracted, for it is necessary to give at least eight or ten feet of additional room for the performers and scene-shifters, behind each wing. The letters B, B, denote the line which forms the front of the stage behind the orchestra.

The next apertures are the side traps, of which any convenient number may be constructed. Four of these are exhibited in the plan, and are distinguished by the letters E, E, E, E. In the middle are two larger traps. The first, at F, is of an oblong form from six to seven feet in length, and from three to four feet in breadth. It is most frequently used for the grave scene in Shakspeare's tragedy of Hamlet.

The trap marked by the letter G is generally square, and is chiefly used for the sinking of the cauldron in the tragedy of Macbeth. Behind these, in large theatres, where many changes of the scenery are frequently required, there are a number of longitudinal apertures across the stage, which are covered by planks moveable upon hinges, so that by throwing them back, the stage may be opened in a moment. The use of these is to allow the flat scenes to sink through the stage, when required. Three of these will be found in the plan, at the letters H, H, H, and are known by the name of *flaps*.

In the late Theatre Royal of Covent Garden, much of the scenery, not in immediate use, was kept in the cellar under the stage. For the purpose of raising and lowering these scenes with facility, other apertures were made, and closed with square or rectangular pieces of wood, which could be placed or displaced in a few minutes: these were called sliders, and a plan of one is given at the letter I.

Framing of the Traps.

It was usual to produce the ascent and descent of the foot lights by the agency of a person placed in the cellar under the stage. This might have answered the purpose of lowering the lamps for trimming sufficiently well, but the partial darkening of the stage required a more minute attention. For this reason, it was found proper to convey the mechanical power to the place where the prompter stands, that the lamps might be raised or sunk, either by himself, or by a person immediately under his inspection. A framing of this kind, constructed, with a slight variation, from a plan of Mr. George Sloper, of Covent Garden, and similar to what was used there, is represented in *fig.* 2.

This figure is a transverse elevated section of the stage, as it would be viewed by a spectator seated about the middle of the pit. The two side walls of the theatre, under the stage, are represented by the letters L, L; the aperture, where the horizontal frame which supports the lamps rides, is marked A A, as in *fig.* 1. The horizontal frame M M slides upon two upright posts, under the sides of the aperture A A, and from both ends cords, passing over two pullies O, O, are fixed to a large wheel N, placed in a stout framing, which is omitted to prevent confusion in the figure. The weight of the frame M M, and the lamps, is counterpoised by a weight, suspended by a cord passing over the pulley R. Upon the same axis with the large wheel N, is a small wheel, and what is called by mechanics an endless line, passing round this, is guided over the directing pullies P, P, P, to the small barrel or cylinder Q, which being turned by the prompter, or an assistant, the lights are elevated or depressed at pleasure, without entering the cellar under the stage, except when trimming the lamps may be necessary. The difference of the diameters of the wheel N, and the small wheel on the same axis, serves merely to increase the power, and diminish the velocity of the ascent and descent of the lights, upon the common mechanical principle of the wheel and axle.

The traps are worked under the stage, by an apparatus attached to each, and similar in all, according to the dimensions of the respective apertures. That corresponding to the aperture F. in *fig.* 1, is represented by *figs.* 3 and 4. *Fig.* 3, has a transverse elevation, like *fig.* 2. At the ends of the aperture are two upright posts V, V, upon which the trap slides. The trap consists of a horizontal board fitted to the aperture above, and under this is another, with grooves to fit the posts V, V, so that the horizontal position of the trap may be preserved while rising and sinking. These are represented at S. In front of the posts V, V, are two others U, U, to carry a cylinder T, turned by a winch to raise or sink the trap, and secured by a catch and ratchet wheel. The trap, if necessary, may also be counterpoised, but this is seldom, if ever, done.

Fig. 4, is a profile elevation of the same machinery, which will further illustrate the relative positions of the posts V and U, and the way in which the cords by which the motion is communicated, pass from the trap to the band. The reference letters are the same in both figures. The cords are generally made fast to the beams or joists, at the roof of the stage cellar, and pass over a pulley at each end of the trap, to double the power of the person who turns the winch. Besides the moving traps, each aperture is closed by a board supported by an upright piece of wood, or similar contrivance, when the traps are not at work.

No machinery whatever is permanently attached to the flaps or sliders, for as these apertures serve generally for the passage of the flat scenes through the stage, the machinery must depend upon the particular effect which it is necessary to produce. The flat scenery is generally raised by a crane, unless a very rapid ascent or descent be required, when it may be done by the application of a counterpoise.

Disposition of the Stage Lights.

There is, perhaps, no department of a theatre where so much pains ought to be taken, as in the disposition of the lights, for upon this, in a very great degree, depends the effect of the scenery, however nicely the perspective may have been executed by the painter, and every optical illusion calculated to astonish or amuse the spectator. It was formerly the custom to light the stage by a large chandelier, or frame of lamps, suspended in the middle of the proscenium, and elevated or depressed at pleasure. This still prevails in many parts of the continent, and even in Britain, is very generally used to illuminate the ring, or area of those theatres, where feats of horsemanship, and other athletic exercises, are exhibited.

It seems obvious, that the suspension of a chandelier directly in the view of the spectator, must materially deteriorate the

the effect of an exhibition, which can only be considered as excellent in the degree in which it is a faithful copy of nature. When suspended over the proscenium of a large theatre, it must also greatly impede the vision of all spectators seated in the upper parts of the house. These inconveniences induced the late Mr. Garrick, when patentee of the old Theatre Royal of Drury-lane, to remove the chandelier and substitute the frame of lamps now distinguished by the appellation of *foot lights*, and this improvement has been adopted in all other regular theatres in the British islands.

But although the adoption of the foot lights removes the objections to the chandelier, they are still very far from producing that disposition of light and shade, which would be very desireable to increase the effect both of the scenery and of the countenances of the performers. The glare of light in the front, and parallel to the stage, besides the smoke which the lamps, however clean and nicely trimmed, always produce, inverts every shadow, and throws the shade upwards instead of downwards upon the performers' face. The most experienced professional men assign this as the reason, that the face of a performer must be so highly coloured to produce an effect in the front of the house, as to appear absolutely ridiculous to a stranger unconversant with the business, if admitted into the green-room, or behind the scenes. The limits of this article will not admit of going farther into detail upon this subject, nor indeed have we any established facts to proceed upon. All mechanical experiments necessarily involve a certain expence, while their success is merely speculative, and it is much better, in every case, to ascertain the extent of the improvement practically than theoretically. The disposition of the lights of a theatre, however, still seems to afford very ample scope for the exercise of the talents of an expert and skilful optician.

To give a sufficient light to the stage side lights are used, as well as foot lights: these are generally placed between the wings, to turn upon a hinge, for the purpose of darkening the stage when necessary. A plan of these, which is very simple, will be found in *fig.* 5. The apparatus consists merely of an upright post, to which is attached a piece of tinned iron, forming two sides of a square, and moveable upon joints or hinges, and furnished with shelves to receive the lamps or candles. That which gives light to the stage is represented by 1, and the position in which the side lights are placed, when the stage is partially darkened, by 2. Side lights are placed between every set of wings, on both sides of the stage.

Besides the foot and side lights, which are permanent, a number of occasional lights are disposed at times on different parts of the stage, to give effect to transparencies, and for other causes, of which, as they must be varied according to circumstances, no particular account can be given. They must be left entirely to the genius and taste of the persons who conduct the business of the stage.

Disposition of the Scenery.

The scenery of a theatre consists of the flat scenes which form the termination of the perspective across the stage, and the side scenes, or wings, which are disposed upon each side of the stage so as to be shifted as often as may be necessary, and to afford opportunities for the actors to come upon the stage, or quit it, at any of the intervals between the respective sets. Besides these, there are scenes which may be occasionally placed and displaced, such as the fronts of cottages, cascades, rocks, bridges, and other appendages, requisite in the representation of particular dramas. These are generally called pieces.

The flat scenes are of three kinds: the first of these are drops, or curtains, where the canvas is furled or unfurled upon a roller, placed either at the top or bottom of the scene. A difference of opinion exists as to the placing of the roller, which, as it is a mere matter of taste, may probably never be determined—both ways are used in the London theatres. The rollers, in either case, are made to revolve by means of cords tightened or slackened as may be necessary; and when the scenes are large it is usual to wind them up by means of a cylinder and a winch, as in the trap machinery.

Although the drop scenes are the most simple, it is necessary sometimes to have recourse to those scenes which are called flats. In these the canvas is stretched upon wooden frames, which are generally constructed in two pieces, so as to meet in the middle of the stage, the junction being in a perpendicular direction. The side frames are moved in grooves, composed of parallel pieces of wood fixed upon the stage, and so constructed that they may be removed with facility from one place to another. The upper part of the framing is also confined by a groove, to retain the perpendicular position of the flat scene. These are sometimes constructed, to save room, upon joints, by which they may either be lowered to the horizontal position, or drawn up to the side walls. In this respect their construction is pretty similar to that of a common draw-bridge. This plan was used in the late Theatre Royal, Covent Garden, where they were called flys. The principal use of the flats is where apertures, such as doors, windows, chimney-pieces, &c. are wanted in the scene, which may be opened and shut as required; these are called, in the technology of a theatre, *practicable* doors, &c., because, when not to be used, they may be painted upon a drop scene. A third kind of scene is the profiled or open *flat*. This is used for woods, gateways of castles, and such purposes: it is framed exactly like the other, and the only difference consists in parts of the scene being left open to shew another behind, which terminates the view.

A very important part of the scenery of a theatre is the wings. These also are stretched upon wooden frames, and slide in grooves fixed to the stage. In some large theatres they are moved by machinery, in others by manual labour. The disposition of the grooves will be seen at the letters K, K, in *fig.* 1. In this figure are nine sets of wings, the front only of which are marked by the reference letter. The wings, like the flats, whether moved by the hand or by the aid of machinery, usually stand upon the stage. The plan of moving the wings of the late theatre of Covent Garden, and that of the Theatre Royal of Glasgow, invented by the writer of this article, are represented in *Plate* X.

Fig. 1, is a transverse elevated section of the stage cellar, and stage of a theatre, where the wings are moved by a cylinder, or barrel under the stage, as was done at Covent Garden. D, D, are the side walls of the house; at A is a strong horizontal beam of wood, such as builders generally call *sleepers*, laid upon the floor of the cellar under the stage. Of these there must be a sufficient number to serve as railways for the frames of all the wings to run upon: four of these frames are represented and distinguished by the letters B B, C C. The frames B, B, are in front of those marked C, C. Each frame runs upon two small wheels, to diminish the friction, and all passing through longitudinal apertures in the stage, which serve as guides, rise to a sufficient height above the stage to support the wings which are attached to them in front, so as to be quickly removed, and others substituted. The line of the stage is represented at E. Two frames at each side of the stage only were used for each set of wings. At F is a long cylinder, or barrel of wood, revolving

upon iron axles, and extending from the front to nearly the back of the ſtage, ſo as to move all the wings at once. It will appear, by inſpecting the plate, that the cords, or endleſs lines, paſſing from each frame round the barrel F, and over the directing pulley H back to the ſame frame, are ſo diſpoſed that when the upper part of the barrel is moved towards the right, the front frames B, B, will move forward upon the ſtage, and the back frames C, C, will be withdrawn. In this ſtate they are repreſented in the figure. When the motion of the barrel is reverſed, that of the frames will alſo be inverted; the back frames will advance, and the front ones will recede. When a change of ſcenery is requiſite, the wings are taken off the frames which are out of the view of the ſpectators, and thoſe fixed on which are to be next diſplayed. Upon the barrel F is a wheel, moved by a pinion G, by means of the handle I, to give motion to the barrel, and increaſe the power. A horizontal fly wheel, like that of a jack, was alſo added, but in ſo ſhort a motion it is not probable that it could be of great advantage.

Fig. 2, is an elevation of the machinery by means of which the wings of the new ſubſcription Theatre Royal of Glaſgow are moved, and is the only plan of the kind hitherto attempted. It may be thought ſtrange that any deviation ſhould have been made in this theatre, from the plans adopted in the Theatres Royal in London: the reaſons are the following. Before plans for moving the machinery had been procured, the architectural part of the houſe was finiſhed, and three apartments upon each ſide under the ſtage having been fitted up for dreſſing-rooms, there did not remain ſufficient room to conſtruct the barrel and apparatus to advantage in the ſtage cellar, which was ſufficiently occupied by the footlights and trap framings already deſcribed. It became neceſſary, therefore, either to alter the houſe, or to abandon the idea of working the wings by machinery, unleſs another place could be found where the machinery might be placed to advantage, without interfering with that ſpace behind the ſcenes allotted to the performers and ſervants of the theatre. In every theatre it is neceſſary to have platforms at each ſide above the ſtage, and between theſe a temporary flooring, for the purpoſe of hanging up, taking down, or moving the flat ſcenery. Theſe ſide platforms are diſtinguiſhed by the letters K, K, and the intermediate moveable flooring by L in *fig.* 2. This ſuggeſted the idea that the barrels might be placed upon one of theſe platforms, and the wings moved above inſtead of below. But had the moving lines been attached to the upper parts of wings reſting on their baſes, every motion of the barrel muſt have overturned thoſe wings, or at leaſt have made them totter, and impeded their motion. To obviate this it was thought expedient that the wings, inſtead of reſting upon the ſtage, ſhould be hung from above, the baſis being ſo near to the ſtage as to appear to every ſpectator to reſt upon it, although really ſuſpended over it. Upon this general principle ariſing, as moſt inventions do, from a caſe of immediate neceſſity, the machinery which ſhall now be deſcribed was planned and executed.

Under the platform K were placed horizontal boards upon their edges, $\frac{3}{4}$ of an inch in thickneſs and ſeven inches deep; theſe correſponding to the number of the wings to be uſed, were ſeparated at each end by ſquare pieces of board, of the ſame thickneſs, to keep them aſunder; at each end the whole were bound together by a claſp of iron, O, which paſſing upwards through the platform, was ſecured by wedges paſſing through the arms of the claſp; by means of theſe wedges the claſp, and all the wings ſuſpended from it, could be raiſed, ſhould the platform yield in any part. The claſps, horizontal boards, and intermediate pieces, were ſecured by a ſcrew-bolt paſſing through the whole. The horizontal pieces of board ſerved as rail-ways for the ſuſpended wings to move upon, and were ſeven feet in length within the claſps; from theſe the wings were ſuſpended by ſheers of iron, in each of which was placed a ſmall friction roller reſting upon the board, and the lower part of the ſheers was ſcrewed to the wing, ſo that its baſe might be nearly an inch clear of the ſtage. Between the pieces of wood which ſeparate the rail-ways in front were pullies of about ſix inches diameter, two of which are repreſented at P P; a cord attached to a ſtaple in the top of the ſheers of each wing, and paſſing over each of theſe pullies, connected the wing with one of the barrels above at F. When the barrel was turned theſe cords neceſſarily pulled forward the wing to which each was attached, and thus the wings were brought forward. To allow the wings to recede, another cord, attached to the ſheers, was conducted over the directing pullies H, H; and from the other end a weight was ſuſpended ſufficient to overcome the friction and pull the wing back whenever the cords attached to the barrel were ſlackened. The frame M, which carried the barrels, conſiſted of upright poſts of wood about four inches ſquare, and the horizontal rails for carrying the barrels were of caſt iron with braſs buſhes for receiving the axles or journals of the barrels. The barrels were ſolid pieces of fir, ſix inches diameter, and hooped with iron at each end; the longeſt, which moved ſix wings on each ſide of the ſtage, was divided into three pieces, and the journals connected by coupling boxes. Eight barrels were uſed, four of which were placed as repreſented in the figure, and the other four above upon the rail at M; becauſe the barrel, when pulling forward the wings, was obliged to raiſe all the weights for making them recede; a counterpoiſe, equal to the ſum of all theſe weights, was placed upon the barrel in an oppoſite direction. To increaſe the power each barrel had a wheel and pinion on one end, exactly ſimilar to what is repreſented at F and G in *fig* 1; the pinion containing one-third part of the teeth in the wheel of courſe trebled the power, and thus one man was able to work 12 wings at the ſame time with ſufficient velocity, for the wings always advanced or receded more quickly than the drop ſcenes could be raiſed or ſunk. The direction of the cords will be very obvious by inſpecting the figure, two barrels with the counterpoiſes being corded.

For raiſing and lowering the drop-ſcenes another framing was conſtructed carrying 12 ſhort barrels, a profile ſection of which, with one barrel, is repreſented at N. When the drop-ſcenes were pulled up the barrel was ſecured by a ratchet-wheel and catch.

Although this machinery was conſtructed rather to correct an error in the general conſtruction of the theatre than for any other reaſon; it appears, after four years trial, to poſſeſs ſome important advantages over the plans of the London theatres, whilſt it is fair to ſtate that it is equally liable to ſome objections. As it was conſtructed in a hurried manner, the practical part was not executed ſo perfectly as might have been wiſhed; all the directing pullies were made of wood, and the grooves to receive the cords by no means ſufficiently deep to prevent them from ſlipping occaſionally, which muſt have frequently interrupted the motion of the wings. For this reaſon the counterpoiſe weights were ſubſtituted for the double or endleſs line; and this was more neceſſary, becauſe the cordage being new, it was perfectly evident that the natural ſtretch would in a few days render it quite unſerviceable in this reſpect, unleſs greater care had been taken than is generally to be expected. This machinery, with very little attention, has been found to anſwer the purpoſe remarkably well. Its advantages over that uſed in Covent Garden ſeem to be the following:

The frames which carry the ſcenes by the plan *fig.* 1, reſting upon the floor of the ſtage cellar, require a ſtrength of framing to keep them ſteady, which both renders them heavy to move and involves a very great expence for the timber and workmanſhip; beſides this, many people muſt be employed to change the wings upon the frames when drawn back, and in this reſpect no ſaving of labour can ariſe, and the only advantage gained by the machinery is regularity of motion. The hanging wings of the Glaſgow theatre are greatly lighter, and might be much more ſo than they are, for the whole frame-work was finiſhed upon the preſumption that they muſt reſt upon their baſes, as in the caſe of other wings. But it will at once occur, that a much greater ſtrength of frame-work will be neceſſary for a ſcene upwards of 20 feet high, and reſting upon its baſe, than for one ſuſpended from above, where the force of gravitation acts in a contrary way, and which requires no other power than what is neceſſary to diſtend the canvas. Add to this, the weight of a framing paſſing through grooves in the ſtage and running upon a rail-way nearly 20 feet below, and without exactly meaſuring the dimenſions of the wood, which muſt always depend upon thoſe of the theatre, the diſproportion of the one plan to the other will appear enormous. In the working of the wings according to either of theſe plans the ſuperiority alſo evidently reſts with the latter. A perſon or perſons under the ſtage are ſituated in a moſt inconvenient place for obſerving the conduct of the drama, and regulating operations to forward its effect. On a platform above every thing is eaſily viſible, and common attention to what paſſes below is all that is neceſſary. In the London theatres, as alſo in moſt reſpectable provincial ones, a whiſpering tube is placed, to convey ſounds from the prompter to thoſe employed above, for their occaſional government; this tube is entirely ſimilar to a common ſpeaking trumpet.

The defects of the hanging machinery, as conſtructed at Glaſgow, ought alſo to be noticed. The rail-ways, upon which the wings move, were found ſometimes apt to warp, and had of courſe ſome tendency to interrupt the motion of the wing; this might be eaſily remedied by making the rail-ways of caſt-iron, and if the upper edge ſhould be well poliſhed the friction would be very ſmall indeed.

In a provincial theatre, where a certain ſet of wings are almoſt conſtantly uſed, the plan of ſcrewing the ſheers which carry the pullies to the wings may anſwer very well; it is, however, certainly more deſirable that means ſhould be deviſed for altering the wings with greater ſpeed than can be done by the drawing of ſcrew-nails. Many plans may be contrived to anſwer this purpoſe; one, which may do ſufficiently well, is repreſented in *figs.* 1 and 2, *Plate* XI.

Fig. 1, is a profile elevation of the ſuſpending apparatus and upper part of the wings as in *fig.* 2, *Plate* X. B is the platform above; A,A, the hanging ſupporters, with wedges to raiſe or ſink the whole as may be proper. C is the railway which in this inſtance is ſuppoſed to be of caſt iron. E is a pair of ſheers or clutch of malleable iron, through which is an axle to carry a ſmall friction wheel on each ſide. F, F, are fractions of the wings, ſuſpended by ſcrews or bolts and cutters, ſo as to be eaſily changed. The cordage and barrels may be either as in the former plate, or the endleſs line may be ſubſtituted, if precautions are taken to prevent the cords from ſlipping off the directing pullies.

Fig. 2, is a tranſverſe elevation of the ſame apparatus, taken directly behind the wings as they advance or recede, and the various parts are diſtinguiſhed by the ſame letters of reference as in *fig.* 1.

The object of this apparatus is, in the firſt place, to enſure the regularity of the motion of the wings; and in the ſecond to effect this motion by as few ſervants as poſſible. The hanging part of all the diviſions between the five wings repreſented may be of caſt iron, and the projecting parts under the friction rollers may be either caſt as *feathers*, or in ſeparate pieces, and joined by counter-ſunk ſcrews. The intermediate pieces to preſerve the diſtances, where the bolt D paſſes through, may be of well-ſeaſoned plank.

By theſe means, and the application of the double rollers, an interval is left by which any wing may be ſpeedily removed, without unfixing a ſingle ſcrew or bolt; and the moving cords, being merely hooked to the wing, may be inſtantly unfixed and placed upon hooks in the ſuſpending apparatus, as repreſented in *fig.* 1, until a new wing is placed on the railway. At the ſame time, by uſing caſt iron, the whole may be compreſſed into ſo ſmall a ſpace, as to have all the wings, neceſſary for an evening repreſentation, fitted in their places before the exhibition commences, unleſs in very extraordinary caſes.

Beſides the permanent machinery, which is always in uſe, many occaſional engines muſt be uſed to ſuit particular pieces. The limits of this article will not admit of going much into detail reſpecting theſe; nor is it neceſſary.

The mechaniſt, whoſe chief aim is to produce continual novelty, muſt depend much more upon the fertility of his own genius, than upon antecedent plans. We ſhall therefore cloſe the article, with ſhort deſcriptions of a few miſcellaneous ſpecimens, which will be found in the remaining figures of *Plate* XI.

Fig. 3, repreſents the common method of executing a ſea-ſcene. A certain number of horizontal axes being placed acroſs the ſtage, with croſs boards properly painted and cut or profiled, when turned upon their reſpective centres, produce the appearance of water, which may be repreſented either as tranquil or ſtormy as the occaſion requires.

To give the appearance of ſhips or boats, a very ſimple apparatus will ſuffice. A plan of a ſmall boat is given in *fig.* 4.

A frame of wood, moving upon friction wheels, is repreſented by the letters A, A, upon this the boat is placed upon an axis at B. From the aftermoſt part of the boat, a cord, paſſing over the pulley C, is conducted behind the ſcenes. The bow or fore part of the boat being made heavier than the after-part or ſtern, the cord, by being lightened and ſlackened alternately, will move the boat upon the axle B, and give it a motion very ſimilar to that produced by the natural undulation of the waves. If the friction wheels are covered with cloth or liſt, and the axles ſmoothly turned and well oiled, the noiſe from friction will be avoided, which often deſtroys the illuſion when boards without wheels are puſhed acroſs the ſtage. The frame A is drawn acroſs between the axles in *fig.* 3, and all that is under the ſurface of the water (repreſented at D,) is concealed by a painted board. Two ſtops may be placed upon the carriage to regulate the vibration of the boat, as repreſented in the figure.

Fig. 5, is a plan of a machine to produce the oblique aſcent or deſcent of a car, horſe, or any other body, above the ſtage. Upon a croſs bar of wood A, A, paſſing between the platforms, and ſufficiently high to be concealed from the ſpectators, is a box or frame B moving upon rollers. A cord F, attached to this frame, is wound upon a barrel upon the platform. Another cord G, attached to any fixture upon the oppoſite ſide, and paſſing over a pulley in the box B, ſuſpends the car C. When the cord F is wound upon the barrel, the car will aſcend in the direction of the dotted line D, and when unwound will deſcend in the ſame line by its own gravity. The cord E will keep the car or other body ſteady.

ſteady. This is merely another application of the principles, inveſtigated under the article DIAGONAL *motion*, and were the deſcent required to imitate the parabolic curve of a projectile, it might be effected by conſtructing the barrel like the ſpiral of a watch, the diameters for the convolutions of the cord F being accurately calculated, and another barrel conſtructed to regulate the deſcent of the ſuſpending cord G. The cords are very ſlender and painted black, to elude the eye of the ſpectator. The lights alſo are ſtrong in front, and dim behind, to aſſiſt the optical deception. To give the cords ſufficient ſtrength without increaſing their diameter, they are ſpun of the beſt hemp, mixed with braſs wire well annealed. Thoſe uſed at Covent Garden for the flying horſes in the *Pantomimic Spectacle* of Valentine and Orſon, whoſe flight was effected by an apparatus ſimilar to that in the figure, although leſs in diameter than a common quill, were ſaid to poſſeſs ſufficient ſtrength to ſuſpend a ton weight.

Fig. 6, is an apparatus, rather optical than mechanical. It is deſigned to give the effect of a full moon, and was uſed with great ſucceſs at Drury Lane. The front view is diſtinguiſhed by the numeral 1; the profile by 2. It is a conical caſe of tin, the leſſer diameter of which is a concave reflector at A. The greater diameter, at B, is covered with taffeta, or any tranſparent coloured cloth, to give the ſhade required, and a lamp is ſuſpended within the caſe, which is perforated in many places to admit the air. Simple as this apparatus is, it gives a very ſtriking reſemblance of a full moon when ſuſpended by three cords, and when the back part of the ſtage is darkened.

Fig. 7, is a plan of one of thoſe quick tranſitions of ſcenery, which are uſed in pantomimes or other pieces, where an aſſimilation to the agency of magic is attempted. Any number of perpendicular cylinders being placed upon the ſtage to revolve eaſily; let theſe be covered with canvas of ſufficient length to reach from each cylinder to that neareſt to it. When the canvas is rolled upon the cylinders and painted, they will aſſume the appearance of pillars placed in a room or hall, and a ſcene placed behind will be ſeen through the intervals. By pulling the cords at A, the canvas unwinding from each cylinder and reaching to the next, will almoſt inſtantaneouſly change the appearance of the pillars into that of a flat ſcene, and the former appearance may be as inſtantaneouſly reſtored, either by the action of weights, as in the figure, or by a power acting in a contrary direction. Cords, ſimilar to thoſe at A, muſt be placed at the bottom in the direction of the dotted line B, to unroll the canvas equally, and the pivots at top and bottom muſt be concealed.

Fig. 8, is a ſection of thoſe double flat ſcenes, which are alſo uſed to produce inſtantaneous changes. The whole ſcene being covered with pieces of canvas, framed and moving upon hinges, one ſide is painted to repreſent a certain ſcene, and the other to repreſent one totally different. The ſection marked 1 ſhews theſe pieces when elevated above the joints; that marked 2 ſhews them when ſuſpended below. The contrivances for moving them are very various. In general, however, they are kept in the elevated ſituation by catches, which being ſuddenly relieved, they fall by their own weight.

DRAMATIC *Muſic* of the Greeks. Ariſtotle tells us, in his "Poetics," that muſic, μελοποιεια, is an eſſential part of tragedy; but how it became eſſential, this philoſopher does not inform us. M. Dacier has endeavoured to ſupply this omiſſion, by ſuggeſting, that cuſtom and a natural paſſion implanted in the Greeks for muſic, had incorporated it into their drama. Indeed Ariſtotle calls it, in the ſame work, "the greateſt embelliſhment that tragedy can receive." And innumerable paſſages might be quoted from other ancient writers, to prove, that all the dramas of the Greeks and Romans were not only ſung, but accompanied by muſical inſtruments.

However, many learned critics, not reflecting upon the origin of tragedy, and inſenſible, perhaps, to the charms of melody, have wondered how ſo intelligent a people as the Greeks could bear to have their dramas ſung. But as antiquity is unanimous in deriving the firſt dramatic repreſentations at Athens from the dithyrambics, or ſongs, ſung in honour of Bacchus, which afterwards ſerved as choruſſes to the firſt tragedies, we need not wonder at the continuation of muſic in thoſe choruſſes, which had been *always* ſung. Nor will the cuſtom of ſetting the epiſodes, as the acts of a play were at firſt called, appear ſtrange to ſuch as recollect that they were written in *verſe*, and that *all verſe was ſung*, particularly ſuch as was intended for the entertainment of the public, aſſembled in ſpacious theatres, or in the open air, where it could only be heard by means of a very ſlow, ſonorous, and articulate utterance.

It is true that tragedy is an imitation of nature; but it is an exalted and embelliſhed nature; take away muſic and verſification, and it loſes its moſt captivating ingredients. Thoſe who think it unnatural to *ſing* during diſtreſs, and the agonies even of death, forget that muſic is a language that can accommodate its accents and tones to every human ſenſation and paſſion; and that the colouring of theſe on the ſtage muſt be higher than in common life, or elſe why is blank verſe, or a lofty and figurative language, neceſſary.

The ſtage cannot ſubſiſt without exaggeration; as verſe is the exaggeration of common ſpeech, ſo muſic is that of verſe; in like manner exaggerated geſture becomes dancing. In the ſame manner as it becomes neceſſary on the ſtage to allow of ſmall deviations from truth and nature in favour of the poet and the actor, whoſe writings and ſpeech are ſomewhat more inflated when the buſkin is on, than at other times. Marmontel, in the Encyclopedie, art. Declamation, ſays, "For the ſame reaſon as a picture, which is to be ſeen at a diſtance, requires bolder ſtrokes and higher colouring, the theatrical voice muſt be pitched higher, the language be more lofty, and the pronunciation more accentuated, than in ſociety, where we communicate our ideas with more facility, but always in proportion to the perſpective; that is to ſay, in ſuch a manner that the tone of voice ſhould be ſoftened and diminiſhed to the degree of nature, before it arrives at the ear of thoſe to whom it is addreſſed."

The *marks*, *echeia*, or vaſes, the accompaniments of the *cithara*, and *flutes*, *equal* and *unequal*; all which, ſingly and collectively, prove the declamation of the Greeks and Romans to have been muſical, and regulated like the recitative of modern operas, by a notation.

DRAMATIC *Muſic* of the Romans. Livy, lib. vii. cap. 2. gives a kind of hiſtory of the Roman drama, which, as well as the Grecian, was inſeparable from muſic. The Romans, indeed, were later in cultivating arts and ſciences than any other great and powerful people; and none of them ſeem to have been the natural growth of the ſoil, except the art of war; all the reſt were brought in by conqueſt. Before their acquaintance with the Greeks, they had all their refinements from the Etruſcans, a people very early civilized and poliſhed. The dramas of Plautus, Terence, and other early dramatic writers, invented nothing, their plays were all tranſlations from the Greek, and probably ſung or declaimed to Grecian muſic. Vitruvius ſpeaks of no other than was uſed in the theatres. Cicero, in his ſecond book of Laws, tells us, that before Greece and her

arts were well known to the Romans, it was a cuſtom for them to ſend their ſons for inſtruction into Etruria. And thence they had the firſt ideas, not only of religion, but of poetry, painting, ſculpture, and muſic, according to the confeſſion of their own hiſtorians.

Beſides the obligations which the Romans had to the Etruſcans and Greeks for their taſte and knowledge in the fine arts, the conqueſt of Sicily, 200 years before the Chriſtian era, contributed greatly to their acquaintance with them. Fabricius gives a liſt of ſeventy Sicilians who have been celebrated in antiquity for learning and genius; among whom we find the well known names of Æſchylus, Diodorus Siculus, Empedocles, Georgius, Euclid, Archimedes, Epicharmus, and Theocritus. Among theſe, the Romans might have had tragedy from Æſchylus; comedy from Epicharmus, and muſic from Empedocles.

Dramatic *Muſic*, attempted in England, previous to the Italian opera. All theatrical repreſentations and public amuſements having been ſuppreſſed by the parliament, in 1647, no exhibition was attempted till 1656, when ſir William D'Avenant's "Entertainment of Declamation and Muſic after the Manner of the Ancients," ſeems to have eſcaped moleſtation more by connivance than the protection of government. For though Ant. Wood has aſſerted, that ſir William D'Avenant had obtained leave to open a theatre for the performance of operas in the Italian language, during the protectorſhip, when all other theatrical exhibitions were ſuppreſſed; "becauſe being in an unknown tongue they could not corrupt the morals of the people;" yet on a careful ſcrutiny into the validity of the fact, it ſeems to be wholly a miſtake. Ant. Wood, at this time, had never been in London, and ſeems but little acquainted with its amuſements at any time.

Being in poſſeſſion of the firſt edition of ſir William D'Avenant's "Entertainment" performed at Rutland-houſe, and printed in 1657, the year after, we ſhall give an account of the manner in which it was diſpoſed and arranged, from the work itſelf; which informs us, that "after a flouriſh of muſic, the curtains are drawn and the prologue enters," who ſpeaks in Engliſh verſe, and talks of the Entertainment being an opera, the only word that is uttered in the Italian language throughout the exhibition. He deſires the audience, indeed, to regard the ſmall theatre as "their paſſage, and the narrow way, to our Elyſian field, the opera." But not a line of this introduction is ſet to muſic, either in recitative or air; though, after it has been ſpoken, and the curtains are again cloſed, "a conſort of inſtrumental muſic, adapted to the ſullen diſpoſition of Diogenes, being heard awhile, the curtains are ſuddenly opened, and, in two gilded roſtras, appear Diogenes the cynic, and Ariſtophanes the poet—who declaim againſt and for publique entertainments by moral repreſentations." Then in two proſe orations that were *ſpoken*, not ſung, public exhibitions are cenſured and defended in the ſtyle of that celebrated philoſopher and comic writer.

Operas are, indeed, frequently mentioned and deſcribed: Diogenes, manifeſtly alluding to the ſplendid manner in which they were then exhibited in Italy, when he ſays, "Poetry is the ſubtile engine by which the wonderful body of the opera muſt move. I wiſh, Athenians! you were all poets, for then if you ſhould meet, and with the pleaſant vapours of Leſbian wine, fall into profound ſleep, and concur in a long dream, you would every morning enamel your houſes, tile them with gold, and pave them with aggots!"

When the cynic has finiſhed his declamation, "a conſort of muſic, befitting the pleaſant diſpoſition of Ariſtophanes, being heard, he anſwers him," and defends operas, their poetry, muſic, and decoration, with conſiderable wit and argument. After which the "curtains are ſuddenly cloſed, and the company entertained by inſtrumental and vocal muſic, with a ſong."

"The ſong being ended, a conſort of inſtrumental muſic, after the French compoſition, being heard awhile, the curtains are ſuddenly opened, and in the roſtras appear ſitting a Pariſian and a Londoner, in the livery robes of both cities, who declaim concerning the pre-eminence of Paris and London."

When the Frenchman has finiſhed his Philippic againſt our capital; after "a conſort of muſic, imitating the waites of London, he is anſwered by the Londoner." In neither of theſe harangues is the opera mentioned, which, as yet, had not found its way into either capital. When the Engliſhman has terminated his defence, there is another ſong; an epilogue; and, laſtly, a flouriſh of muſic; after which the curtain is cloſed, and the entertainment finiſhed.

At the end of the book we are told, that "the vocal and inſtrumental muſic was compoſed by Dr. Charles Colman, captain Henry Cook, Mr. Henry Lawes, and Mr. George Hudſon."

By this account it appears, that the performance was neither an Italian, nor an Engliſh, opera. That there was no recitative, and but two ſongs in it, the reſt being all declaimed or ſpoken, without the leaſt aſſiſtance from muſic. It ſeems, indeed, as if ſir William D'Avenant, by this Entertainment, as it was called, had ſome diſtant deſign of introducing exhibitions ſimilar to the Italian opera, on the Engliſh ſtage, for which theſe declamations were to prepare the way.

Pope tells us, that "The Siege of Rhodes," "by ſir William D'Avenant, was the firſt opera ſung in England."

"On each enervate ſtring they taught the note
To pant, or tremble, through an eunuch's throat."

What foundation our great poet had for this opinion, we know not, unleſs he truſted to the looſe aſſertion of Langbaine, who, in "An Account of the Engliſh dramatic poets," ſays, that the Siege of Rhodes, and ſome other plays of ſir William D'Avenant, in the times of the civil wars, were acted in *ſtilo recitativo*.

The firſt performance of the Siege of Rhodes was at Rutland-houſe, in 1656. It was revived in 1663, and a ſecond part added to it. In the prologue the author calls it "our play," and the performers, *players*, not ſingers. The firſt part is divided into five entries, not acts; each preceded by inſtrumental muſic. But we can find no proof that it was ſung in recitative, either in the dedication to lord Clarendon, in the folio edition of 1673, or the body of the drama.

It was, indeed, written in rhyme, which, after the Reſtoration, became a faſhion with theatrical writers, probably to imitate the French, and gratify the partiality of Charles II. for Gallic amuſements. Such dramas were called heroic plays, and the verſe dramatic poeſy.

Upon the whole, it ſeems as if this drama was no more like an Italian opera than the maſques, which long preceded it; and in which were always introduced ſongs, choruſes, ſplendid ſcenes, machinery, and decorations. But if we might believe Mr. Pope, in the lines juſt cited, this opera, as he calls it, was not only ſet to recitative and florid muſic, but ſung by eunuchs!

Downes, the prompter, tells us, that in 1658, ſir William D'Avenant exhibited another entertainment, entitled "The Cruelty of the Spaniards in Peru," expreſſed by vocal and inſtrumental muſic, and by art of perſpective in ſcenes.

ſcenes. Theſe ſcenes and decorations, according to Downes, were the firſt that were introduced (on a public ſtage) in England. Roſcius Anglicanus. Mr. Malone (Sup. to Shakſpeare) imagines that Cromwell, from his hatred to the Spaniards, may the more readily have tolerated this ſpectacle.

In another piece, however, of ſir William D'Avenant's, "The Playhouſe to be let," a muſician who preſents himſelf as a tenant, being aſked what uſe he intended to make uſe of it? replies, "I would have introduced heroique ſtory in *ſtilo recitativo*." And upon being deſired to explain himſelf further, he ſays, "recitative muſic is not compoſed of matter ſo familiar, as may ſerve for every low occaſion of diſcourſe. In tragedy, the language of the ſtage is raiſed above the common dialect; our paſſions riſing with the height of verſe; and vocal muſic adds new wings to all the flights of poetry."

In the third act of this piece, which we are told was in *ſtilo recitativo*, we have the hiſtory of ſir Francis Drake expreſſed by inſtrumental and vocal muſic, and by art of perſpective in ſcenes, &c.

Such were the firſt attempts at dramatic muſic to Engliſh words in this country, long before the muſic, language, or performers of Italy were employed on our ſtage.

The word opera ſeems, however, to have been very familiar to our poets and countrymen, during the chief part of the laſt century; *ſtilo recitativo* was talked of by Ben Jonſon, ſo early as the year 1617, when it was a recent innovation even in Italy. After this it was uſed in other maſques, particularly ſcenes of plays, and in cantatas, before a regular drama, wholly ſet to muſic was attempted.

But the high favour to which operas had mounted in France by the united abilities of Quinault and Lulli, ſeems to have given birth to ſeveral attempts at dramatic muſic in England.

Sir William D'Avenant dying in 1668, while his new theatre in Dorſet Gardens was building, the patent, and management, devolved on his widow, lady D'Avenant, and his ſon Mr. Charles, afterwards Dr. D'Avenant, well known as a political writer and civilian, who purſued ſir William's plans. The new houſe was opened in 1671; but the public ſtill more inclining to favour the king's company at Drury-lane than this, obliged Mr. D'Avenant to have recourſe to a new ſpecies of entertainments, which were afterwards called dramatic operas, and of which kind were the Tempeſt, Macbeth, Pſyche, Circe, and ſome others, all "ſet off," ſays Cibber, "with the moſt expenſive decorations of ſcenes and habits, and with the beſt voices and dancers."

"This ſenſual ſupply of ſight and ſound," continues he, "coming in to the aſſiſtance of the weaker party, it was no wonder they ſhould grow too hard for ſenſe and ſimple nature, when it is conſidered how many more people there are, who can ſee and hear, than can think and judge."

Thus men without taſte or caſe for muſic ever comfort themſelves with imagining that their contempt for what they neither feel nor underſtand is a mark of ſuperior wiſdom, and that every lover of muſic is a fool. This is the language of almoſt all writers on the ſubject. The ingenious author of the "Biographica Dramatica" tells us, that "the preference given to D'Avenant's theatre, on account of its ſcenery and decorations, alarmed thoſe belonging to the rival houſe. To ſtop the progreſs of the public taſte, and divert it towards themſelves, they endeavoured to ridicule the performances which were ſo much followed. The perſon employed for this purpoſe was Thomas Duffet, (a writer of miſerable farces,) who parodied the Tempeſt, Macbeth, and Pſyche; theſe efforts were, however, ineffectual." This is fair and hiſtorical; but after ſaying that "the duke's theatre continued to be frequented;" when he adds, "the victory of ſound and ſhew over *ſenſe* and *reaſon* was as complete in the theatre at this period, as it has often been ſince," it ſeems as if ſenſe and reaſon had for a moment quitted this agreeable, and, in general, accurate and candid writer. Opera is an alien that is obliged ſilently to bear the inſults of the natives, or elſe ſhe might courteouſly retort, that nonſenſe *without* muſic is as frequently heard on the Engliſh ſtage, as with it on the Italian; indeed, when Metaſtaſio is the poet, who will venture to ſay that either good ſenſe or good poetry is baniſhed from the ſtage?

But it does not clearly appear, becauſe muſic and decorations were added to Shakſpeare's Tempeſt and Macbeth, that one theatre was in greater want of ſenſe at this time than another. We have ſeen the dramas as they were altered by Shadwell and ſir William D'Avenant, and in the latter find that little was curtailed from the original play, or ſung, but what is ſtill ſung, and to the ſame muſic ſet by Matthew Lock, of which the rude and wild excellence cannot be ſurpaſſed. In the operas, as they were called, on account of the muſic, dancing, and ſplendid ſcenes with which they were decorated, none of the fine ſpeeches were made into ſongs, nor was the dialogue carried on in *recitative*, which was never attempted on our ſtage during the 17th century, throughout a whole piece. Indeed, it never fully ſucceeded in this, if we except the Artaxerxes of the late Dr. Arne; whoſe muſic, being of a ſuperior kind to what our ſtage had been accuſtomed, and better ſung, ſound an Engliſh audience that could even tolerate *recitative*. In the cenſure of theſe muſical dramas, which has been retailed from one writer to another, ever ſince the middle of Charles the ſecond's reign to the preſent time, the ſubject ſeems never to have been candidly and fairly examined; and, indeed, it appears as if there had been no great cauſe of complaint againſt the public taſte for frequenting ſuch repreſentations, particularly thoſe written by Shakſpeare, in which the principal characters were performed by Mr. and Mrs. Betterton, as was the caſe in Macbeth, though muſic, machinery, and dancing were profuſely added to the treat.

DRAMATICO, Stylo. See Style.

DRAMATURGIA, *Ital.* the title given to a book compiled by Leo Allatius, or Allacci, in 4to. containing a chronological liſt of all the dramas, whether for declamation or muſic, which had been publiſhed in Italy from the invention of the preſs to 1667. A new edition of this uſeful catalogue was publiſhed at Venice, with a continuation, to 1755. The authors of words and muſic, the printers, dates of the ſeveral editions, and places of publication, are all ſpecified. See Leo Allatius.

DRAMBURG, in *Geography*, anciently *Draweburg* and *Drageburg*, a ſmall town of Pruſſia, in the new mark of Brandenburg, chief place of the circle of the ſame name, ſituated on the river Drage, from which it derives its name, and which runs through both the new and the old town; it is 6 miles ſouth of Falkenburg.

DRAMME, a river of Denmark, which flows into the weſt ſide of the bay of Chriſtiania. See the next article.

DRAMMEN, a ſmall town of Norway, in the dioceſe of Chriſtiania, or Aggerhuus, on the river Eger, at the place where it falls into the lake, or rather river Drammen, which empties itſelf into the bay of Chriſtiania. That part of the town which is on the Eger is alſo called Eger, and is remarkable for ſeveral iron-works.

DRAN, Henry Francis, Le, in *Biography*, born at Paris in 1685, received his education under his father, Henry Le Dran, who had acquired conſiderable reputation as an operator,

operator, particularly in amputating, or taking out cancers of the breast. Under his auspices our young surgeon soon came into repute, and turning his thoughts principally to the operation of lithotomy, which he performed in the lateral method, as practised by Cheselden, he was enabled to make some valuable improvements in the art. These he communicated to the public in his "Paralele des differentes manieres de tirer la Pierre hors de la Vessie," printed in 1730, 8vo., to which he added a supplement in 1756, containing the result of his later practice. The work was well received, has been frequently reprinted, and translated into most of the modern languages. It contains also a description of the urinary passages, of the urinary bladder in situ, cum arteriæ pudendæ trunco et ramis, accurately depicted. "Observations de Chirurgie auxquelles ou a joint plusieurs reflections en faveur des Etudiens," 1731, Paris, 2 vols. 12mo. These have also been frequently reprinted, and contain numerous valuable practical observations. "Traité ou reflections tirees de la pratique sur les playes d'Armes a feu," Paris, 1737, 12mo. The result of his practice as an army surgeon, commendable for the bold and decisive methods of treatment made use of in the most dangerous cases, and for the general success with which they were attended. "Traité des Operations de Chirurgie," Paris, 1743, 12mo. To the translation of this work into English, by Gataker, Cheselden made some valuable additions. "Consultations sur la plupart des Maladies qui sont du Report de la Chirurgie," 1765, 8vo. A work well calculated for the instruction of students in surgery. The author also sent several observations of considerable merit to the academy of surgeons, which are published in their memoirs. He died, at a very advanced age, in 1770. Haller. Bib. Chir. Gen. Biog.

Dran, in *Geography*, a river of Germany, which runs into the Drave; 4 miles S. of Pettau, in the duchy of Stiria.

DRANCE, a river of Switzerland, which runs into the Rhône, near Martigny, in the Valais.

DRANGÆ, in *Ancient Geography*, a people of Asia, in the Perside, placed by Pliny towards the source of the river Indus.

DRANGIANA, a province of Asia, in the Perside, being one of the provinces of Alexander the Great in Asia. It was bounded on the west by Carmania, on the north by Aria, on the east by Arachosia, and on the south by Gedrosia.

DRANGOWSKY, in *Geography*, a small town of Prussia, in Samland, not far from Tilsit, the inhabitants of which are almost all of the Roman Catholic church.

DRANK, a name given by our farmers to the great wild oats. These are often very troublesome to the ploughed lands, especially after wet seasons and much frost. Many, to destroy this weed, sow the land with black oats, which being ripe much sooner than the seeds of this plant, are cut down before it can sow itself for another year; especially if they are cut a little the earlier, which will do them no harm, if they be suffered to lie a while upon the ground afterwards, for the grain to swell before they are carried in. But, in general, when ploughed lands begin to run to these weeds and thistles, it is a token to the farmer that it is time to fallow them, or else to sow them with hay seed, and make pastures of them. The sowing beans upon a land subject to these weeds is also a good method, because the farmer may send in his sheep when they are about three inches high, which will eat up the drank, and all the other weeds, and will not hurt the beans. The general method is to put twenty sheep to an acre; but they must be put in only in dry weather, and not left too long.

DRANSES, called *Transes* by Herodotus, in *Ancient Geography*, a people of Thrace, who are said to have wept at the birth of their children.

DRANSFELD, in *Geography*, a small town of Germany, in the duchy of Calenberg, which formerly constituted a part of the electorate of Hanover, but at present is a province of the new kingdom of Westphalia. It is situated between Minden and Göttingen.

DRAPERY, in *Painting*. The word drapery denotes all kinds of stuffs, or cloths, disposed in folds. When applied to the clothing of figures, it is sometimes made to include all the various materials, of whatever substance, with which men are accustomed, either from necessity or decency, to cover or enfold their bodies, and also all the ornaments which taste and luxury have adopted to enrich the dress, according to the ideas of different nations, and the fashions of different ages. In this extensive sense Reynolds speaks of it, when he says, that "we make no difficulty of dressing statues of modern heroes, or senators, in the fashion of the Roman armour, or peaceful robe; and we go so far as hardly to bear a statue in any other drapery." It also comprehends all hangings, curtains, &c. and other adjustments, made by means of stuffs or cloths of any kind, in the scenery of a picture, whether apartments or other; but, in this last point of view, it must be recollected, that it is not the name nor substance, but the *disposition* of those materials, that brings them under the denomination of *drapery*. Cloths of any kind may be made to fill whatever portion of his composition the painter may find suitable to his purpose, but unless they be disposed in folds, they are still cloths only, and not drapery.

Drapery then, strictly regarded, consists in the disposition of folds; and the skilful disposition of folds, whether for clothing or other use, constitutes the *art* of drapery.

The art is to be considered, as it regards form, character, costume, and expression. In the general composition of a picture, drapery is connected with *costume* and *character*: as an object of study in a single figure, the *beauty of drapery* stands deservedly next in rank to *beauty of form*, as it not only powerfully co-operates with the latter, but is even found to be at times capable of enhancing its value, by artful management and partial concealment; and it is also capable of assisting *expression*, as far as it is displayed by the action of the figure. In the naked form, and in the disposition of the drapery, Reynolds observes, the difference between one artist and another principally consists.

As the art of drapery has never yet been theoretically treated in our language, the following principles and rules, extracted from the writings of Leonardo da Vinci, Lomezzo, Mengs, Reynolds, Watelet, and Dupiles, will offer instruction from the best source that can be found, *viz.* from professional observations. It would be easy, by combining these observations, to produce the display of a general system; but a far greater advantage, it is conceived, will be afforded to the reader, by giving the particular authorities, whenever any passage is sufficiently close to the original sources, to admit of such confirmation.

The skill of drapery is chiefly comprised in three things, *viz.* 1. The order of the folds. 2. The diversity of stuffs. 3. The variety of colours in the stuffs.

Of the Order of the Folds.

'In clothed figures, the principal effect of draperies should be to make us understand what they cover; in such a manner, that the outward character of the form, and the accuracy of proportions, may generally appear through them, as far at least as probability will allow. For this purpose, the

the greateſt maſters of the art have ſet the example of firſt drawing their figures naked, and afterwards diſpoſing the drapery on them, in order that the eye may ſtill imagine it ſees, or can trace, what is concealed by the caſt of the draperies.' Dupiles.

'The draperies with which the painter clothes his figures ought to have their folds adjuſted to ſurround the limbs they are intended to cover in ſuch a manner, that in the enlightened parts there may not be any folds with dark ſhadows, nor in the maſſes of ſhade any, receiving too great a light; they ſhould go *gently* over, *deſcribing* the parts, but not cutting the limbs with hard lines acroſs, nor with ſhadows that ſink in deeper than the part itſelf can be ſuppoſed to admit. In fact, the drapery ſhould be ſo ſuited to the body, that it ſhould no where appear *uninhabited*, or like an empty bundle of cloth *that has loſt the man* from within; a fault into which many painters have fallen, who, enamoured of a profuſion of folds, have ſo enveloped and encumbered their figures, that they ſeem to have forgotten the real deſign of clothes, which is to dreſs and ſurround the parts of the body gracefully wherever they touch, and not to blow them out like bladders at every projection of the limbs on which the light falls. I do not deny the propriety of introducing ſome full and handſome folds, but let them be placed on thoſe parts of the figure where the action of the limbs, and the poſition of the body under them, naturally gather the drapery together.'

'Above all, be careful to vary the quality and quantity of folds in compoſitions of many figures, ſo that if ſome have large and broken folds produced by thick woollen cloth, others, being dreſſed in thinner ſtuff, may have them narrower and ſmoother; ſome ſharp and ſtraight, others ſoft and undulating.' Leonardo da Vinci on Compoſition.

'Folds, well imagined, give much ſpirit to any kind of action, becauſe their motion implies motion in the acting limb, which ſeems to draw them forcibly, and moves them more or leſs as the action is more or leſs violent.'

'Folds ſhould be great or large according to the quality and quantity of the drapery; and when, from the ſlightneſs of the ſtuffs, it becomes requiſite to uſe much folding, it muſt be ſo grouped that the chiaro-ſcuro may not ſuffer by it.'

'Folds deſigned from mere practice, without applying to nature, are proper only for a ſketch or firſt deſign. In perfecting his work, the painter ſhould always conſult the ſtuffs themſelves, becauſe in them the folds are true, and the lights agreeable to the nature of the ſtuffs.'

'To give a complete air of truth, draperies ought to be ſet either on a *layman* as large as life, or on the life itſelf; but care muſt be taken that they diſcover nothing of the immoveableneſs of the layman. Some painters make uſe of *ſmall* laymen, which they dreſs either with thin ſtuffs or wet paper; but this method cannot be uſeful for *finiſhing*, becauſe the ſtuffs, on account of their ſize, not having the ſame weight as on the larger *laymen* or the *life*, cannot ſhew the folds in their true ſhapes.'

'Light, flying draperies become none but figures in great motion, or in the wind.'

'Rich ornaments form a part of the beauty of draperies when uſed with diſcretion.' Dupiles.

'Many painters prefer making the folds of their draperies with acute angles, deep and preciſe; others with angles ſcarcely perceptible; and ſome with no angles at all, but inſtead of them certain curved lines.'

'That part of the drapery, which is fartheſt from the place where it is gathered, will moſt approach its natural ſtate. Every thing naturally inclines to preſerve its primitive form, and for this reaſon: when a ſtuff or cloth, of equal thickneſs, is conſtrained by ſome fold to relinquiſh its flat ſituation, it obſerves the laws of force at the point of its greateſt conſtraint, and as it is continually making efforts to return to its natural ſhape, the parts, moſt diſtant from that point, reaſſume moſt of their primitive ſhape by ample and diſtended folds. For example, let A B C be the drapery juſt mentioned; A B the place where it is folded or reſtrained. It was ſaid that the part fartheſt from its point of reſtraint would return moſt to its primitive ſhape; therefore, C being the fartheſt, will be broader and more extended than any other part.' See *fig.* 1, *Plate* XII. *Miſcellany*.

'Draperies ought not to be rendered confuſed by numerous folds; on the contrary, there ought to be folds only where the drapery is held up by the hands or arms, and the reſt ſhould be left to fall without conſtraint. The folds ſhould, moreover, be ſtudied from nature, and varied in conformity with the materials of which the drapery is compoſed; they ſhould never be copied from models dreſſed in paper or thin leather, as is the deceitive cuſtom of many painters.'

'In thoſe parts where the figure is fore-ſhortened, there ought to be introduced a greater number of folds than in any others, and they ſhould all ſurround the fore-ſhortened parts in a circular form. *Example*—Let the eye be at E; L M will have the middle of the circular folds removed farther from the eye than at the extremities. In N O, on the other figure, the outlines of the circular folds will appear ſtraight, becauſe they are directly oppoſite to the eye, but in P Q quite the contrary, as in L M.' See *fig.* 2, *Plate* XII.

'The folds of draperies, whatever be the motion of the figure, ought always to ſhew, by the flow of their lines, the action and attitude of the figure ſo clearly, as to leave no doubt in the mind of the beholder, in regard to the true poſition of the body. Let there be no fold which breaks the form by appearing to cut into the ſurface of what it covers; and if the figure be repreſented as covered with ſeveral garments one above the other, let not the upper one appear as if it covered the ſkeleton only, but let it expreſs a thickneſs of folds conſiſtent with the number of the garments beneath.'

'Folds, ſurrounding the limbs, ought to diminiſh in thickneſs near the extremities of the parts which they ſurround.' L. da Vinci.

Beſides theſe rules of method in the diſpoſal of folds, the painter ſhould be watchful to avail himſelf of thoſe beauties, which accident frequently lays before him, in the caſting of his draperies. There may be a happineſs, an air of nature in the firſt *throw* of a piece of drapery, which art can more eaſily interrupt than improve. In this caſe, "there is a danger," ſays Reynolds, "in touching or altering a fold of the ſtuff, which ſerves as a model, for fear of giving it, inadvertently, a forced form; and it is perhaps better to take the chance of another throw than to alter the poſition in which it was at firſt accidentally caſt."

But there are, moreover, in nature, many ſituations of garments, or other cloths, into which it is not in the power of the artiſt to caſt any throw of drapery in ſuch a manner as to allow him opportunities of accurate ſtudy: ſuch, for inſtance, are the light-waving, or agitated folds, occaſioned by rapid motion, wind, &c. In all ſuch inſtances, as he cannot reach what is abſolutely true, he muſt take care that he adopt *the probable*, and avoid every fold that is evidently contradictory to the action, and, of courſe, impoſſible in nature; in doing which he muſt rely on his own knowledge, previouſly obtained by a diligent attention to nature in all her various appearances. See NATURE.

It has been the invariable practice of the painters of the Italian ſchools, from the time of Raffaele to the preſent day, at the beginning of any great work, after firſt ſettling

the distribution and attitudes of the figures, to set the draperies on the life, or on small models, and to make finished, or, at least, highly studied, drawings from them, and afterwards, from those drawings, to paint the draperies of their pictures. Numerous preparatory studies of drapery, executed in this manner for well known works of the most celebrated masters, are found in almost every collection of Italian drawings. Felibien relates, that Annibale Caracci used to make his scholars cast drapery for his works on living models, and make correct drawings from them, by which means he obtained the first design of his drapery from nature; and that he then, from those drawings, set his draperies on the layman, in order to paint them at leisure.

Of Diversity of Stuffs.

Among the many things that are capable of affording pleasure in a picture, variety of stuffs is certainly entitled to consideration; but it is a point which has been estimated very differently by different schools. The Venetian and Flemish schools have appeared to maintain, by their practice, that it is not enough that draperies should be variously cast, but that the stuffs themselves should be of various sorts, to the full extent of which the subject would admit. 'Wool, linen, cotton, silk, as they are manufactured a thousand ways, afford the artist a wide field for choice; by which means he may introduce a great variety into his works, the more necessary, as it avoids a tiresome repetition of folds of the same kind, especially when many figures are introduced into one subject. Some stuffs naturally make broken folds, others more soft and round; some stuffs are rough-wrought, others smooth and glossy; some are thin and transparent, others more solid and substantial; and this variety, whether dispersed among several figures, or collected in one, agreeably to the subject, never fails to produce delight to the eye.'

The Roman, Florentine, and Bolognese schools, on the contrary, have made a general use of the same kind of stuff (particularly in historical painting) for the drapery of every figure in the picture. They conceived this system of dressing their figures to be consistent with the dignity of history and poetry, which are always degraded by individual representations.

In these opinions sir Joshua Reynolds seems entirely to coincide, and every where considers variety of stuffs as inimical to the true style of history. In his "Journey to Holland and Flanders," that great painter has remarked, on a picture of the "Death of Cleopatra," painted by Lairesse, that the style of the work (otherwise good) was degraded by the naturalness of the white sattin, which is thrown over her. The picture, says sir J., "is as highly finished as a Vanderwerf, but in much better style, excepting the drapery, which is not equal to Vanderwerf. Vanderwerf painted what may be truly called drapery; this of Lairesse is not drapery, it is white sattin."

The ancient sculptors have been believed to have made use of wetted linen for the drapery of their statues, (although the great subtileness of modern dresses might well put this belief in doubt,) and their drapery is mostly uniform in *kind*. Modern sculptors, and particularly of the Flemish school, have introduced a greater variety of substances in drapery; but the art of a painter is, for the most part, misapplied, when he imitates the drapery of sculpture.

Of Variety of Colours in the Stuffs.

'Nothing contributes more to the harmony of the whole together, in most pictures, than the different colours of drapery, which are within the range of the painter's choice. With this view, he studies the value of each colour when entire, their effect when placed by one another, and their different degrees of accord when broken.' Dupiles.

Drapery, considered under this head, is capable of affecting the general tone of the impression made on the spectator by any picture. It may contribute to inspire a solemn and mournful, or a gay and cheerful sentiment. But as under this head drapery is merely an organ of colour, and partakes, in common with every other part of composition, of the power of aiding and enriching the general effect, by the colouring of the picture, this division of the study of drapery must be referred to the art of colouring.

General Uses of Drapery.

'Few persons, at least among those who are uninitiated in the mysteries of the painter's art, can imagine of what importance drapery is in the composition of a picture. The art with which the drapery is cast frequently forms the ground-work of the harmony of the whole work, both as it relates to colour and chiaro-scuro, and to the general arrangement of the composition. In regard to colour and chiaro-scuro, in order to comply with every thing which the laws of harmony require, the painter finds an ample resource in the liberty he possesses, of giving to his different draperies such colours as connect and harmonize with the other objects represented in his work, and thus preventing any discord between the parts (see HARMONY): in addition to which, having it in his power to dispose of his folds in such a manner that as they shall either receive a full light, or light diminished, more or less, or be entirely in shadow, he can, by the turn of a fold, recal the light to any of those parts where it is necessary, or take it away by the interposition of more projecting folds.' Watelet in the French Encyclopedie.

'The painter has the same power, by means of drapery, over the harmony of composition, or general arrangement of his subject, as he has over the colouring and chiaro-scuro. If he has several groups to manage, he *ties* them, as it were, together by drapery, employing it to fill the void spaces, which would otherwise cut them off from each other, and thus sustaining the attention of the spectator on the principal object, by giving it greater consistence and extent, serving for its base and support.'

'The same art contributes to the expression of the characters and the passions of the persons represented; a truth which no one will doubt, who reflects how greatly the idea we form of any one, who presents himself before us, is enhanced or diminished by the garb in which he appears. In every imitation, therefore, of human appearances, the mode in which each figure is clothed, will concur with the passion expressed in that individual, in strengthening the idea we conceive of his general character.' Watelet in the French Encyclopedie.

This will presently be shewn more fully under a subsequent head.

Relation of Drapery to Costume.

Amidst the comprehensive range of objects which the studies of a painter embrace under the article of *Costume*, or the usages of different nations, dress constitutes a feature so readily and familiarly palpable, that it has sometimes, in vulgar use, obtained the appellation of the whole; and a picture said to be *in the costume* of a country, has been thought to mean little else than that the figures are dressed in the fashion of that country. Were this really the fact, the importance of drapery, relatively to costume, would be of the highest degree; but the case is far otherwise. Costume, as it regards painting, includes every external circumstance by which the especial and characteristic habits of any people, the

the Mores Gentium, can be expreſſed to the eye. Every object of nature and art is preſſed into the ſervice under this deſcription, and whatever incidental appearances denote the period, the genius, the manners, the laws, the taſte, the character, the climate, or the cultivation of a country, all forms animate or inanimate, the Palms of Syria and the Pyramids of Egypt, the Lion and the Sphinx, are conſidered, in the works of painters, as parts of the coſtume of nations, in the different regions of the earth. The "Battles of Alexande," by Le Brun, are celebrated in the French ſchool for the great diſtinctions of coſtume, which the painter had the ability to introduce in the combatants of different nations; diſtinctions, which are aſſerted to have been, in great meaſure, aſcertained by the hues and phyſiognomy of the reſpective warriors, and by the characters of the horſes; for the ſake of accuracy, in which latter point, in regard to the Perſians, he had procured drawings of horſes by an expreſs commiſſion from Aleppo. Nicolo Pouſſin, alſo, has been admired for his nice attention to coſtume in all the ſubordinate arrangements of his pictures, by the introduction of appropriate trees, animals, and buildings; an excellence which contributed to obtain for him the appellation of "Peintre des Gens d'eſprit."

It is evident, therefore, that in this extenſive ſcale of alluſion, dreſs, the tranſient idol and victim of faſhion, aſſumes a very inferior ſhare of conſequence; and for this reaſon, a rigorous adherence to its minutiæ can ſeldom be required in painting.

At the ſame time, common ſenſe directs one diſtinction to be carefully preſerved, *viz.* that in drapery, as in every other object of imitation, whatever denotes a general and eſſential principle, conformable to the dictates of nature, is by no means to be diſpenſed with. In the repreſentation of a ſultry climate, for inſtance, it would be a contradictory abſurdity to cloath the figures with thick cumberous garments; and, in a cold climate, with thin airy ones. Equally abſurd would be the introduction of two dreſſes, known poſitively to belong to different ages and nations, among a ſet of figures, who, being of the ſame ſpot and time, ought all to wear cloathing of the ſame kind. But beyond this general deference to eſſential points, every thing ſeems to be under the abſolute controul of the painter. The repreſentation of events, which have actually happened in our own time, can alone have any pretenſion to confine his choice.

A juſt knowledge, therefore, and attention to coſtume, forms a neceſſary part of the ſtudy of drapery. In portraiture, the obſervance of coſtume may be conſidered ſo important, that, unleſs when it obſtructs the general deſign of the work, none but the moſt indiſpenſable preventions ſhould ever be ſuffered to interfere with it. This is particularly the caſe in the portraits of eminent men, in which every form of drapery, once worn by the hero of the time, nay, even the minuteſt ornament, becomes valuable to future ages. But, in the compoſition of hiſtorical drapery, it is evident that accuracy of coſtume ought by no means to be carried to the ſame degree of ſtrictneſs. "To ſteer a proper courſe in this reſpect," ſays Watelet, "the painter ſhould equally avoid a blind obedience to the judgment of the mere antiquarian, and of the devotee of modern faſhions. If he conſults the latter, he will, for inſtance, dreſs Cyrus either in Greek or Roman garments, or partly in both, as chance ſhall direct, and Cato, revolving in his mind the immortality of the ſoul, and raiſing his dagger that he may not ſurvive the freedom of the republic—in a night-gown and ſlippers. On the other hand, the former, who paſſes life in fathoming the depths of obſcure erudition, and in whom the taſte for the arts and the pleaſurable ſenſations they are capable of producing, are ſtifled in their birth, will expreſs a diſguſt, at finding a braſs nob wanting in the armour of the Horatii, far ſurpaſſing the feelings excited in his breaſt by the moſt lively repreſentation of the action. The middle courſe which the painter ought to keep, is to give to every nation, to the Romans for example, the dreſs worn in the moſt renowned period of the ſtate; he cannot be required to employ the long and painful reſearches, neceſſary to acquaint him with every ſhade of faſhion, which luxury may have introduced among that celebrated people. He will be ſtill more at liberty, when the ſubject of his work is taken from remote times and nations, whoſe cuſtoms are leſs known to other countries and other ages. I will add, that a painter is more excuſable when, without conſulting the *coſtume*, he gives his figures *ideal* draperies, than when he clothes them in the dreſs of any other nation than their own." Encyclopedie.

Various characters of drapery, adopted by the Italian maſters.

'In the compoſition of draperies, three things are to be conſidered, in order to make them excellent and juſtly proportioned, according to the figure on which they are caſt. Firſt, they muſt be, in regard to their folds, of ſuch a quality, as to ſuit exactly the perſons who wear them; ſecondly, they muſt every where *follow* the parts of the *nudo*, which is under them; and thirdly, they muſt be governed by their ſituation, complying with, or following, the *nudo*, but not beyond proper bounds.'

'In regard to the firſt point; the painter ſhould ſtudiouſly vary the drapery, and the airs of his folds in all his figures, adapting his ſtuffs to the nature and character of the perſons repreſented. If the dreſs is that of a philoſopher, or a prophet, he will learn to make it full and large; and the fewer folds he introduces the better. This has been ſeen in the practice of Michael Angelo, in the "Prophets" and "Sybils" painted in the ceiling of the chapel which contains his work of "The Laſt Judgment," as well as of Raffaelle, in many inſtances, and of Polydore, whenever he had occaſion to repreſent figures of that kind; becauſe, if the folds had been made ſmall, they would not have correſponded with the gravity of demeanour and majeſtic ſtature of ſuch figures. On the other hand, the perſon of a Nymph, or other young female, neceſſarily requires light drapery, capable of being moved with every breeze, and forming ſmall folds, ſuch as denote a texture of drapery, ſuited to her nature and quality. Drapery, of the ſame kind, has been judged moſt appropriate to angels alſo, as we ſee in the works of Gaudentio, Leonardo, Boccacini, and Mazzuolino, ſuch drapery being beſt adapted to the nature and quality of thoſe beings. And, for this reaſon, they have clothed them with thin tranſparent veils, and light garments wrapped round them, with ſmall and minute folds, but ſpreading wider from time to time, according to the turn of the figure.'

'Drapery, with folds neither ſo few and weighty as the former, nor ſo crowded and narrow as the latter, is ſuited to men of elevated character and matrons of a ſuperior claſs; ſuch, for inſtance, as the Virgin Mary, the diſciples, and others of that kind. The painters moſt eminent for draperies of this ſort were Leonardo, Raffaelle, and Gaudentio; the laſt of whom added to the excellence of his draperies an exact repreſentation of their various ſubſtances. After theſe, the moſt excellent in this kind of drapery was Andrea del Sarto; and in the German ſchool, Albert Durer and Bernardo of Bruſſels.'

'Regard muſt alſo be paid to the rank and condition of the characters repreſented, to which the garments and reſpective ornaments ſhould be adjuſted. Jewels, embroidery,

ſilk robes, and rich brocades, are well ſuited to princes, queens, and others of the ſame rank, but not at all to thoſe whoſe beſt ornament is modeſty of demeanour; ſuch as ſaints, the Virgin, &c.; whom many painters, and Mazzuolino, for inſtance, have dreſſed with pearls and jewels in their heads; and it was even at one time the cuſtom to repreſent them with embroidered garments and borders inwoven with gold; a cuſtom which, on all accounts, cannot be too much cenſured.'

'The ſecond point regards the folds following the *nudo*, and every where correſponding with the figure under them. This ſort of drapery is more artificial than natural, and was adopted by Michael Angelo to diſplay his knowledge; whence, availing himſelf of the great power he poſſeſſed in the diſplay of the form and the connection of all the limbs, he has given an inſtance, in the Pauline chapel in the Vatican, of a perfect repreſentation of the *nudo* in a clothed figure. This divine painter was deſirous alſo to demonſtrate by ſuch an example the difficulty of attaining this manner, as well as his own unwearied induſtry in attempting every method of clothing his figures.'

'Raffaelle, and the others whom I have mentioned, have ſet better and ſafer examples of the moderation which was propoſed as the third point of conſideration; *viz.* that the drapery ſhould follow the *nudo*, but not to exceſs.'

'Many other ſorts of drapery have been adopted by Bramante, Andrea Mantegna, and others who have copied them, from models clothed with paper and linen glued on.'

'Beſides theſe, there have been introduced ſeveral intricate ſyſtems of drapery, which ought all to be carefully avoided; and, in particular, a certain confuſed mode of folds, (as different as any can be from the drapery of Raffaelle,) diſcovering neither order, beginning, nor end in the various parts, but the whole garment a chaos of white taffetas, velvets, and brocades, drawn up into numberleſs minute folds. I do not ſay that this fault is found in *an extreme degree* in the draperies of Titian, Giorgione, and Giovanni Bellino; but it is eaſy to be ſeen that they have not expreſſed the action of the figure with the preciſion introduced by the manner of clothing of Raffaelle, Gaudentio, and others above-mentioned.' Lomazzo dell'Arte della Pittura.

The drapery of Albert Durer was, in Sandrart's judgment, ſuperior to that of any other painter, both on account of its breadth and of the total abſence of all but the moſt neceſſary and natural folds; and he aſſerts 'that it became a ſtandard for imitation, not only to the Germans, but even to ſome of the moſt celebrated cotemporary maſters of the Italian ſchool.' Thoſe beauties for which he praiſes it need not be queſtioned: it carefully diſplays the figure, and appears to flow, by a ſort of happineſs, with the direction of the limbs; but the ſharp angular contraction of the folds, which gives Albert Durer's drapery an appearance of being ſuddenly *pinched in*, inſtead of folded, is a fault which can, at preſent, hardly be overlooked, as being neither natural nor happily artificial.

In a latter period of the Italian ſchool two great maſters of the art of drapery, Guido and Carlo Maratti, have ariſen to eclipſe the fame of all preceding painters, except Raffaelle. Guido, in his picture of the "Doctors of the Church revolving the Queſtion of the immaculate Conception," and in his ſtill more celebrated "Aurora," has left examples of the moſt perfect beauty, propriety, and character of drapery. In the former work, the light folds of unſullied whiteneſs of the drapery of the Virgin, mildly and generally illuminated by aërial ſplendours, and the larger foldings and graver hues of the garments of the doctors, are equally deſerving our admiration. In the latter, he has exemplified all that is light, airy, elegant, and graceful in female drapery, caſt or falling into folds by the force of motion or air.

In the picture of the "Doctors of the Church" it is to be remarked, that Guido has entirely laid aſide all reference to coſtume, although he did not want precedents for the dreſſes of the principal perſons repreſented; and that the draperies are as purely ideal in that picture as in his other work of poetical imagination, the "Aurora."

It is remarkable, in the progreſs of the Italian ſchool, that, in proportion as the ſtyle of art deteriorated, attention to drapery continued to gain an aſcendancy.

In Guido, from the varied beauties which he gave to his drapery, from the union of lightneſs, ſoftneſs, and breadth in his folds, drapery firſt became a predominant feature of hiſtorical deſign. Pietro da Cortona, who corrupted art, clothed his female figures in the moſt ſeductive variety of attire. Andrea Sacchi's great work, in the church of St. Romualdo, the fourth wonder of Roman painting, derived the greater portion of its praiſe from the powerful management of the drapery in the dreſſes of the religious characters introduced in it; and in the time of his ſcholar, Carlo Maratti, the whole ſtudy of painting conſiſted ſcarcely in any thing beſides drapery.

Of the draperies of Raffaelle, Correggio, and Titian.

'In ſpeaking of drapery, it is impoſſible to withhold the higheſt eulogium from Raffaelle. In his firſt works he followed the manner of his maſter, Pietro Perugino, in the diſpoſition of his folds, as in all other points. He ſomewhat improved his ſtyle from the works of Maſſaccio, and much more from thoſe of Frà Bartolomeo di San Marco. Afterwards, on ſeeing the works of the ancients, he abandoned altogether the ſchools of thoſe maſters, and adopting ſuch rules as he formed from the ſtudy of the antique for the natural diſpoſition of his draperies, he acquired that admirable taſte by which his folds are diſtinguiſhed.'

'He obſerved, that the ancients conſidered drapery not as a principal part of their work, but as an acceſſory merely; that their aim was to clothe, but not to conceal the *nudo*; that they did not cover their figures with ſcraps of cloth, but with good uſeful drapery, neither prepoſterouſly ſcanty nor redundant, but proportioned to the character, ſize, and action of each figure. He ſaw that they made large folds to correſpond with the large parts of the human body, and that they did not break thoſe parts with ſmaller accidents, or when compelled to do ſo by the nature of the drapery, that they introduced ſmall folds of little elevation, to prevent them from appearing principal. Guided by their example, Raffaelle alſo gave grandeur to his draperies, by avoiding all ſuperfluous folds, and placing the pleatings at the joints and bendings of the limbs, without, in any degree, thereby ſhortening the appearance of the figure.'

'The ſhape of Raffaelle's folds was regulated by a proportionate adjuſtment to the part of the body over which they were caſt; if that was large, he placed a large maſs of folds on it, and where the part was foreſhortened, he made the ſame number of folds, but all foreſhortened. In his early works he uſed to mark the limbs, under looſe and hanging draperies, on one ſide only, but he afterwards corrected this method and marked them on both. When the drapery was detached from the body, he made the folds wide and open, that they might have no appearance of any limb under them.'

'He did not examine his folds with a view to chooſe out the moſt beautiful, but to adopt ſuch as would moſt clearly mark the parts of the body which they covered. He gave his folds as many various ſhapes, as there are muſcles on the ſurface

ſurface of the human body; never however making them entirely round, nor ſquare, becauſe the folding of drapery does not, in its nature, admit of ſquare forms, unleſs when they are divided into two triangles. Over the hollows he caſt large folds and pleatings, but never put two of the ſame ſize cloſe together, nor of equal ſtrength and breadth.'

'His flying draperies are admirable, becauſe they are all plainly moved by one common cauſe, the wind. They appear neither *drawn out*, nor *hung up*; and one fold contraſts another agreeably to the natural quality of the drapery.'

'In ſome places he brings in ſight the hem or border of the garment, to denote its being really adapted to the body. He makes no folds, that cannot be accounted for, either as reſulting from their own weight, or from the action of the limb, to which they correſpond. Sometimes, it is even diſcernible in what form they muſt have been previous to that which they ſeem to have firſt taken, and it appears, from this circumſtance, that, even in his draperies, the great object of his purſuit was Expression. It is eaſy to diſtinguiſh, in many of his folds, whether the arm or leg on which they are formed, ſtood forward or behind, previous to the ſituation in which he ſhews it, and whether the limb has been altered by contracting or extending it.'

'In the principal movement of the figure, he obſerved, that when the drapery covers the half of a limb, it marks the other half by croſſing it obliquely in a triangular form, and that folds take this form more generally than any other, becauſe whatever drapery is carried acroſs to one ſide or the other muſt neceſſarily bend and grow narrow in one part, and ſpread in another; and this gives it a triangular ſhape.'

'I have already remarked that Raffaelle, after the example of the ancients, conſidered drapery as an accidental circumſtance, and that great painter, I now add, conſidered the human figure, and the motions of the limbs, as the only juſt cauſes of the different directions of his garments, and of the variety of the folds in them; deeming it, moreover, expedient to conceal the ſtudy and choice, employed on the occaſion.'

'In the ſame manner that Raffaelle directed every circumſtance to *expreſſion*, Correggio kept always in view the *agreeable*, or what was *pleaſing*. He very early quitted the manner of his predeceſſors in art, and as, in general, he painted his figures from ſmall models, which he clothed with pieces of cloth or paper, he ſought every where for *maſſes*, and, in thoſe maſſes, for what was pleaſing, in preference to the truth of individual folds; and by theſe means his draperies are at once large and light, but with very indifferent folds. When he painted from the life, he ſometimes choſe his folds very ill, and often concealed or broke the form of the body under them. As to the reſt, he made his draperies of moſt beautiful and juicy hues, often introducing dark colours, to give a greater brightneſs to his *fleſh*.'

'Titian painted his draperies, as he did moſt other objects, from imitation merely; he made them ſufficiently beautiful, ſtrongly reſembling nature, and with great brightneſs and relief of colour. His linen, in particular, is moſt eminently clear and ſparkling, entirely, however, without choice in the folds, and exactly as he found it in the object before him; on which account he ought not to be imitated in this point.' Mengs, ſobre la belleza y guſto en la pintura.

Drapery of the Ancients.

As far as any authority can be found, which we may venture to repeat, the invention of the art of drapery was of a later date among the Greeks than that of form. We read that light and ſhade, and colour, had been ſucceſſively added to the at firſt ſimple outline, before we meet with the name of the painter, who diſcovered the method of imitating the folds of drapery. That the ſtudy of this ſubject was afterwards carried to an equal degree of excellence with the other parts of the art of painting, is moſt probable; the proof reſts on the faith of hiſtory.

Of the drapery of the Greek painters, ſo extolled by writers and critics, we have few examples, beyond the pictures diſcovered at Herculaneum; all of which were probably executed by inferior artiſts, and appear to be but ſlight hints of thoſe ſuperior ſources of excellence from which they muſt have deſcended. The greateſt number of theſe pictures repreſent female figures, whoſe drapery is light, airy, eaſy, exquiſitely taſteful, and adapted to the entire diſplay of the figure beneath it. Several inſtances alſo occur, in the outer garments both of male and female figures, in which the drapery is of a larger and heavier caſt, with broad folds, but equally well adjuſted with the former, for ſhewing with preciſion the intent of the action, or the quieſcent poſture of the limbs.

If we may truſt to the reports of Pliny, reſpecting the excellencies of the Greek painters, the curtain painted by Parrhaſius, in his conteſt for pre-eminence with Zeuxis, however confined an idea it may give us of the ſcope of graphic excellence at that period, at leaſt demonſtrates, that the painter was ſkilled in the imitation of the natural appearances of drapery. But no examples of this kind are come down to us. From thoſe paintings, which we ſee, of the Greek ſchool, we can only aſcertain, that the ſame principle of order in the folds, which prevails in the diſpoſition of drapery in their ſtatues, appears to pervade alſo the productions of their pencil; the ſame beauty of method every where predominates; while the juſt diſtinctions, which ſeparate the repreſentations of painting from thoſe of ſculpture, are at the ſame time to no inconſiderable extent, forcibly, judiciouſly, and ſyſtematically preſerved. The flow of the folds is fuller, more free, and, in proper places, detached from the object that ſupports them. Although they every where convey the diſtinct idea of the form, they no where cling to the body; and they furniſh a ſufficient, though unregarded leſſon to thoſe painters, who, in ſome of the modern ſchools, and particularly in the French ſchool, have abſurdly imagined that they were imitating the beauty of antique draperies, when they made their pictures reſemble antique ſtatues. 'The diſpoſing of the drapery,' ſays Reynolds, 'ſo as to appear to cling cloſe round the limbs, is a kind of pedantry which young painters are very apt to fall into, as it carries with it a reliſh of the learning acquired from the ancient ſtatues, but they ſhould recollect there is not the ſame neceſſity for this practice in painting as in ſculpture.'

In the flying draperies of nymphs and other dancing figures, the pictures of Herculaneum exhibit the moſt acknowledged ſpecimens of excellence, in the artful diſpoſition of folds of that deſcription, never afterwards approached by any painter, unleſs by Raffaelle and Guido.

Other modes of Drapery.

Beſides the ſuperior ſtyle of drapery adopted by the ancients, by Raffaelle (ſo well deſcribed by Mengs,) by thoſe mentioned in the precepts of Lomazzo, and by their ſucceeding diſciples, another diſtinct claſs of drapery remains to be noticed, conſiſting in an union of the *picturesque* with *coſtume*, by a bold diſpoſition of real dreſſes of a particular time, without regard to their formal adjuſtment; and by treating them in every reſpect, with the ſame freedom that would attend the diſpoſal of draperies merely ideal. In

this mode of repreſenting hiſtorical draperies, Paul Veroneſe, and, next to him, Rubens, have ſet the moſt conſpicuous examples. They have, with a ſtrict local adherence to the coſtume of dreſs, generalized particular forms into ample maſſes, rendered minutiæ ſubſervient to the increaſe of the whole effect, and, withal, made them the inſtruments of ſo impoſing and delightful ſplendour, as precludes all ſeverity of reflection on the incongruities ariſing from their practice.

The ſource of this example, in the Venetian ſchool, is to be traced to the celebrated picture by Titian, repreſenting the murder of St. Pietro Martyre. The bold poetic uſe, there made of the formal religious dreſs, particularly in the figure running away, freed the art at once from its ſuppoſed inability of uniting force and grandeur of imagination with attention to coſtume in dreſs, and led his followers to attempts of the ſame nature, which, under the guidance of leſs powerful judgment, often rendered their works a kind of carricature in hiſtory, or little better than an hiſtorical maſquerade.

Raffaelle is well ſaid, by a French writer, to have been the beſt painter of *drapery*, and Paul Veroneſe the beſt painter of *ſtuffs*.

There can be no drapery more faulty in painting or ſculpture, than that which, in either art, affects to reſemble the productions of the other. It is not to be denied, that in the higheſt of all examples of ſculpture, the works of Phidias, ſuch drapery is to be found, as from its ſoftneſs and breadth (founded on a knowledge of principles poſſeſſed only by himſelf), may ſafely be transferred to painting. Such, for inſtance, is the drapery of the two females ſitting together, in the collection brought from Athens by the earl of Elgin, in which every quality of beauty of form and character is combined. But without this conſummate knowledge, the experiment, whenever it has been made, has been generally unſucceſsful. Painting, imitating the drapery of ſculpture, has produced garments of ropes; and ſculpture, imitating that of painting, has left it doubtful if it deſigned to repreſent clothes or rocks.

The requiſite diſtinction between the proper management of drapery in painting and in ſculpture, is moſt inſtructively exemplified in the practice of that great maſter of both arts, M. Angelo Buonaroti. Du Freſnoy has juſtly pointed out this diſtinction: the large folds, he remarks, and maſſy garments, with which the prophets, in the Siſtine chapel, are inveſted, are confeſſedly ſuch as correſpond with the powers of painting, and peculiarly adapted to the awful character of the perſons who wear them: but, in the monument of Julius II., in the church of San Pietro in Vincoli, the ſtatue of Moſes, although by the character of the perſon repreſented, it evidently takes the ſame claſs as the figures of the prophets, has nothing of the ſame kind of drapery. The dreſs is caſt cloſer round the limbs, the folds are thinner, narrower, and, in every reſpect, ſuch as the properties of ſculpture render neceſſary, for the juſt expreſſion of the forms of the figure.

Detached Draperies.

The uſes of drapery, in balancing the parts of a compoſition, or in uniting and tying the whole together, have already been noticed; and examples are to be ſeen in numerous works of almoſt every painter. In the conduct of this part of the art, the ſame rules which have been applied to the foldings of drapery connected with the human figure, will hold good, though in a ſubordinate degree, when applied to all draperies detached from the figure, and in ſome meaſure independent of it. Drapery, on whatever object it falls, ſtill bears an eſſential relation to that object, and will, by the nature of its folds, more or leſs expreſs the nature of its ſupport; and it muſt, in painting, be adjuſted accordingly.

But, large maſſes of drapery, almoſt wholly detached and independent, have ſometimes been ſo powerfully employed by the painter, as to conſtitute a predominant feature of his compoſition. Two moſt eminent inſtances of this uſe of drapery are, the famous "Deſcent from the Croſ" by Rubens, and the no leſs famous "Table Cloth" by Titian. In both of theſe pictures, the principal effect of light is formed by the diſplay of an extended piece of linen, which, in the former, involves the greater portion of the compoſition, and, in the latter, forms the foremoſt and moſt attractive object. With theſe inſtances, however, of drapery, (if it may properly be ſo called) the ſtudy of the art is little connected, in any other point than in its power of aſſiſting colour, and effect of chiaro-ſcuro in general. The diſtinction of the parts of the drapery ſeems here to have had very little ſhare in the painter's thoughts; their object being effect, and not folds; and all draperies of ſuch a nature muſt, therefore, ſtrictly ſpeaking, be referred to the articles *Colour* and *Effect*, as ſubordinate branches of thoſe heads.

This article cannot be better cloſed than by the brief, comprehenſive remarks of our inimitable Reynolds. They are, as follows, in his fourth diſcourſe delivered at the Royal Academy:

'In the ſame manner as the hiſtorical painter never enters into the detail of colours, ſo neither does he debaſe his conceptions with minute attention to the diſcriminations of drapery. It is the inferior ſtyle that marks the variety of ſtuffs. With him, the clothing is neither woollen, nor linen, nor ſilk, ſattin, or velvet; it is drapery; it is nothing more.'

'The art of diſpoſing of the folds of drapery makes a very conſiderable part of the painter's ſtudy. To make it merely natural is a mechanical operation, to which neither genius or taſte is required; whereas, it requires the niceſt judgment to diſpoſe the drapery, ſo that the folds have an eaſy communication, and gracefully follow each other, with ſuch natural negligence as to look like the effect of chance, and at the ſame time, ſhew the figure under it to the utmoſt advantage.'

'Carlo Maratti was of opinion, that the diſpoſition of drapery was a more difficult art than even that of drawing the human figure; that a ſtudent might be more eaſily taught the latter than the former; as the rules of drapery, he ſaid, could not be ſo well aſcertained as thoſe for delineating a correct form.'

'This, perhaps, is a proof how willingly we favour our own peculiar excellence. Carlo Maratti is ſaid to have valued himſelf particularly upon his ſkill in this part of his art; yet, in him, the diſpoſition appears ſo artificial, that he is inferior to Raffaelle, even in that which gave him his beſt claim to reputation.'

DRAPERY, in *Sculpture*. See SCULPTURE.

DRAPETES, in *Botany*, ſo named by ſir Joſeph Banks and Dr. Solander. Δραπέτης, *a runaway ſervant*, may allude to the fugacious nature of the flowers, concerning which, however, we have no information, or to the ſtation of the plant in a remote country, far away from its more gorgeous or elegant ſuperiors, *Daphne*, *Gnidia*, &c. of the ſame natural order. Lamarck, who firſt publiſhed this genus, leaves the name unaccounted for. Lamarck in Journ. d'Hiſt. Nat. v. 1. 186. Claſs and order, *Tetrandria Monogynia*. Nat. Ord. *Thymelææ*, Juſſ.

Gen. Ch. *Cal.* Perianth coloured, funnel-ſhaped, regular, four-cleft; its ſegments upright, lanceolate, bearded, nearly equal. *Cor.* none, except the calyx be taken for ſuch.

Stam. Filaments four, thread-ſhaped, equal, longer than the calyx, inſerted into its tube; anthers ovate, of two cells. *Piſt.* Germen ſuperior; ſtyle very ſhort; ſtigma not obſerved. *Peric.* a dry drupa, inveſted with the permanent baſe of the calyx. *Seed* ſolitary, ovate, pointed.

Eſſ. Ch. Calyx funnel-ſhaped, coloured, four-cleft. Corolla none. Stamens projecting. Drupa dry, ſuperior, with one ſeed.

D. *muſcoſus*, Lamarck in Journ. d'Hiſt. Nat. v. 1. 189. t. 10. f. 1, the only known ſpecies, grows among rocks by the ſea-ſide at Staten Land, flowering in December or January, where it was gathered by the eminent botaniſts abovementioned, as well as by Commerſon and Mr. A. Menzies. The *ſtems* are perennial and ſomewhat ſhrubby, though not above three inches high, very ſlender, and thread-ſhaped. They are branched, forming tufts, leafy in their upper part, beſet with ſcars in the lower, where former leaves have been. *Leaves* imbricated, oppoſite, croſſing each other in pairs, ſmall, ſeſſile, obovate, obtuſe, concave, entire, veiny, externally briſtly, deciduous, without ſtipulas. *Flowers* very ſmall, in ſtalked, terminal, ſolitary little heads, each ſtalk hairy, inveſted with a ſheathing deciduous leaf, and at length becoming near an inch long. The head conſiſts of four or five flowers, each on a very ſhort partial ſtalk, which is crowned with numerous white frigid briſtles, encompaſſing the baſe of the flower, like an involucrum, or additional calyx, but they are exactly like the general pubeſcence of the plant, and do not, in our opinion, make a part of the fructification, though Lamarck reckons them "hairs of the receptacle," according to the analogy of *Dais*. *Calyx* white, externally hairy, very ſlender at the baſe. *Stamens* about twice as long as the ſegments of its border, capillary, ſpreading. The flowers and fruit paſs away, leaving the ſtalks crowned with the ſilvery permanent tufts of the hairs above deſcribed.

DRAPSACA, in *Ancient Geography*, a town in or near Bactriana, according to Arrian, and ſuppoſed by Ortelius to be the ſame with *Drepſa*, which Ptolemy makes the metropolis of Sogdiana.

DRASON, a town of Aſia, in Phrygia.

DRASTIC, from δρᾶν, *I act*, a ſtrong and powerful medicine; more particularly, a purgative that works with ſpeed and vigour; as jalap, ſcammony, and the other ſtronger cathartics.

DRASTOGA, or Drastoca, in *Ancient Geography*, a town of Aſia, towards the ſources of the river Dargomanes, in the country of Paropaniſus. It was bounded on the north and weſt by a mountain of this name.—Alſo, a town of Aſia, in India, on this ſide of the Ganges; placed by Ptolemy in the country called Goricca.

DRATIGENA, a country of Aſia, ſo called by Polybius, who ſays, that Antiochus took poſſeſſion of it, and made it his winter-quarters. Some have thought that it is miſtaken for Drangiana.

DRAUCA, a town of the iſland of Crete.

DRAUDIUS, George, a German, author of a work entitled "Bibliotheca Claſſica," in two huge volumes 4to. Frankfort, 1625; in which are inſerted the titles of all kinds of books. It is merely a crowded catalogue of all the works which had appeared at the Frankfort fairs; but they are not well arranged, or very eaſily found, and the errors are innumerable. However, many have been corrected in later editions, and though ſtill incorrect, it is a very uſeful catalogue, particularly for German books, and muſical publications.

DRAVE, in Latin *Dravus*, in *Geography*, a conſiderable river of Hungary, which, iſſuing out of the province of Stiria in Auſtria, divides Hungary from Sclavonia, and at laſt empties itſelf into the Danube near Darda, below Eſſeck in Hungary.

DRAUGHT, in *Architecture*, is the repreſentation of a building delineated on paper, explaining the various parts of the exterior and interior by means of plans, elevations, and ſections drawn to a ſcale, by which all the parts are repreſented on a plane in the ſame proportions of the different ſides of the intended edifice, or, at leaſt, the proportions may be aſcertained from theſe drawings. The extent of the building, with regard to its horizontal dimenſions, is aſcertained by means of plans. The dimenſions of the vertical faces are generally obtained by the elevations and ſections, and always when the plane of delineation is parallel to theſe faces. The vertical dimenſions of buildings, upon circular and polygonal plans, muſt be found partly from the plans, and partly from the elevations or ſections. Over and above general plans, elevations, and ſections in complex buildings, a ſet of drawings, ſhewing the detail of the ſmaller parts, will be neceſſary.

Beſides theſe drawings, which are uſed in the conducting of the work, perſpective repreſentations for the uſe of the proprietor will alſo be neceſſary, in order that he may form a juſt idea of the edifice which he intends to rear in one or more points of view.

When the ſeveral ſtories of a building differ in their conſtruction, each ſtory requires a ſeparate plan. The ſection is generally taken, parallel to one of the ſides of the edifice, through the moſt complex part of it. In this the ſtair-caſe is commonly ſhewn. Moſt buildings require, at leaſt, two ſections; ſome many more. When the ſides of a building are diſſimilar, as many elevations will be required as there are ſides.

The number, the form, and the diſpoſitions of rooms, are ſhewn by the plans.

He who gives the ſeveral deſigns of a building ought to be well acquainted with the nature of its fabrication, or of conſtruction in general, before he commits his ideas to paper, and to the examination of the public, or otherwiſe he will be liable to cenſure.

Draught-*Horſe*. See Horse.

Draught, in *Mechanics*, the force or power neceſſary to move any machine, as a horſe-mill, waggon, cart, plough, &c. For accurately and conveniently aſcertaining the draught of (or power exerted by) horſes, oxen, men, &c. in drawing, as alſo for determining the direct pull or ſtrain on any rope, chain, &c., various machines have been invented, ſome of which we propoſe to deſcribe under the article Dynamometer, which ſee.

Draught, in *Medicine*. See Potion.

Draught, in *Painting*, &c. See Design.

Draught, in *Trade*, is an allowance made in the weight of commodities; the ſame as clough.

Draught, is alſo uſed ſometimes for a bill of exchange, and commonly for an order for the payment of any ſum of money, due, &c. Then the perſon who gives the order is ſaid to draw upon the other.

Draught, *reduction of a*. See Reduction, and Pentagraph.

Draught-*Compaſſes*, thoſe provided with ſeveral moveable points, to draw fine draughts in architecture, &c. See Compass.

Draught *and Cording of Looms*, ſignifies, among *Weavers*, the art of adapting thoſe parts of a loom which move the warp, to the formation of various kinds of ornamental figures upon cloth. In every ſpecies of weaving, whether direct or croſs, the whole difference of pattern or effect is produced, either by the ſucceſſion in which the threads of warp are introduced

troduced into the heddles, or by the ſucceſſion in which thoſe heddles are moved in the working. The heddles being ſtretched between two ſhafts of wood, all the heddles connected by the ſame ſhafts are called a leaf, and as the operation of introducing the warp into any number of leaves is called drawing a warp, the plan of ſucceſſion is called the draught. When this operation has been performed correctly, the next part of the weaver's buſineſs is to connect the different leaves with the levers or treddles by which they are to be moved, ſo that one or more may be raiſed or ſunk by every treddle ſucceſſively, as may be required to effect the pattern required. Theſe connections being made by coupling the different parts of the apparatus by cords, this operation is called the cording. In order to direct the operator in this part of his buſineſs, eſpecially if previouſly unacquainted with the particular pattern upon which he is employed, plans are drawn upon paper, ſpecimens of which will be found in *Plate* XII. *Miſcellany*. Theſe plans are horizontal ſections of a loom, the heddles being repreſented acroſs the paper at A, and the treddles under them, and croſſing them at right angles at B. In *figs*. 1 and 2, they are repreſented as diſtinct pieces of wood, thoſe acroſs being the under ſhaft of each leaf of heddles, and thoſe at the left hand the treddles. In actual weaving, the treddles are placed at right-angles to the heddles, the ſinking cords deſcending perpendicularly, as nearly as poſſible, to the centre of the latter. Placing them at the left hand therefore, is only for ready inſpection, and for practical convenience. At C, a few threads of warp are ſhewn as they paſs through the heddles, and the marks denote the leaf with which each thread is connected. Thus in *fig*. 1, the right-hand thread, next to A, paſſes through the eye of a heddle upon the back leaf, and is diſconnected with all the other leaves; the next thread paſſes through a heddle on the ſecond leaf; the third through the third leaf; the fourth through the fourth leaf, and the fifth through the fifth or front leaf. One ſet of the draught being now compleated, the weaver again begins with the back leaf, and proceeds in the ſame ſucceſſion again to the front. Two ſets of the draught are repreſented in this figure, and the ſame ſucceſſion, it is underſtood by weavers, (who ſeldom draw more than one ſet,) muſt be repeated until all the warp is included. When they proceed to apply the cords, the left-hand part of the plan at B ſerves as a guide. In all the plans upon this plate, excepting one which ſhall be noticed, a connection muſt be formed by cording between every leaf of heddles and every treddle; for all the leaves muſt either riſe or ſink. The raiſing motion is effected by coupling the leaf to one end of its correſpondent top lever; the other end of this lever is tied to the long march below, and this to the treddle. The ſinking connection is carried directly from under the leaf to the treddle. To direct a weaver which of theſe connections is to be formed with each treddle, a black ſpot is placed when a leaf is to be raiſed, where the leaf and treddle interſect each other upon the plan, and the ſinking connections are left blank. For example, to cord the treddle 1. To the back leaf put a raiſing cord, and to each of the other four ſinking cords. For the treddle 2, raiſe the ſecond leaf, and ſink the remaining four, and ſo of the reſt; the ſpot always denoting the leaf or leaves to be raiſed. The *figs*. 1 and 2 are drawn for the purpoſe of rendering the general principle of this kind of plans familiar to thoſe who have not been previouſly acquainted with them; but thoſe, who have been accuſtomed to manufacture and weave ornamented cloths, never conſume time by repreſenting either heddles or treddles as ſolid or diſtinct bodies. They content themſelves with ruling a number of lines acroſs a piece of paper, ſufficient to make the intervals between theſe lines repreſent the number of leaves required. Upon theſe intervals, they merely mark the ſucceſſion of the draught, without producing every line to reſemble a thread of warp. At the left-hand they draw as many lines acroſs the former as will afford an interval for each treddle, and in the ſquares, produced by the interſections of theſe lines, they place the dots, ſpots, or cyphers, which denote the raiſing cords. It is alſo common to continue the croſs lines, which denote the treddles a conſiderable length beyond the interſections, and to mark, by dots, placed diagonally in the intervals, the order or ſucceſſion in which the treddles are to be preſſed down in weaving. The former of theſe modes has been adopted in the remaining plan, upon the plate, but to ſave room the latter has been avoided, and the ſucceſſion marked by the order of the figures under the intervals which denote the treddles.

Some explanation of the various kinds of fanciful cloths, repreſented by theſe plans, may ſerve further to illuſtrate this ſubject, which is, perhaps, the moſt important of any connected with the manufacture of cloth, and will alſo enable a perſon, who thoroughly ſtudies them, readily to acquire a competent knowledge of the other varieties in weaving, which are boundleſs. *Figs*. 1 and 2 repreſent the draught and cording of the two varieties of tweeled cloth wrought with five leaves of heddles. The firſt is the regular or run tweel, which, as every leaf riſes in regular ſucceſſion, while the reſt are ſunk, interweaves the warp and woof only at every fifth interval, and as the ſucceſſion is uniform, the cloth, when woven, preſents the appearance of parallel diagonal lines, at an angle of about 45° over the whole ſurface. When there is no other figure upon the cloth, and the fabric is fine, this produces a very pleaſing effect, and is much uſed, eſpecially in the manufacture of ſilks of various deſcriptions. Tweeling is alſo much employed in the coarſer deſcriptions of cloths made from every kind of material employed in the manufacture. In the linen, it is uſed for ſheeting and many other kinds of houſehold cloths which require durability. Many of the ſtronger kinds of woollen cloths are alſo tweeled. Goods are manufactured in very great variety in Lancaſhire from cotton, and many kinds of fanciful tweeling introduced. A tweel may have the regularity of its diagonal lines broken, by applying the cording as in *fig*. 2. It will be obſerved, that in both figures the draught of the warp is preciſely the ſame, and that the whole difference of the two plans conſiſts in the order of placing the ſpots denoting the raiſing cords, the firſt being regular and ſucceſſive, the ſecond alternate.

Figs. 3 and 4 are the regular and broken tweels which may be produced with eight leaves. This properly is the tweel denominated ſattin in the ſilk manufacture, although many webs of ſilk, wrought with only five leaves, receive that appellation. Some of the fineſt Florentine ſilks are tweeled with ſixteen leaves. When the broken tweel of eight leaves is uſed, the effect is much ſuperior to what could be produced by a ſmaller number, for in this two leaves are paſſed in every interval, which gives a much nearer reſemblance to plain cloth than the others. For this reaſon it is preferred in weaving the fineſt damaſks. The draught of the eight leaf tweel differs in nothing from the others, excepting in the number of leaves. The difference of the cording in the broken tweel will appear by inſpecting the cyphers which mark the raiſing cords, and comparing them with thoſe of the broken tweel of five leaves. *Fig*. 5. repreſents the draught and cording of ſtriped dimity of a tweel of five leaves. This is the moſt ſimple ſpecies of fanciful tweeling. It conſiſts of ten leaves, or double the number of the common tweel. Theſe ten leaves are moved by only five treddles in the

the ſame manner as a common tweel. The ſtripe is formed by one ſet of the leaves flushing the warp, and the other ſet the woof. The *fig.* in the *Plate* repreſents a ſtripe formed by ten threads, alternately drawn through each of the two ſets of leaves. In this caſe, the ſtripe and the intervals will be equally broad, and what is the ſtripe upon one ſide of the cloth, will be the interval upon the other, and *vice verſâ*. But great variety of patterns may be introduced by drawing the warp in greater or ſmaller portions through either ſet. The tweel is of the regular kind, but may be broken, by placing the cording as in *fig.* 2. It will be obſerved that the cording marks of the lower or front leaves, are exactly the converſe of the other ſet; for where a raiſing mark is placed upon one, it is marked for ſinking in the other: that is to ſay, the mark is omitted; and all leaves which ſink in the one, are marked for raiſing in the other: thus one thread riſes in ſucceſſion in the back ſet and four ſink, but in the front ſet four riſe and only one ſinks. The woof, of courſe, paſſing over the four ſunk threads, and under the raiſed one, in the firſt inſtance, is flushed above; but where the reverſe takes place, as in the ſecond, it is flushed below, and thus the appearance of a ſtripe is formed. The analogy ſubſiſting between ſtriped dimity and dornock is ſo great, that before noticing the plan for fancy dimity, it may be proper to allude to the dornock, the plan of which is repreſented by *fig.* 6.

The draught of dornock is preciſely the ſame, in every reſpect, with that of ſtriped dimity. It alſo conſiſts of two ſets of tweeling heddles, whether three, four, or five leaves, are uſed for each ſet. The left hand ſet of treddles is alſo corded exactly in the ſame way, as will appear by comparing them. But, as the dimity is a continued ſtripe from the beginning to the end of the web, only five treddles are required to move ten leaves. The dornock, being checker-work, the weaver muſt poſſeſs the power of reverſing this at pleaſure. He therefore adds five more treddles, the cording of which is exactly the reverſe of the former; that is to ſay, the back leaves in the former caſe having one leaf raiſed and four ſunk, have, by working with theſe additional treddles, one leaf ſunk and four leaves raiſed. The front leaves are in the ſame manner reverſed, and the mounting is compleat. So long as the weaver continues to work with either ſet, a ſtripe will be formed as in the dimity, but when he changes his feet from one ſet to the other, the whole effect is reverſed, and the checkers formed. The dornock pattern upon the deſign paper, *Plate* A, may be thus explained: let every ſquare of the deſign repreſent five threads upon either ſet of heddles, which are ſaid by weavers to be once over the draught, ſuppoſing the tweel to be one of five leaves: draw three parallel lines, as under, to form two intervals, each repreſenting one of the ſets: the draught will then be as follows:—

4	1	4	1	1	4	1	
	4	4	1	1	1	4	4

The above is exactly ſo much of the pattern as is there laid down, to ſhew its appearance, but one whole range of the pattern is compleated by the figure 1 neareſt to the right hand upon the lower interval between the lines, and the remaining figures nearer to the right form the beginning of a ſecond range or ſet. Theſe are to be repeated in the ſame way acroſs the whole warp. The lower interval repreſents the five front leaves; the upper interval the five back ones. The firſt figure 4 denotes that five threads are to be ſucceſſively drawn upon the back leaves, and this operation repeated four times. The firſt figure 4 in the lower interval expreſſes that the ſame is to be done upon the front leaves, and each figure, by its diagonal poſition, ſhews how often, and in what ſucceſſion five threads are to be drawn upon the leaves, which the interval in which it is placed repreſents.

Dornocks of more extenſive patterns are ſometimes woven with 3, 4, 5, and even 6 ſets of leaves; but after the leaves exceed 15 in number, they both occupy an inconvenient ſpace, and are very unwieldy to work. For theſe reaſons the diaper harneſs is in almoſt every inſtance preferred.

Fig. 7, repreſents the draught and cording of a fanciful ſpecies of dimity, which has been manufactured to great extent, although the prevalent taſte for ſimplicity of pattern of the preſent day has rendered it leſs an object of demand than formerly. In this plan it will be obſerved, that the warp is not drawn directly from the back to the front leaf as in the former examples, but when it has arrived at either external leaf, the draught is reverſed, and returns gradually to the other. The ſame draught is frequently uſed in tweeling, when it is wiſhed that the diagonal lines ſhould appear upon the cloth in a zig-zag direction. This plan exhibits the draught and cording, which will produce the pattern upon the deſign paper in *Plate* A. Were all the ſquares produced by the interſection of the lines denoting the leaves and treddles, where the raiſed dots are placed, filled the ſame as on the deſign, they would produce the effect of exactly one-fourth of that pattern. This is cauſed by the reverſing of the draught, which gives the other ſide reverſed as on the deſign, and when all the treddles, from 1 to 16, have been ſucceſſively uſed in the working, one-half of the pattern will be complete. The weaver then goes again over his treddles in the reverſed order of the numbers, from 17 to 30, when the other half of the pattern will be completed. From this ſimilarity of the cording to the deſign, it is eaſy, when a deſign is given, to make out the draught and cording proper to work it, and when the cording is given to ſee its effect upon the deſign.

Fig. 8, repreſents the draught of the diaper mounting, and the cording of the front leaves, which are moved by treddles. The mounting, which raiſes the leaves of the harneſs, muſt be taken from the deſign paper, in a way ſimilar to that uſed for the draw loom, and as deſcribed in that article. From the plan it will appear, that five threads are included in every mail of the harneſs, and that theſe are drawn in ſingle threads through the front leaves, as deſcribed in the article DIAPER. The cording forms an exception to the general rule, that when one or more leaves are raiſed, all the reſt muſt be ſunk, for in this inſtance one leaf riſes, one ſinks, and three remain ſtationary. An additional mark, therefore, is uſed in this plan. The dots, as formerly, denote raiſing cords, the blanks ſinking cords, and where the cord is to be totally omitted the croſs marks × are placed.

Fig. 9, is the draught and cording of a ſpot whoſe two ſides are ſimilar, but reverſed. That upon the plan forms a diamond, ſimilar to the one drawn upon the deſign paper, *Plate* A, but ſmaller in ſize. The draught here is reverſed, as in the dimity plan, and the treading is alſo to be reverſed after arriving at 6, to complete the diamond. Like it too, the raiſing marks form one-fourth of the pattern. In weaving ſpots, they are commonly placed at intervals, with a portion of plain cloth between them, and are generally placed in alternate rows, the ſpots of one row being between thoſe of the other. But as intervals of plain cloth muſt take place, both by the warp and woof, two leaves are added for that purpoſe. The front, or ground leaf, includes every ſecond thread of the whole warp. The ſecond, or plain leaf, that part which forms the intervals by the warp. The remaining

remaining leaves form the ſpots; the firſt ſix being allotted to one row of ſpots, and the ſecond ſix to the next row, where each ſpot is in the centre between the former. The reverſed draught of the firſt is ſhewn entire, and is ſucceeded by twelve threads of plain. One-half of the draught of the next row is then given, which is to be completed exactly like the firſt, and ſucceeded by twelve threads more of plain, when one ſet of the pattern being finiſhed, the ſame ſucceſſion is to be repeated over the whole warp. As ſpots are formed by inſerting woof of coarſer dimenſions than that which forms the fabric, every ſecond thread only is allotted for the ſpotting. Thoſe included in the front, or ground leaf, are therefore repreſented by lines, and the ſpot threads between them by marks in the intervals, as in the other plans.

The treddles neceſſary to work this ſpot are in number fourteen. Of theſe, the two in the centre, A, B, when preſſed alternately, will produce plain cloth, for B raiſes the front leaf, which includes half of the warp, and ſinks all the reſt, while A exactly reverſes the operation. The ſpot-treddles, on the left-hand, work the row contained in the firſt ſix ſpot-leaves, and thoſe upon the right-hand the row contained in the ſecond ſix. In working ſpots, one thread, or ſhot of ſpotting-woof, and two of plain, are ſucceſſively inſerted by means of two ſeparate ſhuttles.

Diſſimilar ſpots are thoſe whoſe ſides are quite different from each other. The draught only of theſe is repreſented by *fig.* 10. The cording depends entirely upon the figure, and may be ſupplied by the following ſimple rule: Having ruled the lines which repreſent the heddles, and croſſed them by thoſe repreſenting the treddles, ſquares will be formed ſimilar to thoſe upon deſign-paper. The pattern being drawn upon deſign-paper, let the lines denoting the heddles repreſent the lines of the deſign, from top to bottom of the paper, and the treddle-lines the croſs-lines. Place a raiſing-dot for every ſquare which is coloured on the deſign, and the plan of cording will be correct. It is neceſſary, however, to remark, that when more than one ſquare is included between the ſame parallel-lines, from top to bottom of the deſign, it is needleſs to tranſfer it more than once to the cording plan, for the treddle, being once marked, will repeat the operation as often as it is preſſed, and, therefore, more than one treddle, for the ſame operation, would only load the loom with uſeleſs and cumbrous machinery. The plain leaves and additional leaves, for placing one row in the boſom of another, are quite the ſame in ſpots, whether ſimilar or diſſimilar. There is, indeed, a ſpot called a paper-ſpot, where all the warp is upon ſpot-leaves, except the intervals, and every ſecond thread of woof is then coarſe. It is undoubtedly ſuperior in effect to the common ſpot; but, as it requires nearly twice the mounting, it is very expenſive, and, therefore, little uſed. Some very beautiful ſpecimens of it are occaſionally imported from India.

Draught-*hooks*, are large hooks of iron fixed on the cheeks of a cannon carriage, two on each ſide, one near the trunnion hole, and the other at the train, and are called the fore and hind draught-hooks. Large guns have draught-hooks near the middle tranſom, to which are fixed the chains, which ſerve to eaſe the ſhafts of the limbers on a march. The fore and hind-hooks are uſed for drawing a gun backwards or forwards, by men with ſtrong ropes, called draught, or drag-ropes, fixed to theſe hooks.

DRAUNSEN-SEE, in *Geography*, a lake of Pruſſia, in the province of Ermeland, a little to the ſouth of Elbing.

DRAVUS, in *Ancient Geography*, the name of a conſiderable river in Germany, which diſcharges itſelf into the Danube. It is alſo called *Drans* and *Dravis*. Ptolemy ſays, that in his time the Barbarians called it *Daris*. It commenced to the north of the Carnic Alps, ran to the eaſt, watered the towns of Virunum, Pœtovio, Jovia, and Murſa, and joined the Danube, to the eaſt of Cornacum. It is now called the *Drave*, which ſee.

DRAW. A ſhip is ſaid to draw ſo much water, according to the number of feet ſhe ſinks into it.

Thus, if fifteen feet from the bottom of her be under water, or if ſhe ſink into the water fifteen feet perpendicularly, ſhe is ſaid to draw fifteen feet water; and according as ſhe draws more, or leſs, ſhe is ſaid to be of more, or leſs draught; and that this may be more readily known, the feet are marked on the ſtern and ſtern-poſt regularly from the keel upwards. Drawing denotes alſo the ſtate of the ſail, when it is inflated with the wind, ſo as to advance the veſſel in her courſe: and *to keep all drawing* is to inflate all the ſails.

Draw, in *Agriculture*, is ſometimes uſed for a ſpit, or ſpade's-graft, or the depth to which a ſpade, or tool, will cut at once.

Draw, in the *Foreſt Law*. See Dog-*draw*.

Draw, in *Geography*, a town of Perſia, in the province of Segeſtan; 70 miles N.W. of Zareng.

Draw-*back*, in *Commerce*, a rebate, or diſcount, upon the price of commodities, purchaſed on certain conditions. See Rebate and Discount.

Draw-back is more particularly uſed to denote certain duties, either of the cuſtoms, or of exciſe, that are allowed upon the exportation of ſome of our own manufactures, or upon certain foreign commodities that have paid a duty at importation.

The oaths of the merchants importing, or exporting, are required, to obtain the draw-back of foreign goods, affirming the truth of the officer's certificate of the entry, and the due payment of the duties; and theſe may be made by the agent, or huſband of any corporation, or company, or by the known ſervant of any merchant, uſually employed in making his entries, and paying his cuſtoms. (2 and 3 Ann. cap. 9.) With reſpect to foreign goods entered outwards, if leſs in quantity, or value, be fraudulently ſhipped out than is expreſſed in the exporter's certificate, the goods therein mentioned, or their value, are forfeited, and no draw-back is to be allowed for the ſame. Foreign goods, exported by certificate, in order to obtain the draw-back, not ſhipped or exported, or re-landed in Great Britain, unleſs in caſe of diſtreſs, to ſave them from periſhing, which muſt be immediately ſignified to the officers of the cuſtoms, are to loſe the benefit of the draw-back, and are forfeited, or their value, with the veſſels, horſes, carriages, &c. employed in the re-landing of them; and the perſons concerned in re-landing them, or by whoſe privity they are re-landed, or into whoſe hands they ſhould knowingly come, are to forfeit double the amount of the draw-back. (13 and 14 Car. II. cap. 11. 8 Ann. cap. 13.) This is to be paid for within five years after the offence. And the ſeizure of the horſes, &c. may be adjuſted by two or more juſtices of the peace. (6 Geo. I. cap. 21. 8 Geo. I. cap. 18. and 11 Geo. I. cap. 29.) Officers of the cuſtoms conniving at, or aſſiſting in any fraud relative to certificate goods, beſides other penalties, are to forfeit their office, and to ſuffer ſix months impriſonment, without bail, or mainprize; as are alſo maſters, or perſons belonging to the ſhips employed in this buſineſs. (8 Ann. cap. 13.) Bonds given for the exportation of certificate goods to Ireland muſt not be delivered up, nor draw-back allowed for any goods, till a certificate under the hands and ſeals of the comptroller, or collector,

collector, &c. of the cuſtoms of ſome port in Ireland be produced, teſtifying the landing, which certificate muſt be produced in ſix months from the date of the bond. (8 Ann. cap. 13. 5 Geo. I. cap. 11. 9 Geo. I. cap. 8. 2 Geo. II. c. 28) See CUSTOMS, DEBENTURES, DUTIES, &c.

DRAW-*bridge*. This conſiſts, in general, of ſeveral boards nailed firmly to a frame, which, being faſtened at one end, by means of ſtrong hinges, to a beam laid horizontally, and parallel to the frame, and being acted upon at its other extremity by means of levers, or by chains worked either by wheels, or by hand; the flat form thus conſtructed, may be raiſed to a perpendicular direction. Draw-bridges are uſually placed over narrow ditches in fortreſſes, or at the ends of great bridges, and eſpecially over the excavations cloſe to the gates; ſo that they may be raiſed, or let down, at the pleaſure of thoſe within the works. Being, for the moſt part, from eight to twelve feet over, they make, when raiſed, a very lofty mantlet, or blind, completely ſhutting up the paſſage; while their abſence from the horizontal poſition in which they formed a part of the bridge, or road-way, cauſes a great gap; ſerving to arreſt the progreſs of parties proceeding to attack the interior.

When draw-bridges are made cloſe on the outſide of gates, the maſonry ought to be ſunk, ſo as to admit the whole depth of the frame to lie within it; elſe the obliſque fire from the beſiegers' batteries would act on the edge of the frame, and ſoon render it unſerviceable. Some draw-bridges have fixed iron poſts with chains, ſerving to ſecure paſſengers from accident; theſe are raiſed with the frames; but the generality have only a chain made faſt from the laſt poſt of the bridge, to the poſt on which the lever is balanced: this chain hooks off and on, according as the draw-bridge is raiſed, or lowered. It is alſo uſed on one or both ſides of a canal, dock, &c. See BRIDGE.

DRAW-*gear*, in *Huſbandry*, any kind of harneſs for drawing a waggon, or other carriage.

DRAW-*latches*, in *Engliſh Antiquity*, were thieves and robbers, mentioned in ſtats. 5 Edw. III. c. 14, and 7 Ric. II. c. 5.

DRAW-*loom* is the moſt complicated and extenſive machine, in its operation, uſed in the weaving of ornamented cloth. There is no diverſity of pattern, or figure, however extenſive, which can be brought within the whole range of cloth of the largeſt dimenſions, but may be produced by this uſeful, although expenſive, machine. Draw-looms, in Britain, are uſed for three purpoſes, *viz.* for weaving damaſk, carpets, and the moſt extenſive patterns of ſpotted muſlins. The general principle of all theſe machines is pretty ſimilar, but modifications in their conſtruction take place, according to the particular purpoſes for which they are intended. When patterns become ſo extenſive, that the number of heddles neceſſary for moving the warp in its numerous combinations, could neither be included within any moderate bounds, nor worked by any moderate power, it becomes neceſſary to have recourſe to the draw-loom. Of all the draw-looms, that for weaving fine damaſk is the moſt extenſive; ſome of thoſe in common uſe containing upwards of 120 deſigns, of 10 ſpaces each, which renders them equal to 1200 leaves of the diaper harneſs, or 6000 of the leaves uſed for dornock, dimity, or common tweeling. The general principle of the draw-loom harneſs, and the mode by which the ſhuthing is reverſed, is in every reſpect the ſame with that of the diaper, the difference conſiſting ſolely in the ſuperior extent of the former, and the method of mounting and working it. *Fig.* 3. *Plate* XIV. *Miſcellany*, is a perſpective view of the harneſs part of a draw-loom, and the apparatus for working it. The number of harneſs-cords of a draw-loom is ſo great, and they are of neceſſity ſo cloſely crowded together, that any repreſentation of the whole, even if drawn upon a very large ſcale, muſt convey a very inadequate idea of their conſtruction and operation. A few, therefore, only are repreſented at intervals to illuſtrate the way of conſtructing them, and this being once well underſtood, may be extended to any length that conveniency will admit. The harneſs of the draw-loom is not confined by leaves, but every cord carrying a mail for the warp is kept ſtretched by a weight. The mails are the ſame as thoſe of the diaper, *fig.* 2. *Plate* XIV. The weights attached to the harneſs are repreſented at L. A horizontal board, or frame C, is fixed acroſs the loom, and is either perforated with a number of ſmall holes, or divided by wires, or pins, to ſerve as guides to the cords of the harneſs paſſing through them. When the range, or extent of the deſign, has been aſcertained, by counting on the paper the greateſt number of ſquares contained in it from right to left, the harneſs muſt be made to correſpond with this range. Let the range be ſuppoſed to extend to 500 ſquares, and the whole breadth of the warp to contain 10,000 threads. If five threads are to be drawn through each mail, the number of mails compoſing the harneſs will be 2000, and four ranges of the pattern will include the whole breadth. The diviſions in the board C, and the number of pullies in the box, or caſe H, being adapted to this, the operator may proceed to put up his harneſs, which is done as follows: the 1ſt, 501ſt, 1001ſt, and 1501ſt harneſs twines, after being paſſed through their reſpective intervals in the board, or frame C, are to be knotted together at M. A cord being attached to theſe is carried over the firſt pulley in the caſe H, and is made faſt to the piece of wood G, which is generally called the *table*. The 2d, 502d, 1002d, and 1502d, are connected in the ſame way, and the cord attached to them, paſſing over the ſecond pulley, is faſtened to the table as before. The ſame operation is ſucceſſively repeated, until the whole 500 connections are compleated. The cords at B, paſſing over the pullies and faſtened to the table, are called the *tail* of the harneſs. From each cord in the tail a vertical cord deſcends, and is made faſt to a piece of wood K, which is laſhed to a fixture in the floor. Theſe cords, repreſented at D, are called *ſimples*. The draught of the warp through the mails of the harneſs is regularly progreſſive from right to left, as in common tweeling, and the draught, cording, and mounting of the front leaves are exactly the ſame as in diaper. A ſtout perpendicular cord is now ſtretched from the roof to the floor, and made faſt at both ends. This cord is repreſented at I, and the loom is then ready to be adapted to work any pattern, of the range of 500 ſquares, or mails.

The next operation, therefore, is to apply a certain number of ſmall cords, called *laſhes*, and repreſented at E, ſo as to form the particular pattern required. This is called reading on the deſign, and from the complexity of the operation, and the neceſſity of its being accurately done, is performed by two perſons. The firſt of theſe perſons ſelects from the deſign paper the ſimples, to which laſhes are to be ſucceſſively applied; and it is the buſineſs of the ſecond to apply thoſe laſhes according to the inſtructions which he receives from the firſt. To read or ſelect the laſhes in their proper rotation, it is proper to obſerve, that the whole range of ſquares, from right to left, between the extreme points of the pattern, is equal to the whole number of ſimples, and the whole range from top to bottom, to the number of operations which thoſe ſimples are to undergo. The perſon who is to ſelect, therefore, taking the deſign paper, begins

at the lowest square, and counting from the right hand, instructs the other to pass as many simples as there are blank squares upon the paper, to put lashes to as many as are coloured, again to pass the blanks, take the coloured squares, and so on until he has reached the left side of the pattern. When these lashes have been applied, which is done by passing each loosely round the simples which it is to work, they are knotted together, and attached to the cord I by a loop, so that they may slide up and down freely, both upon the cord and the simples. Proceeding to the second square from the bottom, the selection is made in the same way, and thus they continue until they have reached the top. The lashes being now in clusters upon the cord I, these clusters are connected at convenient distances from each other, by small cords represented at F, the first applied cluster being lowest upon the cord I.

The draw-loom being ready for work, the operators may begin to weave. Two persons are required to work the loom. One of these pulls down the first set of lashes, the whole being placed high upon the cord I, and by pulling them tight, draws the simples with which they are connected clear of all the rest. Then by grasping these simples firmly in his hand, and pulling them down, he tightens the tail cords at B, by making them diverge more from a straight line, and of course raises the mails which are attached to them by the harness twines at M. The weaver then works over his front, mounting, as in common tweeling, once, or oftener, if more squares than one, upon the design, are included between the same parallel straight lines from top to bottom. When a change of the harness becomes necessary, the connecting cord F pulls down the second cluster of lashes, upon which the same operation is performed as before. By these means, the simples, however numerous, (and in the case we have supposed they would amount to 500,) are selected from each other with the utmost accuracy and facility. The successive repetition of the same operation compleats the pattern, and then it is only necessary to push the lashes up again, and begin a new one.

When the mounting of the draw-loom is very extensive, it would be inconvenient to use only one case of pullies; for the tail-cords and the frame of this case must be extended to very inconvenient dimensions. Besides this, when so many pullies are employed, the tail-cords must deviate so much from the perpendicular line, that there would be much danger of throwing the cords off the pullies, and setting the machine fast until each cord was replaced. Indeed, to prevent the danger of this, which materially impedes the operation, it is customary to place guides of wire under the pullies, to confine the cords. But when the mounting is very extensive, two, and sometimes three, cases of pullies are very generally used. These are placed parallel to each other, that represented at H being the middle one, and an equal number of tail cords are conducted over each. It is also usual to construct more than one set of simples, that which is to be used being lashed to the floor, while the others are loose and hung near the roof, until it becomes necessary to use them in their turns. This, indeed, is very useful in working bordered table-cloths, where the whole is frequently the continuation of one design, extending sometimes three yards, or more, in breadth, and five or six yards in length.

In an age like the present, when simplification of process and saving of labour have become objects of such general attention, it is not wonderful that plans, which have these for their object, should have been adapted to the draw-loom as well as to other machinery. One of these, lately introduced at Dunfermline, has been pretty generally adopted, and appears, upon the whole, to have given very considerable satisfaction. Whether properly or not, it is there known by the name of the patent draw-loom.

The object of the patent draw-loom is, to enable the weaver to change his harness, as well as to perform the other necessary operations of weaving, and consequently to supersede the necessity of employing a second person at the loom. In this loom the tail of the harness, instead of having its direction changed, by passing over pullies, and being carried to one side, rises perpendicularly, and is made fast to the roof. The simples are brought in a horizontal direction to the front of the loom, over the weaver's head. The direction of the simples is very similar to that of the tail cords of the diaper-loom, *fig.* 1. The lashes hang down perpendicularly, so that the weaver may pull them with his hand. Upon the tail are knots, placed at equal heights from the floor, and in front of these knots is an instrument very much resembling a coarse comb, or the teeth of a garden rake. This instrument moves upon a fulcrum, from which a lever extends over the weaver's head, by depressing the end of which he can raise the teeth at pleasure. The simples being pulled, the tail is drawn forward, and the knots engaged between the teeth of the comb. The lever being then pulled down, and secured by a cord and handle, as in the diaper-loom; the teeth rise, and carrying the knots along with them, raise the harness. When a change is required, the teeth are let down, the knots relieved, a second set pulled in, and the operation proceeds as before.

This plan has come into very general use, and seems to meet with much approbation, for those kinds of damask where the pattern is not very extensive. In the others, there is still a diversity of opinion respecting the comparative merits of the old and new plans, which, as the invention is recent, will probably be only decided by experience.

The draw-loom is also applied, in most instances, to the manufacture of carpets. Carpets are not tweeled like diaper or damask, but consist of plain or alternate weaving. A carpet consists of two webs of cloth, woven separately and independently of each other, but being woven at the same time, particular parts of them are taken through each other, so that any part of each web is sometimes above, and sometimes below the other. From this it arises that when a carpet is turned upside down, the pattern remains the same, but the colours are reversed, that which formed the ground being now the pattern, and *vice versâ*.

The front mounting of a carpet draw-loom consists of four leaves, two of which raise the web which forms the ground, and the other two that which forms the figure. One shot of the woof is inserted into each web alternately. The eyes of the front mounting are long, like those of the diaper and damask, to allow the harness to rise freely. As carpets are woven generally of coarse dyed woollen yarn, and do not contain much warp, it is unnecessary, except in very complicated patterns, to use simples. The lashes, therefore, hang perpendicularly from the tail, and at the end of each set there is a small handle, or as it is called, a *bob*. These pass through a long horizontal board, perforated with holes to preserve their regularity, and are arranged in pairs, one bob raising the harness of the pattern-web, and the other that of the ground-web. To adapt the figure upon the design to the application of the lashes, the instructions for the pattern-web are the same as in the damask; those for the ground-web the same exactly reversed. In the latter, therefore, the blanks upon the design are to be taken, and the coloured squares passed. In this consists the whole difference.

The harness of the spot draw-loom is exactly the same as the

the damaſk, excepting that the yarn of the warp being much ſiner, the mails are not uſed, but ſhort eyes of twine ſubſtituted in their places. In the front mounting, alſo, the end is attained by means which, although in effect the ſame, are better adapted to the particular nature of the work. Four leaves of heddles are uſed; but they are mounted, ſo that two leaves will either go together up or down, or in oppoſite directions. The heddles are conſtructed like thoſe for weaving plain cloth, and every thread is drawn through two heddles, being taken through the upper cleft or link of the one, and through the under link of the other. When the two leaves move in the ſame direction, the threads of warp are confined as in the claſp of a common heddle; but when they move in a contrary direction, they preſent all the facility of the long eye in allowing the harneſs to riſe without interruption.

As the time, labour, and materials, neceſſary to mount a draw-loom involve a very conſiderable expence, before any productive return can be attained, it is of the utmoſt importance that the quality of the materials ſhould be good, and that every part ſhould be ſquare, level, and equally ſtretched. Draw-looms will only gradually remunerate thoſe who expend money or labour in fitting them up; and the better they are executed, the quicker and more certain will be the return. A trifling additional trouble or expence to attain thoſe ends will therefore always be found conſiſtent with the ſoundeſt judgment, and trueſt economy.

Draw-*Net*, a kind of net for taking the larger ſort of wild fowl, which ought to be made of the beſt packthread, with wide meſhes: they ſhould be about two fathoms deep, and ſix long, verged on each ſide with a very ſtrong cord, and ſtretched at each end on long poles.

It ſhould be ſpread ſmooth and flat upon the ground, and ſtrewed over with ſedge, graſs, or the like, to hide it from the fowl; and the ſportſman is to place himſelf in ſome ſhelter of graſs, fern, or ſome ſuch thing.

DRAWER *of a Bill of Exchange*, &c. the perſon who draws the bill upon his correſpondent. See Bill, and Exchange.

DRAWING *a Caſt*, among *Bowlers*. See Bowling.

Drawing *Medicines*, or Drawers. See Epispastic, and Ripeners.

Drawing, *Tooth*. See Tooth-*drawing*.

Drawing *of Gold*, or *Silver*, is the paſſing of it through a number of holes in an iron, each leſs than another, to bring it into a wire. See Wire-*drawing*, and Ductility.

Drawing *of a Bill of Exchange*, is the writing, ſigning, and giving it to the perſon, who has already paid the value or content thereof, to receive it in another place.

A perſon ſhould never draw a bill of exchange, unleſs he be well aſſured it will be accepted, and paid. See Bill *of Exchange*.

Drawing, in *Painting*, &c. See Designing, and Counter-drawing.

Drawing, the art of repreſenting the appearances of objects by means of appropriate lines or marks formed on ſome convenient ſurface.

Drawing is the baſis of painting and engraving, and an important auxiliary in all the arts of deſign. Strictly it is a modification of painting, from which it differs only in degree, or in the materials employed: in its more finiſhed and perfect examples, it embraces the whole theory of that art, invention, compoſition, chiaro-ſcuro, and even colouring, though the latter ſeems leſs within its proper ſphere, and perhaps conſtitutes their chief or only difference. Yet the friezes of Polidoro in the Vatican, and others painted in oil, are in chiaro-ſcuro, *i. e.* not coloured; neither can the materials be ſaid to afford any very certain technical diſtinction, for we have drawings ſo called in oil, as the ſketches or deſigns of Rubens, Vandyke, and Weſt; and paintings in water, in freſco, and in crayons. It is ſcarcely poſſible, therefore, to fix any preciſe line of diſcrimination between theſe two arts: wherever they approximate, the terms have been uſed indifferently. It may be obſerved, however, that painting, as the higher term, is generally applied to thoſe deſigns which are coloured, and have a greater degree of completion, in whatever vehicle they may be executed.

We ſhall here conſider drawing chiefly in a practical view, as it is uſed by painters, ſculptors, engravers, &c. in making their preparatory ſtudies; conſiſting in various modes of delineating forms, by means of light and dark, without noticing colour, or thoſe more intellectual qualities, which place painting in the ſame rank with poetry. This art holds a ſort of middle ſtation between painting and writing, poſſeſſing ſome of the advantages of both; and from the extent and variety of its range and application, is perhaps one of the moſt pleaſing and moſt uſeful of human inventions.

Drawing may be divided into outline and ſhading. The outline, or contour, repreſents the boundaries of an object, as they appear to terminate againſt the back-ground, and is a ſection of the whole maſs: outlines are alſo uſed for the circumſcription of all the parts, interior as well as exterior. The ſhading expreſſes the projections, cavities, or flatneſs, which form its anterior boundaries.

A correct outline is of the higheſt importance, and the teſt of an intelligent draughtſman, not only as implying that accuracy of eye on which the art is founded, but, in moſt caſes, as conveying the general character of an object at once, without the aid of ſhading, and is therefore itſelf a drawing complete, as far as it goes; for drawing admits of all degrees of abſtraction. The aim of the ſtudent, therefore, ſhould be to acquire the power of copying it faithfully from whatever may be put before him. The materials principally in uſe we ſhall enumerate hereafter. For the firſt eſſays, nothing is better than a piece of black or red chalk placed in a porte-crayon: this is to be held ſomewhat like a pen, but ſo as to allow a greater extent of motion both in the fingers and in the wriſt. G. Laireſſe, Mengs, and others, recommend him to begin with making parallel lines, ſtraight and curved, in all directions; to exercife himſelf in drawing, without ruler or compaſſes, geometrical figures, into ſome of which all forms may be reſolved; and in copying from good ſpecimens the ſeparate features of the human face. Theſe are well adapted to give firmneſs and flexibility to the hand; to increaſe which the learner ſhould accuſtom himſelf to practiſe upon as large a ſcale as convenient. The difficulty of imitating ſolid bodies would at this time embarraſs rather than improve him, he ſhould therefore endeavour to procure the beſt drawings or prints for his early ſtudy: the latter are uſually leſs eligible than drawings, from having a mode of execution peculiar to engravings, unleſs, as in the illuſtration of this article, they are expreſsly calculated for the purpoſe of examples.

Whatever the object to be drawn, its general form ſhould firſt be ſketched out lightly, that what is found to be amiſs may be the more eaſily removed. Eſtimate as nearly as you can the diſtances of particular points in the original; fix dots at ſimilar diſtances on your paper, which muſt be kept quite ſtraight before you; and then draw your lines carefully to them, beginning at the upper part, and working either from right to left, or in the contrary direction, according to their tendency downwards. Put in the principal diviſions firſt; when theſe are nearly right, mark in the ſmaller parts;

and having got it all together, examine it ſcrupulouſly, paſſing over it with a piece of bread to render the lines more faint. reviſing and retouching them where neceſſary, again and again, till the whole be correct. Compare all the parts of the copy with the original, perpendicularly and horizontally, taking care that they have the ſame inclination, range, and diſtances. A pair of compaſſes may be uſed occaſionally, when the ſtudent is at a loſs, but ſparingly, and by way of proof, after he has done his utmoſt without: habitually 'the compaſſes ſhould be in the eye.' Beginners ſhould make their drawings of the ſame ſize as the originals, to exerciſe the eye in meaſuring with exactneſs; but after ſome practice, it will be better to vary from thoſe dimenſions, that they may acquire the power of preſerving ſimilar proportions on a different ſcale, which forms ſo eſſential a part of the draughtſman's ſkill, and in imitating natural objects is ſo often indiſpenſable. It is not neceſſary that the lines ſhould be of one uniform thickneſs; on the contrary, a delicate variety in this reſpect adds much to the agreeableneſs of the effect: they may alſo be continued a little within the contour, in the hollows, as if purſuing the inflection of the part, which, when done with intelligence, makes a mere outline very characteriſtic. See *Plate* I.

The outlines being completed, the learner may proceed to the ſhadows. In the firſt leſſons theſe ſhould not be too complicated, but indicate only the principal projections. The ſimpleſt method of forming theſe is by repeated lines nearly parallel to the outline: as he advances, and more ſhade is required, theſe lines ſhould be croſſed by other parallels, conſtituting a particular mode of execution called hatching, which is very uſeful, and, with a little practice, expeditious: it is eſpecially neceſſary for engravers in the line manner, but is well calculated to give freedom of hand in any ſtyle of drawing. The chief things to be attended to in this are, that the lines conform as much as poſſible to the ſhape of the parts, ſo as to expreſs their various inflections, flatneſs, or roundneſs; that the interſections are not too violent, nor the lines ſo hard as to convey an idea of network; and that they have an harmonious flow and agreement. It has been objected to this kind of handling, that nothing like it is to be ſeen in natural ſhadows: but this is equally true of any other lines or marks that may be adopted for the ſame purpoſe. Hatching was practiſed by all the old maſters, and is a ſort of rythm, which, when well managed, adds a beauty to that of characteriſtic imitation. To this, of courſe, it ſhould always be ſubordinate; if made the *end* inſtead of the *means*, it is abuſed. In this part of his progreſs, the ſtudent will ſtand in need of good examples, to form his hand, that he may be at no loſs to make out ſhadows and middle tints of all degrees, in a proper ſtyle, when he begins to draw from ſolid bodies. Some ſpecimens of hatching may be ſeen in *Plates* II. and III. We ſhall hereafter deſcribe ſome other approved methods of ſhading.

The learner may proceed gradually from the ſeparate features, to profiles, faces, heads, hands, feet, and limbs of the human figure.

The human figure offering, at once, the moſt intereſting and moſt difficult object of imitation throughout nature or art, we ſhall beſtow our chief attention upon this branch of drawing; aſſuring the ſtudent that whatever labour he may devote to it, will turn to his account in any kind of delineation: an eye and hand that can follow with preciſion the variety contained in the human form, will find but little difficulty in copying any thing elſe.

We ſhall begin with the head. Its general proportions may be ſeen *Plate* II. *figs.* 1. and 2. which we ſhall here explain.

In *front*, the head is of an oval form; the face occupies about three-fourths of its length, and is divided into three equal parts; the fore-head, from the roots of the hair to the eye-brows, is one; thence to the bottom of the noſe, another, and from thence to the bottom of the chin, the third. The ear is as long as the noſe, and ranges within the ſame horizontal lines. The eyes are nearly cloſe under the eye-brows, having the length of one eye between them, and about the ſame diſtance between them and the ears, ſo that the whole of this diameter may be divided into five equal parts: from the corner of the eye to the top of the noſtril, is alſo the length of an eye; the noſe at bottom is rather narrower, and the mouth rather wider than the ſame length. The opening of the mouth is placed at about one-third of the lower diviſion, leaving two-thirds for the under lip and chin. In profile the face is conſtructed on an equilateral triangle.

Much of the beauty of a face depends on the regularity with which the features are arranged on theſe perpendicular and horizontal lines, under whatever aſpect it may be viewed, (ſee *figs.* 4 and 5.) and this can hardly be effected without ſome knowedge of perſpective. Perſpective is, indeed, of ſuch eſſential importance in expreſſing the appearances of all objects, with regard to the fore-ſhortenings of their lines and maſſes, and the ſhadows they project, that it ſhould form a very early part of the artiſt's ſtudy. After drawing the different geometrical figures, he ſhould learn how to put them in perſpective.

When the learner has practiſed long enough from good examples of heads, &c. to have acquired ſome facility in getting in an outline, and a method of making out ſhadows, we ſhould recommend him to begin his ſtudies from the buſt: the ſooner he is able to undertake this, the better, as he will derive much greater benefit from the imitation of one round object, than of many drawings. The placing a model in ſuch a way as to receive the lights and ſhadows favourably being of great importance to the good effect of the copy, he muſt firſt attend to this circumſtance.

If the model be too directly oppoſed to the light, there will be a want of ſhade to give relief to the projections, and to ſhew thoſe varieties which contribute ſo much to the beauty of forms; if too obliquely, there will be a redundancy of ſhadow, and many of the parts will be loſt in obſcurity. In general, the light is beſt which comes from a ſingle window rather on high and on one ſide. The ſhades ſhould lie in maſſes ſoftening into each other, ſo as to diſplay the parts to advantage, and at the ſame time produce an agreeable whole. The buſt ſhould be raiſed to about the level of the eye, and at ſuch a diſtance as to be comprehended by it at one glance. The ſtudent muſt contrive to place himſelf ſo, that the light fall on his paper from the left, otherwiſe his own hand will overſhade it, and muſt be very careful, every time he looks at his model, to view it under preciſely the ſame aſpect.

Having ſecured a good outline, he may proceed to mark in the darkeſt ſhadows, then the next in ſtrength, and laſtly the more delicate half tints.

As he advances, he muſt examine well the direction of all the lines, and the relative proportions of all the diviſions, taking care when he enlarges one part not to encroach upon others, and continue to add or diminiſh where neceſſary, till he have attained the *poco piu, poco meno*, the little more or leſs that conſtitutes correctneſs. In finiſhing, the ſame attention muſt be paid to the ſhapes, quantities, and combinations of light, middle tint, ſhadow, and reflexion, as to the diverſities of the outline. The learner will find ſome difficulty in diſtinguiſhing this delicate modulation of light and ſhade, and eſtimating the degree of *tone* belonging

belonging to each part, and practice alone can teach him. It may be useful however to remark, that he must reserve his greatest strength of light and dark for the parts most prominent; every light must be accompanied and supported by its shade; the middle tint becomes deeper in tone, as it recedes from the light, till it is lost in the shadow, and the outline is softened into the back ground by reflexions from surrounding bodies; the contour therefore must not be too strongly marked, otherwise the extreme parts, which should retire, will come forward. A *breadth*, or extension of middle tint, is always desirable, as it gives repose to the eye, and value both to the lights and darks; this, however, belongs to chiaroscuro, (see the article CHIAROSCURO,) one of the great principles of the art of painting, (literally, the system of light and dark in a picture or drawing,) something like a gradation, or balance of which, is necessary even in the slightest sketch, to make it agreeable, insomuch, that, if it consist of two lines only, they should not be equally strong.

With respect to the various modes of execution used in finishing drawings, each, perhaps, has advantages when skilfully managed.

For heads, red or black chalk is generally adopted, and the shadows are made out by hatching, or worked closely with the point, so as to lose all appearance of lines, in the manner called by the French *égréné*.

Black lead is sometimes employed in both these ways, but leaves a disagreeable glossiness. Sometimes the shadows are laid in with a stump (a piece of soft leather rolled up tight and cut to a point) rubbed in powdered chalk, and afterwards hatched upon. The paper is frequently coloured of some neutral tint, which affords an opportunity of using white chalk for the lights, and black, or black and red, for the shadows, leaving the paper for the middle tints; in which case, care must be taken to keep as much of the ground untouched as possible, and never to suffer the black and white to mix; the lights may be worked just in the same way as the shades. This is an approach to the system of painting in crayons.

The shadows are sometimes made out by washing, or tinting the paper with Indian ink, sepia, or bistre, laid on with a camel's hair pencil, but we recommend it only to those who have made some proficiency in drawing.

This may be done in two different ways; the one that of laying down the shades as nearly in their places as possible, with a tint sufficiently dark and softening off the edges with a clean pencil and water; when dry, repeating the process, if necessary: the other is by working with tints rather lighter than enough, at first, in blotches placed near each other; these are blended by a faint wash over the whole, and when *nearly* dry, strengthened by other blotches in the interstices, and so on, gradually giving the shades their due force, and shape, leaving the paper for the lights. This mode is called *stippling*, and in the hand of an artist is, perhaps, the best, at least for finished drawings: the other produces a very smooth appearance, and may be preferable for the amateur; in both cases it is adviseable to work with as large a pencil as convenient, and to have plenty of the same tint mixed up for use. But which-ever of these methods of shading, or whatever mixture of them may be adopted, is of little importance compared with the fidelity of the imitation. The term *highly finished* drawing is frequently given to one that is merely elaborate in execution, however deficient in science, but is strictly applicable to these drawings only, in which all the parts of the subject are given with their true relative force and subordination, softness and decision, and are so exactly copied in their various effects of relief, that a sculptor might model from them; in which, as in nature, you have all the detail, without losing the predominance of the whole.

In short, the aim of the student should be to deceive the eye; this, though not the true end of painting, is the end of drawing, as a practical art.

To delineate the human figure, or its members, with any intelligence, an acquaintance with the bones, and external muscles and their offices, is essential, (see ANATOMY,) for though practice may enable him to draw with tolerable accuracy any object that is set before him, yet the degree of knowledge he possesses will inevitably appear to the real connoisseur. A considerable portion of his labours should, therefore, be devoted to this object. When he is thoroughly exercised in copying heads, legs, arms, hands, feet, bodies, and entire figures from the best drawings he can procure, anatomical and others, and has had a little experience in imitating *casts* of the parts, he may venture on a figure from the *round*. That he may acquire, along with correctness of eye and obedience of hand, some improvement in taste also, and an idea of what is grand or beautiful in the human form, it is highly adviseable to begin with the study of the *antique*: the ancients have carried symmetry to a perfection which cannot be surpassed; and as casts or copies of some of their finest remains are easily obtained, they should, by all means, be the first models adopted. It will be previously necessary too, that the student make himself acquainted with the general proportions of the figure. (See PROPORTIONS.) According to Vitruvius, from the crown of the head to the sole of the foot, should measure ten faces; this is about equivalent to seven heads and a half in height, which is a good general stature, but varies considerably according to the age, sex, or character of the subject: The Castor by Phidias on Monte Cavallo exceeds eight heads and a half. Some examples of antique statues will be found among the plates belonging to the article SCULPTURE.

The precepts we have given in respect to the head are equally applicable to the figure, requiring only to be extended: care must be taken to place the model in a light favourable to a distinct and harmonious display of the parts, and, to see it properly, the student should be removed from it at least three times its height. The whole must be first sketched in a slight and general way, beginning with the head; then drawing in the neck, shoulders, breasts, and trunk, as far as the hips; then the upper part of the arms; then the thighs, and so on, downwards, connecting every portion with the preceding, and not pursuing any line too far, but returning to the opposite side, and carrying on the work as much together as possible. When it is all got in, survey it collectively, and make alterations in those parts which are most defective, till you have caught the character of the figure; then begin again at the head and proceed in the same order to correct your first lines, scrupulously comparing every division with the rest as to shape, quantity, and position, both horizontally and perpendicularly; and as this is of the utmost importance in getting the true sway or balance of the figure, it will be expedient for the learner to suspend a plumb-line before him when he is in doubt, and to use a ruler, or some such thing, for the horizontal examination; attending particularly to the inclination of the head, and the range of the shoulders, haunches, knees, and feet, and, lastly, to the grace or expression of the subject. Having made your outline as accurate as possible, proceed to finish your head in the manner already shewn, and so on with the rest, taking care to make the *parts* duly subordinate to the *whole*, that the object may be one, according to the laws of chiaroscuro. A bunch of grapes has been given as an apt

illustration.

illuſtration of this, in which each individual grape, being differently ſituated in the maſs, has its particular light, middle tint, ſhadow and reflection, without diſturbing the unity of the group. It may here be obſerved, that, when drawing on a ſmaller ſcale than your original, there is a neceſſity for marking the ſubdiviſions more delicately, in proportion to the diminution; (the character of forms, as well as of chiaroſcuro, is better conveyed, even by leaving theſe out, than marking them *too* ſtrongly,) this ſubordination eminently contributes to the unity above-mentioned, and to produce what in painting is termed *breadth*.

When the ſtudent is ſo far advanced as to be able to draw with accuracy and facility from caſts, he is qualified to make his firſt eſſays from nature, and it will be adviſeable to take this ſtep as early as convenient, leſt he ſhould fall into a dry and frigid manner, by copying too long from inanimate objects. It is unneceſſary, for this purpoſe, to add to the practical inſtructions we have already laid down; he may proceed exactly in the ſame way as with caſts, but as he cannot expect, in living models, to find the ſtillneſs to which he has hitherto been accuſtomed, a knowledge of the bones, and outer muſcles and their functions, of the proportions, and of perſpective, will now become ſtill more indiſpenſable; without theſe guides he will be continually falling into difficulty and error. We recommend him, however, to return frequently to the antique, to form his taſte in ſymmetry, the principles of which he can acquire from no other ſource, but will afterwards be able to recognize in nature. He muſt refer always to his anatomical ſtudies, to explain thoſe appearances in the human figure which he may not have obſerved in his former models, and comparing them with nature, and with the antique, he may learn from the latter what to modify and what to reject, for deception muſt be no longer his aim, but a ſelected imitation. The antique will lead him to diſtinguiſh what is general from what is merely individual, (the baſis of true taſte,) and will initiate him alſo in the harmony and contraſt of lines and quantities, and furniſh him with a clue for diſcovering the grand, the beautiful, or the characteriſtic in forms. But this belongs to the theory of painting, to which we muſt now refer the ſtudent for further inſtruction.

The next important diviſion of our ſubject is *Landſcape*.

In landſcape drawing, the reduction of the natural objects being ſo great, as to preclude the ſame exactneſs of repreſentation that we have inculcated in reſpect to the human figure, it is obvious that thoſe who wiſh to acquire that great eſſential of the art, accuracy of eye, will do well to make this branch follow the other, in their order of ſtudy: a complete change of ſyſtem, indeed, is neceſſary: as it is impoſſible to trace preciſely all the parts of a tree, a certain mode of imitation muſt be adopted, expreſſive of its general appearance; that is to ſay, its maſſes of light and ſhade, and its principal forms, muſt be carefully attended to, and details introduced here and there to characterize the minutiæ of leaves, branches, &c., and give it an air of truth. After copying ſome good examples of ſketches and finiſhed drawings, to gain a ſtyle of execution, and learning, at leaſt the fundamental rules of perſpective, we ſhould recommend the ſtudent to proceed as quickly as poſſible to nature. It will here be expedient to begin with ſimple ſubjects, as ſeparate ſtudies of different ſpecies of trees, plants, rocks, ſtones, buildings, with cattle and figures to introduce into your compoſitions, it being very ſeldom that any one ſcene will furniſh all the parts of a good landſcape. In taking a view, the portion of country included ſhould not be more than can be conveniently comprehended by the eye without turning the head, nor exceeding perhaps an angle of 60 deg. By extending your paper before you, till it juſt takes in the ſpace you wiſh, you will be able to note upon it the ſituation and proportions of the principal objects; fix the extremes firſt, and the height of the horizon, (which expreſſes the level of the eye,) and then ſketch, *very* faintly, the general form of the larger diviſions; after this draw in the outlines carefully and decidedly at once, the minuteneſs of the parts requiring that they ſhould be marked with as few lines as poſſible, and without alteration; exactneſs being unattainable, the draughtſman muſt aim at conveying the character of every thing with as much truth and ſpirit as poſſible, obſerving to give more detail and more ſtrength of touch as he advances to the foreground. As the fineſt ſcenes are apt to be inſipid without ſome decided chiaroſcuro, while the commoneſt derive picturesque intereſt from the ſame principle, he ſhould habituate himſelf to ſketch all the ſtriking effects he may ſee in nature. Sunſhine is almoſt eſſential to the animation of landſcape; the morning and evening are to be preferred, in general, from affording more light and ſhade; where this is wanting, a ſubſtitute muſt be found in objects, dark or bright in themſelves, to create an agreeable balance. The choice and application of theſe circumſtances is to be learned from painting. The outlines are ſometimes put in with a pen, but this ſhould be done on the ſpot; it is adviſeable never to alter the lines put in from nature, as it is ſcarcely poſſible to go over them again, from recollection, without injuring their ſpirit. The ſhadows may afterwards be made out by hatching, or waſhed in with biſtre, ſepia, or Indian ink. A greyiſh paper is ſometimes uſed, the lights being made out with white chalk, the ſhadows with black; this is a very good and expeditious method. To *waſhed* drawings a ſlight tinge of colour is ſometimes given, in which caſe they are called *tinted* drawings; this is the firſt ſtep towards painting, but we ſhould not adviſe the uſe of colours till the ſtudent has ſome proficiency of execution in chiaroſcuro. See *Plates* VIII. IX. X.

Having ſaid ſo much on the two principal branches of drawing, the human figure and landſcape, it will be unneceſſary to enter into the particular conſideration of any other, the rules laid down for theſe being applicable to all. The ſtudy of animals may be purſued like that of the human figure; their anatomy muſt be acquired, and their characters ſtudied from nature. Drapery, ſtill life, flowers, &c., need no further precepts than thoſe already given. Architectural drawing and machinery proceed entirely by the mechanical aid of rule and compaſs.

We ſhall conclude this article with obſerving, that the great *deſideratum* in every kind and ſtyle of drawing, is a characteriſtic repreſentation of its ſubject, however ſlightly indicated, for the want of which no beauty of workmanſhip, no high finiſhing, as it is falſely called, can ever atone; this muſt depend on correctneſs of eye, facility of hand, and a competent knowledge of the ſubject: if to theſe we add juſt feeling and good taſte, we ſhall comprehend all the requiſites of a complete draughtſman.

Drawing, or *Deſign*, is alſo technically uſed for that part of painting which is employed in expreſſing the forms of objects, and, in its perfection, implies ſymmetry, congruity of character, anatomical correctneſs, and truth of proportion, equilibrium and perſpective, in the figures of a picture.

The revivers of painting in the 13th century followed the meagre taſte in drawing of the Greek artiſts, their immediate predeceſſors, and appear to have ſelected for their models the moſt emaciated objects in nature. Donatello and Luca Signorelli broke through this in a great degree; and its overthrow was completed by Michael Angelo. It required, however,

however, two centuries to get entirely the better of this ſtrange poverty of ſtyle. Michael Angelo himſelf, when he deſigned his celebrated Cartoon of Piſa, if we may judge from the Holkham copy, (which has every appearance of being an accurate tranſcript,) had not then adopted that fulneſs of form which characterizes his ſubſequent works, and which he probably derived from ſome fine fragments of antiquity diſcovered in his time, particularly the *torſo*. The ſight of the Siſtine chapel produced in Raffaelle an immediate change from the Gothic taſte of his maſter Pietro Perugino, in which he commenced, and he ſeems to have been ſo pleaſed with this new ſtyle, as ſometimes to carry it to exceſs; he uſually ſurpaſſed his rival in grace, though he never equalled him in energy or grandeur. Drawing degenerated rapidly with the ſucceſſors of theſe two great men. After Guilio and Polidoro, the Roman ſchool fell into inſipidity, and the Florentine endeavouring to imitate Michael Angelo, became tumid and extravagant. Correggio and Parmeggiano, ſeduced by beauty of line, too often ſacrificed correctneſs to elegance. The Carraci at Bologna compoſed a ſort of middle ſtyle, in which they attempted to obviate all theſe defects; but it was heavy, and poſſeſſed little ſentiment or character, though it has become the common place hiſtorical *manner* of almoſt all their ſucceſſors, and we may add, of moſt academies in other parts of Europe. Lodovico Carraci, and Domenichino, are the beſt of this ſchool, in regard to purity of taſte. Pouſſin adopted another ſtyle, founded on a cloſe imitation of the antique ſtatues, but acquired too much of the hardneſs of the material in which they are wrought, without attaining, in general, their grace or ſymmetry. The preſent French ſchool have puſhed this ſtill further, and fill their pictures with frigid copies of all the *ideal* forms of the ancients. The *antique*, however, muſt always be conſidered the great ſource of true taſte in drawing. It is here the artiſt may learn to ſeparate the eſſential and generic from the accidental and individual, the great principle of the ſuperiority of the ancients over the moderns, how much of this which is properly called *ſtyle*, may be adopted in painting, is a queſtion of ſome nicety: Rubens has expreſſed his admiration of the ancient ſtatues, and given his opinion how far they may be ſtudied with advantage by a painter, in a treatiſe quoted by Du Piles, but ſeems to have wholly neglected them in his practice. In this country, as it was formerly in the Venetian ſchool, drawing is conſidered as the leaſt important part of painting; fine tones and impoſing effects compenſate for all omiſſions of this kind. The pre-eminent talents of the late ſir J. Reynolds have probably not a little contributed to give this direction to the taſte of the Engliſh ſchool; his ſucceſsful example, though utterly at variance with his precepts, added to the natural faſcination of colour and chiaroſcuro, has made the ſenſual triumph over the intellectual part of the art, and it is the more to be regretted, as he has merely left his followers to labour in a mine which he himſelf had almoſt exhauſted. But in ſpite of faſhion or indolence, it may be ſafely affirmed, that drawing is the ſoul of beauty, character, and expreſſion, and that its neglect will inevitably be followed by the extinction of all the higher ſtyles of painting.

Drawing, among *Hunters*, is, when they beat the buſhes after a fox. The term is alſo applied to hounds who ſearch for hares or deer in covers and furze, buſhes, &c.

Drawing *amiſs* is, when the hounds, or beagles, hit the ſcent of their chace the contrary way, ſo as to purſue it up the wind, when they ſhould have done it down the wind. The huntſman, on firſt finding a fox, ſhould draw quietly, and *up the wind;* this is ſaid to be material. The fox, by drawing up the wind, does not hear the approach of the hounds, who by this means are alſo within hearing: beſides, if the fox ſhould turn down the wind, as moſt probably he will, it lets the hounds all in. See Scent. See alſo *Fox-hunting*.

Drawing *on the ſlot* is, when the hounds touch the ſcent, and draw on, till they rouſe, or put up the chace.

Drawing, *fine*. See Fine *Drawing*.

Drawing *out Ships Bolts*. See Bolts.

Figs. 1, 2, 3, 4, of *Plate* XXIII. *Mechanics*, repreſent a machine for this purpoſe, invented by Mr. W. Hill, who was rewarded with 40 guineas by the Society of Arts, London.

The power to draw out the bolt is obtained by two ſtrong male ſcrews, A, A. *figs.* 1 and 2, working in female ſcrews near the extremities of the cheeks B, B, againſt plates of iron, *c*, *e*.

C, the bolt to be drawn, which, being held between the chaps D, D, of the machine, (*fig.* 1.) is, by turning the ſcrews A. A. by a lever, forced upwards out of the wood, or plank of the ſhip. F, F, *fig.* 2, are two iron dogs, with hooks at their lower extremities, which being driven into the plank, ſerves to ſupport the machine till the chaps have got faſt hold of the bolt. At the upper parts of theſe dogs are rings, paſſing through holes in a collar, moveable near the heads of the ſcrews.

Fig. 4, is a plan of the upper ſide of the cheeks, when joined together; *a*, *a*, the holes in which the ſcrews A, A, work; B, B, the cheeks by which the bolts are drawn.

Fig. 3, the under ſide of the cheeks; *a*. *a*, the holes in which the ſcrews work; D, D, the chaps by which the bolts are drawn.

Under the article Bolts we have given an account of Mr. Bolton's machine for drawing out and drawing in bolts, which was rewarded by the Society of Arts with their gold medal.

DRAXHOLM, in *Geography*, a ſmall town of Denmark, in Zealand, which gives its name to the circle of Draxholm, and has an ancient caſtle, remarkable for having ſerved as a priſon to ſeveral ſtate priſoners, and, among others, to the wicked John Hepborne, earl of Bothwell, huſband of Mary queen of Scotland, who was confined here in the year 1576.

DRAY, a name given by ſportſmen to ſquirrel neſts, built on the tops of trees. See Squirrel.

Dray is alſo a cart uſed by brewers to carry beer on; likewiſe a ſledge without wheels.

Dray-*Plough*. See Plough.

DRAYTON, Michael, in *Biography*, an Engliſh poet, was born at Hartſhill, a village in Warwickſhire, in 1563. He ſtudied at Oxford, but with what particular view is not known. During the reign of queen Elizabeth he became known by various poetical publications, which obtained for him patrons, to whoſe liberality he acknowledged himſelf much indebted. On the acceſſion of James I. he attempted an ode in honour of the occaſion; but he ſucceeded ſo ill as to cut off all the hopes of preferment which he had indulged. He died in 1631, and was honoured with a tomb among the poets in Weſtminſter Abbey. In one of his own title-pages he is ſtyled poet laureat; but his name is not in the liſt of thoſe who have poſſeſſed the court office to which the title of laureat has in modern times been appropriated. From his various dedications, it ſhould ſeem that he enjoyed the favour of ſeveral noble families, particularly of that friend to literature, Sackville earl of Dorſet, who was at that period lord chamberlain. "Drayton," ſays his biographer, "is one of the moſt fertile Engliſh poets, and the moſt original and truly national in his ſubjects." Moſt of his pieces are derived from Engliſh hiſtory; but his principal perform-

ance is entitled "Polyolbion," which is a kind of fyſtem of the geography and antiquities of England and Wales. To the modern reader this would appear tedious, but the learned Selden thought it worthy of annotations. His works were publiſhed twice during the laſt century, once in folio in 1748, and afterwards in four volumes, 8vo. The deſign of his poetry is evidently better than its execution. The variety is, however, conſiderable, the ſubjects often animating, the language and verification are not ſo antiquated as might be expected; but the marks of true genius are rarely diſplayed. With occaſional inſtances of elevation and beauty, the general run of his verſe is proſaic and inſipid. Biog. Brit.

Drayton, in *Geography*, a town of England, in the county of Salop, with a weekly market on Wedneſday; 18 miles N.W. of Stafford, and 159¾ N.W. of London.

DREAMS. According to Wolfius every dream takes its riſe from ſome ſenſation, and is continued by the ſucceſſion of phantaſms in the mind. His reaſons are, that when we dream we imagine ſomething, or the mind produces phantaſms; but no phantaſm can ariſe in the mind without a previous ſenſation: hence neither can a dream ariſe without ſome previous ſenſation. He obſerves farther, that though it be certain *à priori*, from the nature of the imagination, that dreams muſt begin by ſome ſenſation, yet that it is not eaſy to confirm this by experience; it being often difficult to diſtinguiſh thoſe ſlight ſenſations, which give riſe to dreams, from phantaſms, or objects of imagination. Yet this is not impoſſible in ſome caſes, as when the weak ſenſation ſufficient to give riſe to a dream gradually becomes ſtronger, ſo as to put an end to it, as it often happens in uneaſy and painful ſenſations. Wolf. Pſychol. Empir. § 123.

The ſeries of phantaſms, or objects of imagination, which conſtitute a dream, ſeem to be ſufficiently accounted for from the law of imagination, or of aſſociation; though it may be extremely difficult to aſſign the cauſe of every minute difference, not only in different ſubjects, but in the ſame, at different times, and in different circumſtances. We have an eſſay on this ſubject by M. Formey, in the Mem. de l'Acad. de Berlin. tom. ii. p. 316. He expreſsly adopts Wolfius's propoſition above mentioned, that every dream begins with a ſenſation, and is continued by a ſeries of acts of imagination, or phantaſms; and that the cauſe of this ſeries is to be found in the law of the imagination. "Si naturale ſomnium eſt, initium capere debet per legem ſenſationis, & continuari per legem imaginationis." Hence he concludes thoſe dreams to be ſupernatural, which either do not begin by ſenſation, or are not continued by the law of the imagination.

This opinion is as ancient as Ariſtotle, who expreſsly aſſerted, that a dream is only the φαντασμα, or *appearance* of things, ariſing from the previous motions excited in the brain, and remaining after the objects are removed. Hobbes has adopted this hypotheſis: he aſcribes different dreams to different diſtempers of the body, and whimſically enough obſerves, that lying cold breeddeth dreams of fear, and raiſeth the thought and image of ſome fearful object. Thus he accounts for that which was in reality the waking viſion of Brutus, which addreſſed him the night before the battle of Philippi. "I am, Brutus, thine evil genius; but thou ſhalt ſee me again near Philippi." And Mr. Locke, though he does not expreſsly declare how dreams are excited during ſleep, ſeems to aſcribe the perfection of rational thinking to the body; and traces their origin to previous ſenſations, when he ſays, "The dreams of ſleeping men are all made up of the waking man's ideas, though for the moſt part oddly put together." He urges the incoherence, frivolouſneſs, and abſurdity, of many of our dreams, as well as the ſuppoſed fact that ſome ſleep without dreaming, as objections to the notion that men think always: to which it has been replied, that dreams may be entirely, imperfectly, or not at all remembered, according to the various degrees in which the nerves are impreſſed by the motion given to the animal ſpirits in ſleep. Ariſt. de Inſomn. cap. 3. Hobb. Lev. cap. 2. & cap. 45. Locke, Eſſ. book ii. ch. i. § 10, &c. Watt's Eſſ. § 2. p. 120, &c. Dr. Hartley explains all the phenomena of the imagination by his theory of vibrations and aſſociations. Dreams, he ſays, are nothing but the imaginations or reveries of ſleeping men, and they are deducible from three cauſes, *viz.* the impreſſions and ideas lately received, and particularly thoſe of the preceding day, the ſtate of the body, and particularly of the ſtomach and brain, and aſſociation.

That dreams are, in part, deducible from the firſt of theſe cauſes, appears, he ſays, from the frequent recurrence of theſe in greater or leſſer cluſters, and eſpecially of the viſible ones, in our dreams; more eſpecially when they are recent: whereas, in general, ideas that have not affected the mind for ſome days recur, in dreams, only from the ſecond or third cauſe above aſſigned. That the ſtate of the body affects our dreams is evident from the dreams of ſick perſons, and of thoſe who labour under indigeſtions, ſpaſms, and flatulencies. We may alſo perceive ourſelves to be carried on from one thing to another in our dreams partly by aſſociation. For the purpoſe of ſolving the moſt uſual phenomena of dreams upon theſe principles, this ingenious author obſerves, that the ſcenes which preſent themſelves are taken to be real:—that in our dreams there is a great degree of wildneſs and inconſiſtency:—that we do not take notice of, or are affected at, theſe inconſiſtencies, but paſs on, without heeding them, from one to another:—that in dreams it is common for perſons to appear to themſelves to be tranſferred from one place to another, by a kind of ſailing or flying motion, which ariſes from the change in the apparent magnitude and poſition of the images excited in the brain, the change being ſuch as a change of diſtance and poſition in ourſelves would have occaſioned:—that dreams conſiſt chiefly of viſible imagery, which agrees remarkably with the perpetual impreſſions made upon the optic nerves and correſponding parts of the brain during vigilance, and with the diſtinctneſs and vividneſs of the images impreſſed; and that viſible imagery in dreams is compoſed, in a conſiderable degree, of fragments of viſible appearances lately impreſſed:—that many of the things which are preſented in dreams appear to be remembered by us, or, at leaſt, as familiar to us; and that this may be ſolved by the readineſs with which they ſtart up, and ſucceed one another, in the fancy:—that dreams ought to be ſoon forgotten, as they are in fact, becauſe the ſtate of the brain ſuffers great changes in paſſing from ſleep to vigilance:—and that the dreams which are preſented in the firſt part of the night are, for the moſt part, much more confuſed, irregular, and difficult to be remembered, than thoſe which occur towards the morning; and theſe laſt are often rational to a conſiderable degree, and regulated according to the uſual courſe of our aſſociations: for the brain then begins to approach to the ſtate of vigilance, or that in which the uſual aſſociations were formed and cemented. For the illuſtration and proof of theſe obſervations we muſt refer to the author himſelf. Obſ. on Man, § 5. p. 226, &c. 4to. edit. 1791.

Democritus and Lucretius account for dreams, by ſuppoſing that ſpectres and ſimulacra of corporeal things, conſtantly emitted from them, and floating up and down in the air, come and aſſault the ſoul in ſleep. Lucret. De Rer. Nat. lib. iv.

Thoſe

Thofe who have maintained the effential difference between foul and body have folved the common phenomena of dreams by the union of thefe two fubftances, and the neceffary connection arifing thence between ideas in the mind, and certain motions in the body, or in thofe parts more immediately united to the foul; whilft others, who have denied the exiftence of matter, account for them in the fame manner as for our other ideas, which may not be improperly called waking dreams.

A learned author has afferted, that our dreams are prompted by feparate immaterial beings; an opinion which was advanced long ago by the heathens, and maintained very generally, and applied to a fpecies of divination. He contends, that the phantafm, or what is properly called the vifion, is not the work of the foul itfelf, and that it cannot be the effect of mechanical caufes; and therefore afcribes it to feparate fpirits, having access to our minds, and furnifhing us with ideas while we fleep. See Mr. Baxter's Effay on the Phen. of Dreaming, in his Inquiry into the Nature of the human Soul, vol. ii. 3d edit. 1745.

Bifhop Newton, "On Dreams," (Works, vol iii. p. 180, &c. 8vo. ed.) adopts the hypothefis of Mr. Baxter; alleging that the irregularity of our dreams may proceed from the indifpofition of the organ rather than from the imperfection of the agent, from fome obftruction in the brain or fenfory, than from any incapacity in the fpirit at that time acting upon the fenfory: and endeavouring to obviate that tendency to encourage fuperftition, with which it has been, not unjuftly, charged. Speaking of dreams, that have been of a prognofticating kind, he fays, "Have not fuch dreams confeffedly fomething of *divine* in them, and do they not plainly declare a fpiritual original? and fhall we afcribe fome to fpiritual and fome to material caufes? or fhall we not rather be more confiftent with ourfelves, and fuppofe that good fpirits may infpire fome, as evil fpirits may excite others?" He adds, "It is a fentiment as old as Homer (Il. i. 63.), that dreams are from Jupiter; and the beft and wifeft authors of antiquity fpeak the fame language. Nay, what is more, the Scriptures themfelves, the oracles of truth, fpeak always of dreams and vifions as proceeding from God immediately or mediately, by his infpiration, or by the agency of angels and fpirits through his permiffion; and the worfe fort of dreams is expreffly attributed to the fame caufe, as well as the better. Job, vii. 13, 14."

Profeffor Dugald Stewart has, with his ufual acutenefs and perfpicuity, difcuffed the fubject of dreaming in his "Elements of the Philofophy of the Human Mind," (ch. v. p. 1. § 5.) He begins with ftating three different queftions that may be propofed with refpect to the phenomena of dreaming; they are as follow: What is the ftate of the *mind* in fleep, or, what faculties then continue to operate, and what faculties are then fufpended? How far do our dreams appear to be influenced by our bodily fenfations; and in what refpects do they vary, according to the different conditions of the body in health, and in ficknefs; and what is the change which fleep produces on thofe parts of the *body*, with which our mental operations are more immediately connected, and how does this change operate in diverfifying, fo remarkably, the phenomena which our minds then exhibit, from thofe of which we are confcious in our waking hours? The fecond of thefe queftions, which belongs to the medical inquirer, will be difcuffed in a feparate article; and the third relates to a fubject, which feems to be placed beyond the reach of the human faculties. With regard to the firft inquiry, which alone belongs to the philofophy of the human mind, or the ftate of the *mind* in fleep, it feems reafonable to expect, fays the ingenious profeffor, that fome light may be obtained from an examination of the circumftances which accelerate or retard its approach; for when we are difpofed to reft, it is natural to imagine, that the ftate of the mind approaches to its ftate in fleep, more nearly than when we feel ourfelves alive and active, and capable of applying all our various faculties to their proper purpofes. The approach of fleep is accelerated by every circumftance which diminifhes or fufpends the exercife of the mental powers, and is retarded by every thing which has a contrary tendency. When we wifh for fleep, we difengage our attention, as much as poffible, from every intereffing fubject of thought. Moreover, if we examine the particular clafs of founds, which compofe us to fleep, fuch as the hum of bees, the murmur of a fountain, and the reading of an uninteresting difcourfe, we fhall find that it confifts of thofe that are adapted to withdraw the attention of the mind from its own thoughts. It has been alfo obferved, that children and perfons of little reflection, who are occupied about fenfible objects, and whofe mental activity is, in a great meafure, fufpended, as foon as their perceptive powers are unemployed, find it difficult to continue awake, when they are deprived of their ufual engagements. This has been remarked to be the cafe with regard to favages, whofe time, like that of inferior animals, is almoft wholly divided between fleep and their bodily exertions. From thefe facts our author concludes, that in fleep thofe operations of the mind are fufpended, which depend on our volition. Accordingly, the difference between the ftate of the mind, when we are inviting fleep, and when we are actually afleep, is this; that, in the former cafe, although its active exertions be fufpended, we can renew them, if we pleafe: and in the other cafe, the will lofes its influence over all our powers both of mind and body, in confequence of fome phyfical alteration in the fyftem, which we fhall never probably, be able to explain. Admitting the fufpenfion of our voluntary operations in fleep as a fact, its caufe may be either the fufpenfion of the power of volition, or the will's lofs of influence over thofe faculties of the mind and thofe members of the body, which, during our waking hours, are fubjected to its authority. The firft of thefe caufes not being agreeable to fact, the latter muft be admitted, as a neceffary confequence. That the power of volition is not fufpended during fleep appears from the efforts which we are confcious of making while we are in that fituation. Many inftances might be adduced to this purpofe. The fame conclufion may be otherwife confirmed. When we are anxious to procure fleep, the means to which nature directs us on fuch occafions are not to fufpend the power of volition, but to fufpend the exertion of thofe powers, whofe exercife depends on volition. Befides, the effect which is produced on our mental operations is analogous to that which takes place with regard to our bodily powers. In fleep the body appears to be, in a very inconfiderable degree, if at all, fubject to our command. However, the vital and involuntary motions fuffer no interruption. In like manner, the operations of the mind, depending on our volition, feem to be fufpended, whilft fome other operations are, at leaft occafionally, carried on. This analogy naturally fuggefts the idea, that *all* our mental operations, which are independent of our will, may continue during fleep; and that the phenomena of dreaming may, perhaps, be produced by thefe, diverfified in their apparent effects, in confequence of the fufpenfion of our voluntary powers. Moreover, the train of thought in the mind does not depend *immediately* on our will, but is regulated by certain general laws of affociation. Nevertheleefs, the *indirect* influence, which the mind poffeffes over its train of thoughts, is fo great, that during the whole time of our being awake, ex-

cepting in those cases in which we fall into what is called a reverie, and suffer our thoughts to follow their natural course, the order of their succession is regulated more or less by the will. In sleep, says our author, the succession of our thoughts so far as it depends on the laws of association, may be carried on by the operation of the same unknown causes by which it is produced while we are awake; but the order of our thoughts, in these two states of the mind, must be very different; inasmuch, as in the one, it depends solely on the laws of association, and in the other, on those laws combined with our voluntary exertion. He then proceeds to shew, that the succession of our thoughts in sleep is regulated by the same general laws of association, which influence the mind while we are awake; and that the circumstances which discriminate dreaming from our waking thoughts, are such as must necessarily arise from the suspension of the influence of the will. In proof of the first proposition it is alleged, that our dreams are frequently suggested to us by bodily sensations, and with these, particular ideas are frequently very strongly associated. Our dreams are also influenced by the peculiar temper of the mind, and generally vary, in their complexion, according as our habitual disposition, at the time, inclines us to cheerfulness or melancholy: and our dreams are influenced by our prevailing habits of association, while awake. In proof of the second proposition our author observes, that if the influence of the will be suspended during sleep, all our voluntary operations, such as recollection, reasoning, &c. must also be suspended, which appears to be the case from the extravagance and incoherency of our dreams: the mind will also remain as passive, while its thoughts change from one subject to another, as it does during our waking hours, while different perceptible objects are presented to our senses: and, in the case here supposed, of the suspension of the influence of the will during sleep, the conceptions which we then form of sensible objects will be attended with a belief of their real existence, as much as the perception of the same objects is while we are awake. To this purpose it is observed, that as the subjects, which we then think upon, occupy the mind exclusively, and as the attention is not diverted by the objects of our external senses, our conceptions must be proportionably lively and steady. As there is no state of the body in which our perceptive powers are so totally unemployed as in sleep, it is natural to think, that the objects which we conceive and imagine, must then make an impression on the mind, beyond comparison greater than any thing of which we can have experience while awake. Our author's principles afford a satisfactory explanation of what some writers have represented as the most mysterious of all circumstances connected with dreaming, *viz.* the inaccurate estimate of time which, whilst we are thus employed, we are apt to form; so that sometimes a single instant has the appearance of hours, or perhaps, of days. A sudden noise, for instance, suggests a dream connected with that perception; and the moment afterwards this noise has the effect of awaking us; and yet, during that momentary interval, a long series of circumstances has passed before the imagination. In accounting for these facts, some have supposed, that, in our dreams, the rapidity of thought is greater than while we are awake; but this supposition our author thinks to be needless. In sleep, he says, the conceptions of the mind are mistaken for realities; and, therefore, our estimates of time will be formed, not according to our experience of the rapidity of thought, but according to our experience of the time requisite for realizing what we conceive.

In cases where our sleep seems to be complete, the mind loses its influence over all those powers, the exercise of which depends upon its will; but there are many cases, in which sleep seems to be partial, or where the mind loses its influence over some powers, and retains it over others. In the case of the *somnambuli* it retains its power over the limbs, but possesses no influence over its own thoughts, and scarcely any over the body, except those particular members of it which are employed in walking. In madness, the power of the will over the body remains undiminished, while its influence in regulating the train of thought is in a great measure suspended, either in consequence of a particular idea, which engrosses the attention to the exclusion of every thing else, and which we find it impossible to banish by our efforts; or in consequence of our thoughts succeeding each other with such rapidity, that we are unable to stop the train. In both these kinds of madness, the conceptions or imaginations of the mind become independent of our will, and therefore they are apt to be mistaken for actual perceptions, and to affect us in the same manner.

Professor Stewart has subjoined, in his notes and illustrations (Ed. 2. p. 570, &c.) some additional remarks on the phenomena of dreaming, which seem to obviate the difficulties attending his hypothesis. In cases, he says, where our dreams are occasioned by bodily sensations, or by bodily indisposition, it may be expected that the disturbed state of our rest will prevent that total cessation of the power of attention, which takes place when sleep is profound and complete; and, in such instances, the attention which is given to our passing thoughts, may enable us afterwards to retrace them by an act of recollection. On the other hand, the more general fact unquestionably is, that at the moment of our awaking, the interval spent in sleep presents a total blank to the memory; and yet it happens, not unfrequently, that, at the distance of hours, some accidental circumstance occurring to our thoughts, or suggested to us from without, revives a long train of particulars associated in the mind with each other; to which train (not being able otherwise to account for the concatenation of its parts) we give the name of a *dream*.

Among the astonishing appearances exhibited by the mind in sleep, a very large proportion is precisely analogous to those of which we are every moment conscious while we are awake. If the exciting causes, for example, of our dreams seems mysterious and inscrutable, is not the fact the same with the origin of every idea or thought which spontaneously solicits our notice? The only difference is, that in the latter instance, in consequence of long and constant familiarity, they are surveyed by us with little wonder, and by most with hardly any attention. In the former instance, they rouse the curiosity of the most illiterate, from their comparative infrequency, and from the contrast which, in some respects, they present to the results of our habitual experience.

Dreams, in *Pathology*. Dreaming is much influenced by the physical condition of the body; and therefore dreams of various character, and of different degrees of intensity, are among the effects and signs of various diseases. They may be traced by the medical observer in all the gradations, from a common dream, produced by any cause of imperfect sleep, up to actual Delirium, as well as under the varieties of Night-mare, Somnambulism, &c. See those articles respectively.

Some writers, as Wolfius, (Psycholog. Empir. § 123.) and after him Formey, (in the Hist. de l'Academie de Berlin, tom. ii.) have considered all dreams as originating in some corporeal sensation, and continued by the imagination, by successive phantasms, which arise according to the law of this faculty. Hartley not only more fully developed the

the nature of this law of *association*, by which our dreams are carried on, but he admitted the recurrence of recent ideas, especially of those of the preceding day, as frequently giving origin to dreams, as well as various corporeal sensations, particularly in the head and stomach. We have shewn, under the word DELIRIUM, how much our dreams are modified or produced by external impressions, as well as by internal sensations, and have quoted some cases in illustration, from Mr. Smellie's (then erroneously called *Stewart's*) Philosophy of Natural History. It remains for us here to point out the more obvious physical conditions, under various states of disease, in which dreams are particularly increased both in frequency and force.

Diseases give occasion to unusual dreaming in two ways: first, by inducing various internal sensations, connected especially with morbid conditions of the circulation and of the nervous system; and, secondly, by rendering the sleep imperfect, and, therefore, leaving the mind in that state of activity, in which not only the internal feelings, but also the external impressions on the senses, become the origin of trains of associated ideas, which constitute our dreams, and likewise admitting the recurrence of those thoughts, which had particularly occupied the mind before the commencement of sleep.

1. All febrile diseases, and especially idiopathic fevers, in which both the nervous system and the circulation are greatly deranged, and the general feelings are always uncomfortable, often extremely distressing, are accompanied from the beginning with frequent and disagreeable dreams. It is chiefly under the various forms of fever that the dreams extend to that degree which constitutes delirium, when the internal feelings become highly irritated, and especially when the circulation through the brain, in its then morbid condition, is particularly excited. Any derangement of the circulation in the head, indeed, occasions much dreaming. The approaches of symptomatic fever, however slight; even the temporary acceleration of the blood from an evening of exercise in the ball-room, or from excess in drinking, short of intoxication, or from any other cause of excitement, will produce a succession of dreams through the night; most commonly of an unpleasant nature, but sometimes agreeable, according to the general state of the sensations: the febrile dreams are, from this cause, almost invariably unpleasant.

Dreams are also generally among the symptoms of those diseases, which derange the circulation through the brain in a manner, different from that of unusual excitement; and especially where there is some distressing corporeal sensation. Thus in *peripneumony, asthma, hydrothorax*, &c. in which the pulmonary circulation is obstructed, the blood is prevented from undergoing its proper changes, and the circulation in the head is also necessarily impeded, the vessels of the brain being distended with blood imperfectly altered by respiration, dreams of a painful and alarming nature, from which the patient awakes in fear and by starting, are constant occurrences. The horrors with which these dreams are accompanied, and the sudden interruption of repose in which they terminate, are doubtless to be attributed to the distressful sensations in the chest, which arise from imperfect breathing, and from the obstruction to the free motion of the heart. The feelings of impending suffocation, the sensations of constriction, of weight, and of stuffing in the lungs, the laborious and palpitating action of the heart, and the anxiety about the præcordia, which render the waking hours of the patient painful to himself, and his situation distressing to spectators, continue during his short and imperfect intervals of repose, and excite those perpetual images of terror, which constitute his dreams: and when the corporeal feelings and the phantasms of the imagination become at once too painful to be consistent with sleep, the sleep is suddenly interrupted, and the patient seeks, by change of position, to relieve for a while the sensations, in which his dreams originated.

Again, the stomach is a common, perhaps the most common seat of those corporeal sensations, which give origin to our dreams, as Hartley has intimated. In those persons, whose powers of digestion are weak, a series of dreams, generally of an unpleasant nature, usually occur during the night, if they have taken a heavy supper immediately preceding sleep. The stomach being loaded and oppressed, is the seat of uneasy feelings, and its distension somewhat impedes the motions of the heart and lungs, by which those feelings are much augmented. It is chiefly under such circumstances, that the dreams amount to that distressing degree, which is denominated *incubus*, or NIGHT-MARE. Dr. Darwin observes, that great fatigue, with a full supper and much wine, always produced the night-mare in one of his patients. The stomach, in such a case, partakes of the fatigue of the body at large, and therefore is the less able to digest, and rid itself of the mass of food which oppresses it. The state of the stomach from drunkenness, the position of the body in bed, and other kinds of uneasiness during sleep, give rise to night-mare, and to the lesser degrees of unpleasant dreaming.

2. It can scarcely be doubted, that all those morbid, or accidental conditions of the body, which, by the painful sensations which they induce, occasion much dreaming, contribute to that effect, likewise, in no small degree, by rendering the sleep imperfect. It must be within the compass of every person's experience, that his dreams principally occur at the commencement, or towards the termination of sleep, especially during the dozing of the morning hours, and when his sleep is any how disturbed. Prof. Stewart has observed, that many people "never recollect to have dreamed, excepting when the soundness of their sleep was disturbed by some derangement in their general health, or by some accident which excited a bodily sensation." (Elem. of the Philosophy of the Human Mind, p. 570, 3d edit.) Whether dreams do not occur in sound sleep; or whether they occur, but are not recollected, except when the sleep is imperfect, is a question which does not affect our reasoning here.

All the disorders, then, above alluded to, may be considered as exciting dreams in a twofold manner: first, they render sleep unsound, and, therefore, favour the occurrence of dreams; and, secondly, by the disagreeable sensations connected with them, they contribute to excite particular trains of associated ideas, and, therefore, to modify the character of the dreams.

Besides, in imperfect sleep, the attention is, in a certain degree, alive to external impressions on the senses, which become an additional source of excitement of our dreams. Under such a state of unsound sleep, our dreams are often suggested to us by external bodily sensations, with which, as we know from what we experience while awake, particular ideas are frequently very strongly associated. "I have been told by a friend," says professor Stewart, "that having occasion, in consequence of an indisposition, to apply a bottle of hot water to his feet when he went to bed, he dreamed that he was making a journey to the top of mount Ætna, and that he found the heat of the ground almost insupportable. Another person, having a blister applied to his head, dreamed that he was scalped by a party of Indians." Loc. cit. chap. v. § 5. In the same way various dreams are constantly excited during imperfect sleep, by

external ſenſations. See ſome ſimilar examples under the article Delirium.

This imperfect ſleep, likewiſe, admits of thoſe dreams which originate from the recurrence of the accuſtomed trains of thought, eſpecially thoſe of the preceding day, as obſerved by Hartley; the faculties of the mind, in ſuch a ſtate of ſleep, being partially active, particularly the faculty of attention. Stewart, loc. cit.

Hence, it is obvious, that almoſt every ſtate of diſeaſe, which is attended with painful and uneaſy ſenſations, will give riſe to much dreaming, which will be variouſly influenced and modified, according to the nature of thoſe ſenſations, and of the accidental external impreſſions, and of the individual habits of aſſociation.

The older medical writers attempted to deduce information, relative to the nature of diſeaſes, and the indications of cure, from the dreams of their patients. They ſuppoſed that all dreams, which were different from the thoughts of the preceding day, or the prevalent ideas ariſing from the buſineſs of life, were neceſſarily the reſult and the ſigns of a more or leſs diſtempered ſtate of the body; and, therefore, that the true nature of that ſtate might be often better learned from thoſe dreams, than from any other ſource. But ſuch a notion could only ariſe from an ignorance of the nature of the faculty of *aſſociation* by which our dreams are carried on, and of the ſlight and various relations by which ideas are aſſociated with bodily ſenſations, during ſleep. This ſlight and varying connection between the corporeal origin and the ſubſequent conceptions of our dreams, renders it impoſſible to deduce any general concluſions from them, or to trace back, from the phenomena which they exhibit, the corporeal condition by which they were ſuggeſted.

It will be ſufficient to enumerate ſome of the fanciful and gratuitous opinions which have been delivered, both in regard to diagnoſis and prognoſis, in order to ſhew their futility. Lommius has collected from the writings of Hippocrates the following obſervations on the ſubject. To dream of fire indicates a redundance of yellow bile: to dream of fogs, or ſmoke, indicates a predominancy of black bile: to dream of ſeeing a fall of rain, or ſnow, or a great quantity of ice, ſhews that there is a redundancy of phlegm in the body: he who fancies himſelf among ſtinks may be aſſured that he harbours ſome putrid matter in his body: to have red things preſented before you in ſleep, denotes a redundance of blood: if the patient dreams of ſeeing the ſun, moon, and ſtars hurry on with prodigious ſwiftneſs, it indicates an approaching delirium: to dream of a turbid ſea indicates diſorders of the belly: the appearance of monſters and frightful enemies, indicates delirium in diſeaſes: and to dream of being thrown down from ſome very high place, threatens an approaching vertigo, or ſome other diſorder of the head, as an epilepſy, apoplexy, or the like. Lommii, Obſervat. Medicin.

Theſe obſervations are altogether erroneous, and are obviouſly the ſuggeſtions of the imagination, and not the inferences of experience.

DREBBER-*Jacobs*, in *Geography*, a town of Germany, in the circle of Weſtphalia, and county of Diepholz.

Drebber-*Marien*, a town of Germany, in the circle of Weſtphalia, and county of Diepholz; 5 miles N. of Diepholz.

DREBKAU, or Drebkoy, a ſmall town of the kingdom of Saxony, in Lower Luſatia, one of the ſix towns of Lower Luſatia, in which the deſcendants of the Vandals have preſerved ſome traces of their language. It has 148 houſes, and about 1000 inhabitants, ſupported chiefly by agriculture, and the manufacture of linen cloth.

DRECANUM, in *Ancient Geography*, a place ſituated on the weſtern part of the iſle of Cos. Strabo.

DREDGE, or Dreg, a term uſed by the farmers for oats and barley mingled together.

DREDGERS, a term uſed in the admiralty courts for the fiſhers for oyſters. See ſtat. 2 Geo. II. cap. 19.

DREDGING-Machine, in *Mechanics*, an engine uſed to take up mud, or gravel, from the bottom of rivers, canals, docks, harbours, &c. while they remain full of water.

The common method of dredging is performed by men in a barge: the gravel, or ballaſt, is taken up in a leather bag, the mouth of which is extended by an iron hoop, attached to a light pole, of a ſufficient length to reach the bottom: in the ſmall way, two men are employed to work each pole. The barge being moored, one of the men takes his ſtation at the ſtern, with the pole and bag in his hand, the other ſtands in the head, having hold of a rope, tied faſt to the hoop of the leather bag. The man at the ſtern now puts the pole and bag down, over the barge's ſide, to the bottom, in an inclined poſition. The hoop being fartheſt from the man in the head of the barge, and having a rope, one end of which is faſt to the gunwale of the barge, he paſſes it twice, or thrice, round the pole, and then holds it tight: the man in the head now pulls the rope, faſtened to the hoop, and draws the hoop and bag along the ground, the other allowing the pole to ſlip through the rope as it approaches the vertical poſition, at the ſame time cauſing ſuch a friction, that the hoop digs into the ground, the leather bag receiving whatever paſſes through the hoop: both men now aſſiſt in getting a bag into the barge, and delivering its contents.

When the bag is large, ſeveral men are employed; and, to increaſe the effect, a windlaſs, with wheel-work, is uſed to draw the hoop along the ground. It is in this manner the convicts at Woolwich upon the Thames perform the ballaſt heaving, or dredging, which they are condemned to labour at as a puniſhment.

In large rivers, which require much dredging to keep the channel at the proper depth, the above method of manual labour becomes ſo expenſive, that a large machine, worked by horſes or a ſteam engine, is uſually employed; two ſuch machines worked by a ſteam engine have been ſome time in uſe in the river Thames, one of them is repreſented in *Plate* III. *Hydraulics*, which contains an elevation and plan of the engine.

It is erected in the hulk of a diſmaſted ſhip. A A, *fig.* 1, is a frame of timber bolted to the ſtarboard gunwale, to ſupport a large horizontal beam, B B, *fig.* 2; another ſimilar frame is fixed up in the middle of the ſhip at D, *fig.* 2, and the end of the beam is ſuſtained by an upright poſt bolted to the oppoſite gunwale; the ſtarboard end of the beam projects over the veſſel's ſide, and has an iron bracket S faſtened to it, to ſupport one of the bearings for the long frame E E, compoſed of four timbers bolted together: the other end of the frame is ſuſpended by pulleys *a*, *a*; from a beam F fixed acroſs the ſtern, the upper ends of the outſide beams of the frame E E have each a ſtout iron bolted to them, which are perforated with two large holes to receive two ſhort caſt iron tubes, one faſtened to the iron bracket S at the end of the beam B, and the other to a croſs beam of the frame A; theſe tubes act as the pivots of the frame E, upon which it can be raiſed or lowered by the pulleys *a*, *a*: they alſo contain bearings for an iron axis, on which a wheel or trundle O is fixed, containing four rounds. Another ſimilar trundle P is placed at the bottom of the frame E E, and two endleſs chains *k*, *k*, paſs round both, as is ſeen in the plan. Between every

every other link of the two chains, a bucket of plate iron *b b b* is fastened, and as the chain runs round, the buckets bring up the soil; a number of cast iron rollers *d, d,* are placed between the beams of the frame to support the chain and buckets as they roll up. Four rollers *e, e,* are also placed on each of the outside beams, to keep the chains in their places on the frame, that they may not get off to one side. The motion is conveyed to the chains by means of a cast iron wheel at G in the plan, wedged on the end of the axis of the upper trundle O. The wheel is cast hollow, like a very short cylinder, and has several screws tapped through its rim, pointing to the centre, and pressing upon the circumference of another wheel inclosed within the hollow of the first, that it may slip round in the other where any power greater than the friction of the screw is applied; the internal wheel is wedged on the same shaft with a large cog-wheel *f* turned by the small cog-wheel *g* on the axis of the steam-engine. The steam-engine is one of that kind called high pressure, working by the expansive force of the steam only, without condensation; *h* is the boiler containing the fire place and cylinder within it; *i* is one of the connecting rods, and *l* the fly wheel on the other end of the same shaft as the wheel *g*. For a more particular description of the engine, see STEAM ENGINE.

The pulleys *a*, which suspend the chain frame, are reeved with an iron chain, the tackle fall of which passes down through the ship's deck, and is coiled on a roller *m* in the plan, and represented by a circle in the elevation: on the end of the roller is a cog-wheel *p*, turned by the engine wheel *g*: the bearing of this wheel is fixed upon a lever, one end of which comes near that part of the steam-engine, where the cock which regulates the velocity of the engine, is placed; so that one man can command both lever and cock, and by depressing that end of the lever, cause the wheel *p* to geer with *g*, and consequently be turned thereby, and wind up the chain of the pulleys; *g* is a strong curved iron bar bolted to the vessel's side and gunwale, passing through an eye bolted to the frame E, to keep the frame to the vessel's side, that the tide or other accident may not carry it away.

A large hopper or trough is suspended beneath the wheel *o*, by ropes from the beam B, into which the buckets *b, b, b,* empty the ballast they bring from the bottom; the hopper conveys it into a barge brought beneath it: this hopper is not shewn in the plate, as it would tend to confuse parts already not very distinct. The motion of the whole machine is regulated by one man. The vessel being moored fast, the engine is started, and turns the chain of buckets, the engine tender now puts his foot upon a lever, disengages the wheel *p* from *g*, and by another takes off a gripe which embraced the roller *m*. This allows the end E of the frame to descend, until the buckets on the lower half of the chain drag on the ground, as shewn in *fig.* 1, when he stops the further descent by the gripe, the buckets are filled in succession at the lower end of the frame, and brought up to the top, where they deliver their contents into the hopper before-mentioned: as they take away the ballast from the bottom, the engine tender lets the frame E down lower by means of the gripe lever, and keeps it at such a height that the buckets come up nearly full; if at any time the buckets get such deep hold as to endanger the breaking of the chain or stopping the engine, the coupling-box at G before-described, suffers the steam-engine to turn without moving the chain of buckets, and the engine tender pressing his foot upon the lever which brings the wheel *p* to geer with *g*, cautes the roller *n* to be turned by the engine, and raise up the frame E, until the buckets take into the ground the proper depth, that the friction of the coupling-box at G will turn the chain without slipping in any considerable degree.

The steam engine is of six horses power, and is so expeditious, that it loads a small barge with ballast in an hour and a half.

DREGAL, in *Geography*, a town and castle of Hungary; 12 miles N. E. of Gran.

DREGS *of Oil*, a name given by the people who trade in oil, to that coarse and thick part of it, which subsides to the bottom of the vessels in which great quantities of it are kept. This is not fit for the common uses of the clear oil at the top, but there are several purposes to which it serves very well. Great quantities of these lees or dregs of common oil are used by the soap-boilers, principally in making the common soft soap. The leather dressers also use it in considerable quantities to soften the hides they are employed to prepare for the several artificers who use them. Some of these dregs are also used in the making of flambeaux, which, instead of being made of yellow wax, as pretended, are usually composed of pitch, rosin, and this oil, mixed in such a proportion as to make a mass of a proper hardness and consistence. People who use presses, and other works in which there are many screws, sometimes buy this to grease their screws, instead of soap or suet. These are the uses mentioned by Savary; but besides these we have in England another manufacture which consumes a greater quantity than all these put together. This is the making of spermaceti; some persons among us have found the art of making this out of the fæces of oil, and will give an oilman at any time as much clear oil in exchange of these dregs, as they are in quantity. All the other uses of these dregs leave the trader at a great loss; and as Savary observes, the more fæces the oil contains, the greater is the loss to the buyer; but with us, this is rendered equal, and there is no loss in it.

All sorts of oil produce more or less fæces and dregs, but of all others, the whale-oil is observed to produce the largest quantity, and the nut oil the least.

DREHBACH, in *Geography*, a small town of the kingdom of Saxony, in the circle of the Erzgebirge, four miles from Ehrenfriederfdorf. It is divided into Upper and Lower Drehbach, and has several bleaching grounds where most of the thread is bleached, which is used in the manufacture of the common and middling sort of Saxon thread lace.

DREHEMI, a town of Arabia, in the country of Yemen; 20 miles S. E. of Hodeida.

DREHHALS, in *Ornithology*, the name given by Frisch to the YUNX *torquilla*, which see.

DREIT-DREIT, or DROIT-DROIT, in our *Old Writers*, signifies a double right, that is, *jus possessionis & jus dominii*. Bracton, lib. iv. cap. 27. and lib. iv. tract. 4. cap. 4. and lib. v. tract. 3. cap. 5. Coke on Litt. fol. 266.

DREITSCH, in *Geography*, a town of Germany, in the circle of Upper Saxony, and circle of Neustadt; two miles N. E. of Neustadt.

DRELINCOURT, CHARLES, in *Biography*, an eminent protestant divine, was born, and received the elementary parts of his education at Sedan, whence he was sent to study philosophy, at Saumur, under the celebrated professor Duncan. He was admitted to the ministry in the year 1618, being then twenty-three years of age, but meeting with some disappointments at Langres, the place in which he first settled, he removed to Paris, and, in 1620, became pastor of the church at Charenton. In 1625, he married the daughter of a rich merchant at Paris, by whom he had sixteen children. He greatly excelled as a preacher, and was

was regarded by the people among whom he ministered, in the relation of a kind and benevolent friend and affectionate parent. The interests of religion were not only served by his discourses as a preacher, and by the advice and consolation which he afforded as a pastor, but his various writings shew how distinguished he was as a pious author, and zealous advocate of the protestant faith. By his contemporaries the controversial pieces of Drelincourt were regarded as of the utmost importance in fortifying the young and unwary against the arts and delusions of Romish priests and emissaries: his moderation and prudence were as conspicuous as his zeal was active and energetic. He never provoked the resentment of his adversaries by injurious aspersions, unfair arguments, or illiberal language. He died in the year 1669, highly beloved by those who enjoyed his friendship, and respected even by those who differed from him most widely in religious opinions. Bayle.

DRELINCOURT, CHARLES, son of a minister of that name, of Charenton, acquired great fame for his learning, and for his skill in every branch of medical science. He was born at Paris in the year 1633, and after studying some years at Saumur, he went to Montpellier, where he completed his medical course, by being honoured with the degree of doctor in that faculty. We find him soon after attending the marshal Turenne, in his campaigns, and by him appointed physician to the army. The skill and ability he had shewn in this situation, occasioned his being nominated to succeed Vander Linden as professor of medicine at Leyden, whither he obtained permission to go, though he had been made, several years before, one of the physicians to Lewis the XIVth. This was in 1688. Two years after he was advanced to the chair of anatomy in the same university. He was also made physician to William, prince of Orange, and to his princess Mary. As rector of the university of Leyden, he spoke the congratulatory oration to the prince and princess, on their accession to the throne of England. He continued to hold his professorships, the offices of which he filled so as to give universal satisfaction, to the time of his death, which happened on the last day of May 1697. He was a voluminous and learned writer, but there is little original in his works, which were nevertheless much read in his time, and passed through several editions. They were collected, and published together in 1671, and again in 1680, in four vols. 12mo. But the most complete edition of them is that published at the Hague, in 1727, in 4to. In one of his orations, he has been careful to exculpate professors of medicine from the charge of impiety, so frequently thrown upon them. "Oratio Doctoralis Monspessulana, quâ Medicus Dei operum consideratione atque contemplatione permotos, cæteris hominibus Religioni astrictiores esse demonstratur: atque adeo impietatis crimen in ipsos jactatum diluitur." He also, in his "Apologia Medica," refutes the idea of physicians having been banished from, and not allowed to settle in, Rome for the space of six hundred years. He was a lover of Greek literature, and like his countryman, Guy Patin, an enemy to the introduction of chemical preparations into medicine, which were much used in his time. He was also a strong opponent to his colleague Sylvius. His son Charles succeeded him in his practice, but has left no publication, except his inaugural dissertation, "De Lienosis." Haller Bib. Med. et Ch. Gen. Biog.

DRENA, in *Geography*, a town of Germany, in the county of Tyrol; 7 miles N. E. of Riva.

DRENCH, among *Farriers*, a physical draught, or potion, given to a horse, by way of purge.

DRENCHES, or DRENGES, *Drengi*, or *Threngi*, in our *Old Customs*, a term, about which the lawyers and antiquaries are a little divided. See THRENGUS.

Drenges, says an ancient manuscript, were "e tenentes in capite:" according to Spelman, they were "e genere vasallorum non ignobilium, cum singuli qui in domes-day nominantur singula possiderent maneria:" such as, at the coming in of the conqueror, being put out of their estates, were afterward upon complaint, restored thereto; because, they being before owners thereof, were neither in auxilio, nor consilio, against him.

DRENGAGE, DRENGAGIUM, vel *servitium drengagii*, in our *Old Writers*, the tenure by which the drenches held their lands; concerning which, see Term Trin. 21 Ed. III. Ebor. and Northum Rot. 191. "Notandum est, eos omnes eorumve antecessores, qui e drengorum classe erant, vel per drengagium tenuere, sua incolumisse patrimonia ante adventum Normanorum." Spelm. Gloss. Du-Cange, Gloss. Lat. in voc. Drenches.

DRENGFURT, in *Geography*, a small town of Prussia, in that part of Eastern Prussia which is called Samland It was built in the year 1403.

DRENTE, a quarter or district of Overyssel.

DRENTELBURG, or TRENTELBURG, a town of Germany, in the circle of the Upper Rhine, and principality of Hesse; 18 miles N. N.W. of Cassel, and 32 E. S. E. of Paderborn. N. lat. 51° 23′ E. long. 8° 59′.

DREPANA, in *Ancient Geography*, a town of Asia Minor, in Lycia —Also, a town in Sicily —Also, a town of Africa, in Libya.—Also, two islands in the Ægean sea, placed by Steph. Byz. in the vicinity of the island of *Lebinthus*. The Drepana of the Phæacians, so called by this geographer, is Corcyra or Corfu.—Also, a mountain of Ethiopia. Steph. Byz.

DREPANIA, in *Botany*, from Δρέπανον, a *sickle*, Juss. Gen. 169 is a genus made by Jussieu of the *Crepis barbata* of Linnæus, *Tolpis* of Gærtner, t. 160, who adopts the name from Adanson, and who is followed by Willdenow, Sp. Pl. v. 3. 1608. See TOLPIS.

DREPANON, Δρέπανον, among the Greeks, an engine of iron crooked like a sickle, and fixed to the top of a long pole. It was used in cutting asunder the cords of the sail-yards, in order to disable the ship by letting fall the sails, and was otherwise called *dorydrepranon*. Potter's Archæol. tom. ii. 141.

DREPANIS, in *Ornithology*, the sand-martin or shore-bird, the HIRUNDO *Riparia*, which see.

DREPANUM, in *Ancient Geography*, a town of Asia Minor, in Bithynia; situated on the gulf of Nicomedia, and called by Constantine the Great *Hellenopolis*.—Also, a promontory of the Peloponnesus, in Achaia Propria; placed by Pausanias in the gulf of Corinth. It was also called *Rhium*, according to Ptolemy —Also, a promontory of Cyrenaica, a country of Africa, mentioned by Ptolemy.—Also, a promontory of Egypt in the Arabic gulf, distinguished by Ptolemy from *Lepte*, though Pliny says, that they were the same.—Also, a promontory in the south east part of the isle of Cyprus, to the south of the ancient town of Paphos. M. d'Anville places it N.W. of Paphos.—Also, a town of Sicily *(Trapani)* towards the west. Here, Æneas, according to Virgil, lost his father Anchyses; and near it was the temple of Venus on mount Eryx. The Carthaginians had possession of Drepanum, and made many vigorous efforts to preserve it. This place was famous for a naval battle, in which Adherbal defeated Claudius, the consul, A. U. C. 505.

505. B. C. 249.—Alſo, a promontory of the iſle of Crete, now *La Punta di Drapono* in the iſle of Candia.—Alſo, a promontory of the iſle of Icaria, ſo called by Strabo.—Alſo, a promontory in the weſtern part of Sicily oppoſite to the Ægades, under mount Eryx, of which it formed a part, according to Ptolemy; now called *Trapani*.—Alſo, another promontory of Sicily, on the eaſtern ſide of the iſland, and almoſt oppoſite to the town of Rhegium, according to Pliny. Ptolemy calls it Argennon, and it is now *Capo di S. Aleſſo*.—Alſo, a ſmall branch of Achaia, ſituated E. of Panormus, which, according to Strabo, had a temple of Neptune.

DRESBACH, in *Geography*. See Drehbach.

DRESDEN, Dresen, *Dreſdin*, *Dreſnem*, *Drazdzu*, *Drazdonech*, in Latin *Dreſdena* and *Dreſda*, in French *Dreſde*, one of the handſomeſt towns of Europe, is the capital of the kingdom of Saxony in Germany. It is ſituated on the Elbe, where the Weiſſeritz falls into that river, which divides it into the old and new town, 18 miles S. E. of Meiſſen, and 58 miles S. E. of Leipzick.

Dreſden conſiſts of three parts, *viz.* Dreſden, or Old Dreſden, with its three ſuburbs; the new town (Neuſtadt) which is, properly ſpeaking, the old town, ſince it obtained its town privileges in 1216, two hundred years ſooner than Old Dreſden, but which was called the new town by order of Auguſtus II., king of Poland, and elector of Saxony; and the Frederickſtadt or Oltra, which communicates with the ſuburbs of Old Dreſden by means of a ſtone bridge over the Weiſſeritz.

In 1429, 1491, and 1614, Dreſden ſuffered greatly by fire; it alſo endured many hardſhips in the thirty years' war. From 1631 to 1635, the plague raged with the greateſt fury at Dreſden, deſtroying 14 out of 15 perſons, and cauſing, in the year 1632, the death of 6892 individuals. In 1697, Dreſden had 1916 inhabited, and 219 uninhabited houſes, with 40,000 inhabitants. In 1755, one year before the ſeven years' war, during which Dreſden ſuffered ſeverely; its population amounted to 63,209 individuals. In 1760, Dreſden was bombarded by the Pruſſians, when the old town had 226 houſes deſtroyed, and 37 damaged, the new town 25 damaged, and the ſuburbs 190 deſtroyed. The Auſtrians, who were ſhut up in the town, which was but badly fortified, had added ſome intrenchments before the ſuburb of the Frederickſtadt from the river Weiſſeritz to the Elbe. In the year 1788, Dreſden counted 2450 dwelling houſes, and 53,000 inhabitants, without the garriſon. There were 349 couple married, 1516 born, of whom 240 were illegitimate children, and 2009 dead. The number of the poor relieved by public charities in hoſpitals, orphan-houſes, infirmaries, poor-houſes, &c. exceeded 3000. There were 5000 Roman catholics, and about 900 Jews.

The ſtreets of Dreſden, which are 61 in number, are ſpacious, ſtraight, well paved, and well lighted. There are ſeveral handſome ſquares and ſome beautiful walks. Dreſden has 40 public ſchools and 18 churches, the moſt remarkable of which are the church of St. Sophia, in which the firſt Lutheran ſermon was preached at Dreſden, on the 23d of April, 1539; the church of St. Ann; that of St. Mary's, or our Lady (Fraüenkirche) built in 1734, by Auguſtus II. upon the plan of St. Peter's at Rome: and the new Catholic church, built by Auguſtus III., from the year 1737 to 1756.

The royal palace at Dreſden is a very fine building, which owes moſt of its grandeur to Auguſtus II. The green vault, (das grüne Gewölbe) which contains eight rooms, is particularly ſplendid. The floors are moſtly of exquiſite marble, and the walls covered with large mirrors. In theſe rooms is one of the richeſt cabinets of curioſities.

In the ſecond floor of the Dreſden palace, is the celebrated picture gallery, which has ſeven pictures of Correggio, among others his "Night" and his "Magdalen;" ſeveral of Vanderveld and Mengs; many paſtels, chiefly of the celebrated Roſa Alba; and, in 1806, it was enriched by a large hiſtorical painting of Fr. Mathæi, with 12 figures, repreſenting Ægiſthus puniſhed by Oreſtes and Pilades in the palace of Agamemnon. The royal armoury occupies 36 rooms. The gardens, called der Zwinger, contain a magnificent building, in which there is a cabinet of natural curioſities; a gallery of prints, which ſhews the progreſs of engraving from the infancy of the art; a collection of anatomical preparations, and a ſhow room of mathematical inſtruments.

Of the public buildings, the moſt remarkable are the large and the ſmall opera-houſe, the aſſembly rooms; the arſenal; the military academy; the barracks; the mint; the ſtate-houſe (landhaüs); the royal china warehouſe; the beautiful ſtone bridge over the Elbe, with ſixteen arches; the Dutch palace, which contains a muſeum of curious articles made of china of different manufactures, a cabinet of medals, and the royal library. The latter has above 150,000 volumes and 2000 manuſcripts.

The principal manufactures of Dreſden are thoſe of woollen cloth, ſaddles, ſaddle-clothes, ſilks, ſilk ſtockings, gauze, ribbands, lace, leather gloves, play-cards, muſical inſtruments, and large mirrors, which are poliſhed at Dreſden, but caſt at Frederickſthal near Senftenberg.

The diſtrict of Dreſden contains three towns and 167 villages; 31 of which belong to the town of Dreſden, the whole population of which amounts to about 90,000 individuals.

The beſt account of Dreſden is to be found in the hiſtories of Anthony Week, Daſdorf, and Haſche. The deſcription (umſtändliche Beſchreibüng von Dreſden) of Dreſden by the latter has had a new improved edition ſince the year 1788. (Guibert's Journal d'un voyage en Allemagne. F. G. Leonhardi's Erdbeſchreibüng der Sächſiſchen Lande 1790.)

Dresden, a poſt town of America, in the ſtate of Maine, and county of Lincoln, ſeated on the eaſt bank of Kennebeck river, nine miles from Wiſcaſſet point, 12 S. by E. of Hallowell, and 180 N. by E. of Boſton. Swan iſland lies in this townſhip.

DRESIA, in *Ancient Geography*, a town of Aſia, in Phrygia. Steph. Byz.

DRESNICK, in *Geography*, a town of Croatia; 18 miles N. W. of Bihacs.

DRESS, as it relates to *military* affairs, means a word of command given when the ſoldiers are not exactly in line, to bring them into their proper places, ſo that the whole front may appear exactly even. Perſons habituated to "dreſſing in line," however irregularly they may "fall in," or move to a new poſition, will, on the word "dreſs" being given, inſtantly conform to its intention, and aſſume the moſt regular front. This, however, can only relate to ſmall bodies, ſuch as a company, drawn up in two or three ranks; all perfectly even, and parallel. When large bodies are to aſſume a new front, it is uſual to ſend from each company a ſoldier, who, from his being poſted on the flank, is called a "pivot-man." Theſe, being acquainted with the number of paces their reſpective companies meaſure in front, habitually place themſelves at the proper diſtances from each other along the new front, and taking care to "cover," that is, to dreſs, exactly in a correct line, remain motionleſs until their

their respective companies arrive at their new stations; and thus, not only determine the precise localities of the flanks, or pivots, of the several companies, but make certain, that, when the whole wheel up into line, there shall be no irregularity, break, or undulation in its front. When the several companies have wheeled up, their commanders being guided by the point, either on the right or on the left, flank, which gave the direction to the new front, order their several divisions to dress by the right, or by the left accordingly. In order to "dress" correctly, either the chin, or the breast-plate, of the second man, on the right, or left, as may be ordered, is to be seen; and no more: when a soldier cannot see either of these objects, he is not up to the line; and when he can see more, he is beyond the line.

Dress also appertains to the regimentals of a corps; and, in many instances, is classed, as "full dress," "half dress," and "undress." The former relates to the complete uniform, such as is worn at reviews; the second to that which is in ordinary use for common duties; and the last to that which is appropriated to labour; such as working parties, watering horses, cleaning out stables, and for wear on board ship. The three classes are most in use among the cavalry and artillery corps; battalions of the line rarely have more than an ordinary and a full dress; some, indeed, have little or no distinction, beyond trowsers, feather-cases, and belt, or old, cloathing.

We are free to confess, that the great increase of articles in requisition, merely to ornament the soldier's person, by no means appears judicious. We have heard it said, that soldiers cannot be kept too poor; but, we believe, that when all fair expences are discharged, there will be found a very small balance for the soldier's comfort: much less to enable his following corporal Trim's inimitable interpretation of the fifth commandment; or towards the support of his wife and family. The opinions of many veteran officers, high in rank and repute, warrant us in the expression of our wish, that every soldier in the British service were provided by government with all necessary articles of the first quality; but, that no trappings, or gew-gaws, should be exacted from his purse. He should have no petty accounts to settle with his superiors: they loosen the ties of respect, and of subordination; and give birth to much discontent. It would, perhaps, not be unreasonable, that such commanders as may wish to see their regiments highly dressed, should defray all the extra expences.

DRESSERUS, Matthew, in *Biography*, was born at Erfurt, the capital of Thuringia, in August 1536, and obtained a considerable reputation among the learned. He studied for a short time under Luther and Melancthon, at Wittemberg, but the air of that city not being congenial to his health, he returned to Erfurt, where he completed his studies. In 1559, he took his degree of master of arts, and immediately assumed the office of lecturer in belles lettres and rhetoric at his own house, after this he was chosen professor in the college of Erfurt, and besides philosophy, he undertook to instruct the young men in classical literature. In the duties of this office he continued to labour sixteen years, during which he obtained a high reputation. In 1574, he removed to Jena, as the successor of Lipsius, who had been the professor of history and eloquence in that university. Here Dresserus remained but a short time, when he became head of the college of Meissen, and afterwards, *viz.* in 1581, he was appointed to the professorship of polite learning in the university of Leipsick, and a particular pension was allowed him to continue the history of Saxony. Here he spent the remainder of his life, a useful member of the body to which he belonged: he died in the year 1607. He was a man of deep learning and great industry, and contributed to the extension of learning in Germany, not only by his own exertions as a teacher of the Greek language, but by obtaining the consent of his colleagues, while he was one of the professors at Erfurt, that the Hebrew language should be taught in that university. He was author of various works in polite literature, moral philosophy, &c. Bayle. Moreri.

DRESSING *of hemp and flax*. See Hemp and Flax.

Dressing *of hops*. See Hops.

Dressing *of meats*, the preparing of them for food by means of culinary fire.

The design of dressing is to loosen the texture of the flesh, and dispose it for dissolution and digestion in the stomach. Flesh not being a proper food without dressing, is alleged as an argument, that man was not intended by nature for a carnivorous or flesh eating animal.

The usual operations are, roasting, boiling, and stewing. In roasting, it is observed, meat will bear a much greater and longer heat than either in boiling or stewing, and in boiling greater and longer than in stewing. The reason is, that roasting being performed in the open air, as the parts begin externally to warm, they extend and dilate, and so gradually let out part of the rarefied included air, by which means the internal succussions, on which the dissolution depends, are much weakened and abated; boiling being performed in water, the pressure is greater, and, consequently, the succussions to lift up the weight are proportionably strong; by which means the coction is hastened, and even in this way there are great differences; for the greater the weight of water, the sooner is the business done.

In stewing, though the heat be much less than what is employed in the other ways, the operation is much more quick, because performed in a close vessel, and full; by which means the succussions are more often repeated, and more strongly reverberated. Hence the force of Papin's digestor; and hence an illustration of the operation of digestion.

Boiling, Dr. Cheyne observes, draws more of the rank, strong juices from meat, and leaves it less nutritive, more diluted, lighter, and easier of digestion: roasting, on the other hand, leaves it fuller of the strong, nutritive juices, hard to digest, and needing more dilution. Strong, grown, and adult animal food, therefore, should be boiled, and the younger and tenderer roasted. See the several articles.

Dressing *of Ore*. The methods of preparing each species of metallic ore for fusion may be found under the heads of the various metals; and for the general principles of this important manipulation, see Ores, *dressing of*.

Dressing, in *Surgery*, is a term which includes every species of application employed for the cure of external diseases. A surgeon, therefore, is said to *dress* a wound, &c. when he applies remedies to it; such as fomentations, ointments, lint, bandages, or any other kind of curative means. Dressings must vary according to the nature of the case; and the same case may require different dressings in its successive stages. The skill of a surgeon will be easily distinguished from the routine of an ignorant pretender by the judicious selection he makes of peculiar dressings in various circumstances of disease, climate, or constitution. The modern practice of surgeons has greatly simplified the art of dressing, since it has been found that nature does much more towards a cure than our ancestors imagined. Very little is requisite by way of dressing to fresh incised wounds in muscular parts, except bringing the lips of the wound into contact, and preserving them in that situation by ligature or adhesive plasters, aided occasionally with a bandage. Complicated wounds must, however, be supposed to require additional

tional means. See WOUNDS, FRACTURES, LUXATIONS, ABSCESSES, CICATRIX, CONTUSIONS, ULCERS, &c.

It is a very general error among unprofessional persons to pour balsams, oils, or spirits into a fresh wound, and then to fill it up with lint or some other extraneous substance. This officious fuss is commonly hurtful, and causes the patient to be three or four times as long in recovering as he would if left entirely to nature. Those irritating applications to recent wounds always produce more or less pain and inflammation, with subsequent inconveniences, if not long continued suppuration and swelling of the part, &c. &c. A little blood flowing from a wound will be useful in preventing the pain, inflammation, and tumefaction which might otherwise have ensued; and therefore none of the above artificial means of arresting the hemorrhage (if it be but slight) should be had recourse to in trivial accidents of this kind. See LINT, BANDAGES, PLASTERS, LIGATURES, and the other articles connected with this subject.

DRESSING *a ship*, is the act of ornamenting a ship with a variety of colours, as ensigns, flags, pendants, &c. displayed from different parts of her masts and rigging on a day of festivity.

DRESSING *Machine*. See *Flour*-MILL.

DRESVIANIA, in *Geography*, a town of Russian Siberia, in the government of Tobolsk, on the Vagai; 60 miles S. of Tobolsk.

DREVET, PIERRE, in *Biography*, a French engraver, died at Paris in 1739, aged 42.

DREUX, in Latin *Durocasses*, or *Durcasses*, in *Geography*, a small but ancient town of France, chief place of a district of the same name, in the department of Eure and Loire, situated at the foot of a mountain on the river Blaise, 18 miles N. W. of Chartres, 51 miles W. of Paris, and 66 S. E. of Rouen. It was in the neighbourhood of Dreux that was fought, in 1562, under Charles IX., the memorable battle, in which the Protestants were defeated and the prince of Condé taken prisoner.

Dreux has 5437 inhabitants. Its canton contains 23 communes and a population of 14,802 individuals, upon a territorial extent of 330 kiliometres. It has a considerable manufacture of cloth for the clothing of the troops. As chief place of a district, Dreux has a sub-prefect, a ranger, a court of justice, and a register office.

The district comprizes an extent of 1572½ kiliometres, 138 communes, and 68,824 inhabitants. It abounds in corn and cattle, makes some bad wine and cyder, and has a few tanneries and manufactures of linen and woollen cloth.

DREYE, or DREIHE, a town of Germany, in the circle of Westphalia, and county of Hoya; five miles S.S.E. of Bremen.

DREYEN, a small island of Denmark, in the Little Belt; three miles S.W. of Middlefahrt.

DREYGELHAUSEN, a town of Germany, in the circle of Lower Rhine, and electorate of Mentz; five miles N.W. of Bingen.

DREYS, or DREYSZ, a town of Germany, in the circle of Westphalia; four miles W. S. W. of Willich.

DREYSALLIGKEIT, a town of Germany, in the duchy of Stiria; five miles N. of Pettau.

DREYSSIGACKER, a small town of Germany, in the duchy of Saxe Cobourg, situated on a hill two miles off Meinungen. It has a summer-palace and a park. One-third of its inhabitants are Jews. The whole population is not much above 300.

DRIBENTZ, a river of Prussia, which runs into the Vistula; six miles S. E. of Thorn.

DRIESEN, anciently DRESN and *Dresno*, a small town of Prussia, in the New Mark of Brandenburg, pleasantly situated on the river Netze, which at this place divides itself into two branches, one called the Lesser, or Old Netze, the other the Larger Netze, 36 miles E. of Landiberg. It is said to have been built in 1270, by Boleslaus, king of Poland. In 1317, margrave Woldemar, of Brandenburg, conferred it as a fief on Henry and Burchard von der-Osten. In 1603 a strong fort was erected against the incursions of the Poles. It is surrounded by a moat and a branch of the river. In 1636, the Swedes made an unsuccessful attempt upon it, but took it in 1639 and restored it to Prussia in 1650. In 1662 the town of Driesen was completely destroyed by fire; it has since been rebuilt. The Russians occupied the fort in 1758, and improved its fortifications.

The district of Driesen comprizes 14 small towns. The principal industry of the inhabitants is tillage and grazing; they also share in the woollen cloth manufacture, which flourishes in the New Mark.

DRIFFBOR, a town of Norway; 46 miles E. of Romsdal.

DRIFFIELD, GREAT, a market town and parish, in the division of Beacon-Bainton, and wapentake of Harthill, in the East Riding of the county of York, England, contains 320 houses and 1411 inhabitants. Several woollen and cotton manufactories have recently been established here; and a considerable trade is carried on in corn. Driffield has a market on Thursdays, and four annual fairs. The parish is consolidated with Little Driffield, which is about one mile and a half distant.

DRIFFIELD *Canal*, is the parliamentary name of a navigable canal, of about 11 miles in length, in the East Riding of Yorkshire; it commences in the river Hull, at Aikbeck Mouth, and extends to the town of Driffield. See CANAL.

DRIFT, in *Mining*. See MINING.

DRIFT *of the Forest*, an exact view or examination of what cattle are in the forest; that it may be known whether it be surcharged or not, and whose the beasts are; and whether they are commonable beasts or not. These drifts are made at certain times in the year by the officers of the forest; when all the cattle of the forest are *driven* into some inclosed place, for the purposes above-mentioned. See FOREST, and COMMON.

DRIFT, in *Mast-making*, denotes the difference between the size of a bolt and the hole into which it is to be driven; and the same term is applied to a hoop, which is to be driven on a mast.

DRIFT, in *Navigation*, denotes the angle which the line of a ship's motion makes with the nearest meridian, when she drives with her side to the wind and waves, and is not governed by the power of the helm; and also the distance which the ships drive on that line, so called only in a storm.

DRIFT-*sail*, in a *Ship*, a sail used under water; veered out right a-head, by sheets, as other sails are: its use being to keep the ship's head right upon the sea in a storm, and to hinder a ship's driving too fast in a current; with which view it is generally used by fishermen, especially in the North sea.

DRILL, or DRILL *box*, a name given to an instrument used in the new method of horse-hoeing husbandry for sowing the land. See BROAD-CAST and HUSBANDRY.

The drill is the engine that plants the corn and other seeds in rows; it makes the channels, and sows the seeds in them, and covers them with earth when sown, and all this at the same time, and with great expedition. The principal parts of the drill are the seed-box, the hopper, the plough, and its harrow. The seed-box is the chief of these, it measures, or rather numbers out, the seeds which it receives

ceives from the hopper, and is for this purpose as an artificial hand, but it delivers out the seed much more equally than can be done by a natural hand. The plough and hopper are drawn by a horse, and by these the ground is opened, and the seed is deposited in it; the harrow follows, and lightly rakes in the earth over them. When the ground is fine, and the seeds small, a hurdle, with some prickly bushes fastened to its under part, will serve better than the harrow. The whole apparatus for this method of sowing is described, and illustrated with figures, by Tull, in his Horse-hoeing Husbandry. See *Drill* PLOUGH.

DRILL *rake*, in *Husbandry*. See *Drill* RAKE.

DRILL, in *Mechanics*, a tool made of hardened steel, used to bore holes in metal; they are of various forms, the most useful of which are shewn in *Plate* XXIV. *Mechanics*.

Fig. 1. is the common lathe or crank-drill, having an angular point, and two cutting edges, *a a*, which are only adapted to be turned one way; it is therefore adapted for drilling any work in the lathe, or by the crank, which is formed of iron, having a socket at the lower end to receive the drill; the upper end is pointed, and is pressed upon by a lever loaded with a weight. The workman turns the drill round by means of the elbow of the crank, and the weight and lever keep it to its work.

Fig. 2. is the ordinary drill, having the cutting edge, as shewn in the side view B. made so as to cut either way; it is used with the crank, but chiefly with the bow.

Fig. 3. is like the former, except that it has a round edge; it is used for drilling steel and hardened iron, where, from the hardness of the work, a point might fail.

Fig. 4. is a drill, where the cutting edge (*a b* in *fig.* D.) crosses the point. The cutting side of the edge at *a* is toward *fig.* A; and at the other side of the centre; *viz.* at *b*, it is toward D; the edge is therefore somewhat like a screw, and leads itself into the work; for which reason it is good for drilling lead, copper, and other metals, which are tough without being very hard.

Fig 5. is called a pin drill, and is used for drilling very large holes. A small drill, like *figs* 1 or 2, is first used, and the hole, thus made, just fits the pin *a a*. and keeps the drill steady while it is turned round. It has two cutting edges, *b* and *d*; in *b* the face is towards the eye of the spectator, and *d* represents the back of the edge; the edge is a little hollowed out above at *b* in the edge view, to make a thinner and sharper edge.

Fig. 6. is a countersunk drill, which is used to make holes to receive the heads of screws; a hole is first drilled by the common drill, which is the size of the body of the screw, and the pin *a a* just fits it, the cutting part *d b* is the size of the head of the screw, *e e* is a shoulder, which prevents the drill cutting any further than intended.

Drills for small work are turned by means of a small pulley fitted on them; the string of an elastic bow is passed round it. The piece of metal to be drilled, is fixed in a vice, and the point of the drill applied to it; the other end is placed in a hole in a piece of metal held against the breast of the operator; by drawing the bow backwards and forwards, a rapid motion is given to the drill, though it is not always in the same direction; therefore, the drill should be shaped like *fig.* 1.

To avoid the trouble of making a great number of pulleys, workmen frequently use drill stocks, which will fit any size drill with the same pulley.

Fig. 7. is one of these where the drill A is formed of a round piece of steel wire, and pushed into a round hole, a little taper in the end of the stock B; *a, a*, are notches to push out the end of the drill in case it breaks in the stock. Sometimes the hole in the stock is square, for unless the work is very light, the round ones are apt to slip.

Fig. 8. is a neat contrivance to obviate this difficulty, communicated to us by Mr. T. Gill. The hole in the end of the stock is cylindrical, and the wire of the drill has one side filed flat, a small pin is put through one side of the hole, as shewn by the small round circle, and the flat side of the wire applies itself to it; by this means, the drill cannot turn round, and always fits tight in its socket.

Fig. 9. is a steel bow for giving motion to a drill as before explained. A is the steel part formed into a hook at the end, to hold the catgut B. At the other end, the steel is enlarged to receive a thumb-nut D, on which the catgut is wound, *d* is a small ratchet wheel fastened to the nut D, and fitted with a click to prevent its turning back. The use of the ratchet is to draw up the catgut, so that it may fit any size pulley on the drill.

In large manufactories where much large drilling is to be performed, it is done by machinery usually turned by a steam engine.

Figs. 10. and 11. are elevations, at right angles to each other, of a machine of this kind. A, *fig.* 10, is a shaft, bringing the power to the machine. B a bevelled wheel fixed thereon, giving a rotative motion to another, D, on a vertical axis, E, turning in bearings *d, d*; this axis is perforated with a square hole throughout to receive a square iron bar *e*, at the lower end whereof the drill *f* is fixed. The work to be drilled is placed on a stool F upon the floor, that it may be readily moved about; in the drawing it is supposed to be a cylinder lid; the drill is pressed down upon the work by a lever G, the fulcrum of which is *g*, at the other end of the lever is jointed an iron rod *h*, having a rack *k* cut in the lower end; this rack is moved by a pinion on the axis of a toothed wheel *l* turned by another pinion, on whose spindle is the winch *m*; the upper end of the iron bar *e* is pointed, and works in a hole in the lever; a collar *n* is put over the lever and keyed upon the bar *e*, so that the lever will lift up the drill as well as force it down upon the work.

The operation of the machine is very simple; the drill being constantly in motion, the workman turns the winch *m*, and raises the drill above the work, he then adjusts the work by moving the stool F and laying the piece upon wedges to the proper place, and by turning the winch *m* back, he brings the drill down upon the work with any degree of force he pleases. The drill must be supplied with cold water, otherwise the friction would heat and soften it. The drill is fitted into its socket by a square, the socket is open above the drill, as shewn in *fig.* 11, that it may be driven out to change it for another.

Drills are hardened by heating them in the fire to a red heat, and plunging them in cold water. They are then rubbed bright in some part by a stone, file, &c. and again heated in the fire, till the bright part assumes a light straw colour, when they are cooled in water. Small drills are heated in the candle by a blow pipe, and cooled in the tallow.

It is a very well known fact, that a drill made of iron has frequently not only a polarity, but so strong an attractive virtue of the magnetic kind, that it will suspend a common needle from its point. It is usually supposed that a drill acquires this polarity by boring iron. But it is not only by boring of iron that this power is obtained, but in the very making. As soon as one of them is finished and hardened, its point becomes a north pole before it has ever been worked either in iron or any other materials, so that of the great numbers of these instruments found in a shop, endowed with this power, it is to be supposed that more of them owe it to their

their original make than to any after-use. All pieces of wrought iron, which in shape resemble drills, that is, which are of a long and slender form, will not only have this polarity, but they will change it on being placed for some time in an inverted posture, and that which was the opposite to the north pole, by standing downwards will be the north pole. This has been an old observation, but on a fair experiment it does not prove to be true in all things without exception, though it be so in most particulars. The larger pieces of iron seem to be most easily influenced in their polarity, by changing their position; but the small ones will sometimes be found to have fixed poles, which no change of posture will alter. Phil. Trans. N° 246. See MAGNET.

DRILL, said to be derived from Fr. *drille*, which signifies a raw soldier, in a *Military Sense*, applies to the tuition of recruits, under the auspices of proper commissioned officers, aided by serjeants, and others, properly qualified to instruct in all the minutiæ of whatever appertains to the management of the firelock; and to the various evolutions performed by the company and by the regiment at large. Some regiments have an extra company, for the purpose of raising, and of instructing new levies; in them that branch of the service is generally much accelerated, on account of their being duly provided with preceptors especially suited to this highly important duty: from these extra companies the recruits are forwarded, in due time, to their regiments. In other corps, the drill is exclusively attended to by the adjutant, and the drill serjeants, and corporals expressly appointed for the purpose: in a few regiments there is no regular drill: the new men being trained by the officers of the companies to which they are, from the first, attached.

From all we have been able to collect on the subject of drills, it appears, that the British service is entitled to greater encomium than any other, for this branch of incipient discipline; though we regret, that it should be held expedient to admit the use of the rattan in any stage of the recruit's progress. We have the authority of many highly respected military characters for our assertion, that it is invariably better to act on the *pride*, than on the *back* of any candidate for an honourable profession. Indeed, it seems rather inconsistent, that a man should be taught to carry himself with dignity, grace, and firmness, by placing a watch over his action, so as to inflict a disgraceful punishment for the most trivial error; or, perhaps, for an accidental deviation from the marked path.

On the other hand, we have heard it urged, that the armies of the great Frederick of Prussia, which, in his days, were considered truly formidable from the great perfection of their discipline, owed their superiority entirely to the severity with which every part of the drill system was conducted. To this we may be allowed to answer, that among a people habituated, and in fact born, to degradation and vassalage, such a method of instruction might be tolerated: the boor might be *warmed* into ardour by the force of stripes; but we cannot conceive that mode to be any wise applicable to the tuition of free men, possessed of some education, or at least to a certain degree enlightened, and in a state of civilization. We must confess it has often occurred to us, when witnessing the rude application of the serjeant's cane, that the object in view was rather retarded, than accelerated: we have seen the types of honest indignation mount upon the juvenile cheek, and glisten in the eye: we have seen offended pride combating with subordination, and oppressing a spirit which, with proper encouragement, and under due guidance, might lead to the most heroic actions.

Further, we have heard it stated, that, in some regiments, where the rattan is exploded; or, at least, its use proscribed, the recruits are more cheerful, more active, more assiduous, and direct their whole attention to an emulous contest for speedy perfection. And this assuredly is natural; the lurking dread of castigation for involuntary lapses, or for venial mistakes, being banished, their minds can freely receive instruction, and there will prevail a certain willingness to please the instructor; which cannot be expected under the system of terror. We sincerely hope, the day is not remote, when kindness, and conciliation, will be made to supersede harshness and severity.

DRILLÆ, in *Ancient Geography*, a people of Asia, in Cappadocia, who inhabited the coast of the Euxine sea, between the territories of Trebisond and Colchis.

DRILLENBURG, WILLIAM VAN, in *Biography*, a painter of landscapes, born at Utrecht in 1620. He was a disciple of Abraham Bloemart, an imitator of John Both, and the master of Houbraken. His pictures resemble those of Both in the choice of subjects and situations; in the trees, skies, and distances; but they have neither the beauty of colouring, the look of nature, nor the freedom, lightness, and delicacy of touch, of that excellent master. He delighted in his art, and was so intent on the practice of it, that he sometimes confined himself to his house for a whole year together, without once going out of doors. Pilkington.

DRILLING and HORSE-HOEING, in *Agriculture*. Drilling is an operation that requires but very little attention. On this subject, we shall only state the depth at which the seed should be sown; the quantity *per* acre, and the width of the intervals. Many crops of wheat have been greatly injured by depositing the seed too deep, especially in wet soils: a little attention to the principles of vegetation will demonstrate this. Nature is uniform in her operations; and whether the seed be put in the earth at four, three, two, or one inch below the surface, the roots which are to carry the corn to perfection will be formed at one precise depth; and, very near the surface, wheat has two sets of roots, which may be termed the seminal and coronal; the first come from the grain, and the others are formed in the spring from the crown of the plant: they are united by a tube of communication, by which the plant is supported, until the coronal roots are formed. By depositing the seeds too deep, it frequently perishes by a superabundance of moisture; and, certainly, from its increased length, this thread-like tube is more liable to be cut asunder by the red, or wire-worm. This theory is confirmed by practical observation; for, in the spring of the year, we have frequently taken up plants of broad-cast wheat, and always found those which appeared most luxuriant had been covered by not more than an inch of mould, and those which had fallen into the furrows, and were three or four inches below the surface, had a very sickly appearance, with a small blade, of a bad colour, and making no efforts for tillering. From this observation, we may conclude, that an inch is the best depth for depositing the seed of wheat. The remark will apply to barley and rye, and all plants which form their coronal roots near the surface. We should recommend wheat, barley, oats, vetches, and rye, on soils not very wet, to be drilled on five, or ten feet ridges, in equal distant rows of one foot: beans, pease, and turnips, on three feet ridges, two rows on a ridge, nine inches from row to row, with intervals of 27 inches; lands in high tilth, and on five feet ridges, will require only three pecks of seed. Wheat and rye, five pecks of oats, barley, or vetches, and one bushel of beans and peale *per* acre, according to the goodness of the seed, and the richness of the soil. For scarifying

ſcarifying and horſe-hoeing, ſome attention and judgment will be requiſite. No corn ſhould be ſcarified until the ſpring: and pulverize the ſurface, by paſſing the fixed harrows acroſs the wheat, previous to ſcarifying, to break the incruſtations on the ſurface, leſt the ſcarifiers ſhould throw large flakes of earth over the rows of corn. After this operation, paſs the ſcarifiers through, about an inch below the ſurface, returning in the ſame track, as deep as the land was ploughed; then roll with a heavy roller, which will give the whole land a concuſſion, and pulverize it ſix inches below the ſurface, allowing the tender roots room to expand, in a fine bed of vegetable food. In ſhort, care muſt be taken not to throw any earth up to the plants in this early ſtage; for, as nature always forms the coronal root at the moſt advantageous depth below the ſurface of the ſoil, by throwing earth to the plants you impede her operations, and ſhe will, by a ſort of vegetable inſtinct, be obliged to form freſh coronal roots, and the progreſs of vegetation will be much retarded, for want of this precaution; and nature has laboured ſo ſteadily to rectify the errors of man, that ſometimes three ſets of coronal roots have been found, thoſe beneath dying away, as the joint at the proper diſtance below the ſurface ſends out new ones. When theſe ſeparations are performed with judgment, the advantages are beyond calculation. The ſcarifiers and rollers moving all the ſoil without earthing up, give the roots room to expand, and aſſiſt the operations of nature: the tillering will be greatly increaſed by it, and all the offſets ripen at the ſame time; and by earthing up the plants, when the ears are riſen ſix or ſeven inches above the ſurface, a plump and fine ſample will be ſecured, and no offſets can be formed. Rolling will be injurious when the ears are riſen above the ſurface. Theſe precautions are only neceſſary with wheat, and the white corn crops; with coronal root, peaſe, beans, vetches, and all tap-rooted plants, no injury can be ſuſtained for want of ſuch attention. Two general obſervations are applicable to all grains and ſoils. Never attempt to perform any of theſe operations until the land is dry; and be ſure to keep a fine tilth on the ſurface of the ground, four or five inches deep in the ſpring, whilſt the plants are in a young and growing ſtate. Were this new mode univerſally adopted, the ſaving of ſeed-corn would be of the utmoſt national conſequence: certainly not leſs than eight million buſhels of wheat, three million buſhels of barley, one of rye, four of oats, and one million of peaſe and beans. This ſtatement does not amount to the full quantity which might be ſaved. This autumn more than a ſixth part of the ſcanty crop of wheat was uſed for ſeed. Such would be the advantage of this improved method, that the farmer might pay his advance rent, and obtain a competency for his labour, without increaſing the neceſſary of life.

DRILLO, in *Geography*, a river of Sicily, in the valley of Noto, which runs into the Mediterranean; 6 miles S.E. from Terra Nuova.

DRILO, in *Ancient Geography*, a river of Illyria, called alſo *Drinus*, which firſt ran from the ſouth-eaſt towards the north-weſt of Epicaria, and then turned its courſe towards the ſouth, and diſcharged itſelf into the ſea, near Liſius. It united with the Mathis.

DRILOPHYLITÆ, a people of India, on this ſide of the Ganges. Ptolemy.

DRIMILLUS, a mountain of Aſia, ſituated in the vicinity of the Euphrates.

DRIMISSA, or Drymusa, an iſland of Aſia Minor, near the town of Clazomæne, according to Thucydides, Livy and Pliny.

DRIMYS, in *Botany*. See Wintera.

DRIN, in *Geography*, a river which riſes in the S.W. part of Servia, and runs into the Save; 32 miles W. of Sabatz.

DRINGENBERG, a town of Germany, in the circle of Weſtphalia, and biſhopric of Paderborn; 6 miles E.S.E. of Paderborn,

DRINK, a part of our ordinary nouriſhment, in a liquid form, ſerving to dilute and moiſten the dry meat. See Diet and Drunkenness.

DRINKING-Glasses. See Glasses.

DRINKLEAN, in our *Old Writers*, a ſcot-ale, or contribution of the tenants towards a potation, *i. e.* ale provided to entertain the lord, or his ſteward. In ſome records it is written *potura drinklean*.

DRINO Blanca, or *White Drino*, in *Geography*, a river of European Turkey, which riſes near Rechia, on the borders of Dalmatia, and joins the Drino Nero; 15 miles N.W. of Ibali, forming with it one ſtream, called *Drino*.

Drino *Nero*, or *Black Drino*, a river of European Turkey, which, ſpringing from a lake near Akrida, and joining the Drino Bianca, takes the name Drino only, and runs into the Adriatic, about 8 miles S.W. of Aleſſio; forming a bay at its mouth, called the *Gulf of Drino*.

DRINOPOLEOS, in *Ancient Geography*, an epiſcopal town of Mœſia.

DRINOVATZ, in *Geography*, a town of European Turkey, in Bulgaria; 28 miles S. of St. Viddim.

DRINUS, in *Ancient Geography*, a river of Europe, which marked the boundaries of Mœſia to the eaſt, and Illyria to the weſt. It ſprung in mount Scardus, took a bent courſe towards the weſt, as far as Sirmium, and then ran towards the eaſt, to diſcharge itſelf in the Danube.

DRIOS, a mountain of the Peloponneſus, in Arcadia.

DRIP, in *Architecture*. See Larmier.

Drips are uſed alſo in building, for a kind of ſteps, on flat roofs, to walk upon.

This way of building is much uſed in Italy; where the roof is not made quite flat, but a little raiſed in the middle; with drips, or ſteps, lying a little inclining to the horizon. See Roof.

DRIPPA, in *Ancient Geography*, a town of Thrace, to the eaſt of the Hebrus, and of Cypſela, and N.E. of Ænos.

DRIPPING-Spring, in *Geography*, a place in which is a poſt-office, in the ſtate of Kentucky, America, and the county of Warren; 855 miles W. by S. from Waſhington.

DRIS, a town of Perſia, in the province of Farſiſtan; 70 miles W.S.W. of Schiras.

DRISON, in *Ancient Geography*, a town of Greece, in Epirus.—Alſo, a town of Thrace. Suidas.

DRISSA, in *Geography*, a town of Ruſſia, and one of the eleven diſtricts of the government of Polotſk, ſeated on the river Driſſa, near its junction with the Duna; 20 miles W.N.W. of Polotſk, and 272 S. of Peterſburg.

DRISTRA, or Silistria, a town of European Turkey, in Bulgaria, near the Danube; 216 miles N. of Conſtantinople, and 160 N. of Adrianople. N. lat. 44° 17′. E. long. 27° 0′.

DRITTEY, a town of Germany, in the duchy of Carniola; 10 miles E.S.E. of Stein.

DRIVASTO, a town of European Turkey, in Albania; 20 miles N.E. of Dulcigno.

DRIVE, in the *Sea Language*. A ſhip is ſaid to drive when ſhe is carried at random, being impelled by a ſtorm, or current; or, when an anchor, being let fall, will not hold her faſt, but ſhe ſails away with the tide and wind.

The beſt way to prevent this, is to veer out more cable;

for the more cable ſhe has, the ſurer and ſafer ſhe rides: or elſe to let fall more anchors.

Alſo, when a ſhip is a-hull, or a-try, they ſay, ſhe drives to leeward, or in with the ſhore, according to the way ſhe makes.

Drive-*bay*, in *Geography*, a bay of the river St. Lawrence, on the ſouth-coaſt of Canada. N. lat. 48° 52′. W. long. 68° 20′.

Drive-*bolt*, in *Ship Building*. See Bolts.

DRIVER, the name given by our ſportſmen to an inſtrument uſed in taking pheaſant-powts, in the method called driving. This inſtrument conſiſts only of a parcel of ozier-wands, ſuch as are uſed by the baſket-makers, which are made up into a bundle, or ſort of great whiſk, and faſtened in a handle; and, to prevent their ſpreading too much at the points, are tied round in one or two places in the length; with this inſtrument the ſportſman, having fixed his nets, drives the young birds into them. See Driving.

Driver, in a *Ship*, is an oblong ſail, occaſionally hoiſted to the mizen-peak, when the wind is very fair. The lower corners of it are extended by a boom, or pole, thruſt out acroſs the ſhip, and projecting over the lee-quarter.

Driver-*boom*. See Boom.

Driver-*yard*. See Yard.

Drivers, *Wool*. See Wool.

DRIVING, amongſt *Sportſmen*, a term applied to the taking of young pheaſants, and ſome other birds, in nets of an open ſtructure. The method of doing this is, when an eye of pheaſants is found, the ground all about is to be ſearched, for finding their principal haunts. The induſtrious ſearcher will ſoon be able to make out ſome one of their paths, which are beaten in the manner of ſheep-tracks, only more ſlightly. When one of theſe is found, the place is to be marked, by ſetting up a ſtick with another tied to its top, like the hand of a road-poſt, marking out the place where the path ſeems to run to. On examining the reſt of the ground thereabouts, having regard to the ſame direction, it is highly probable that ſeveral more of the ſame ſort of tracks will be found all running the ſame way. By one or other of theſe, probably, the ſportſman will be led to their haunt, which he will not miſs knowing, by the nakedneſs and barrenneſs of the ground, and its being covered with the dung and feathers of the young birds. When this is found, the nets are to be placed near this ſpot, looſe and circularly, in ſuch a manner, that the under part being faſtened down to the ground, the upper part may be a hollow, and give a paſſage to the young birds in, and entangle them when there. When the nets are fixed, the perſon muſt go to the haunts, and call them together by the artificial noiſe of the pheaſant-call, which is ſo like the real note of the pheaſant, that the powts, or young ones, will ſeldom fail being deceived by it. When they hear this, and begin to anſwer it with their chucking and piping, the call is to be ſtopped, and a perſon is to get behind them, taking the wind with himſelf, as they always run with the wind. He is to have in his hand the inſtrument called by the ſportſman a driver.

When the perſon who carries this inſtrument perceives that he is come pretty near ſome of the powts, he muſt ſoftly beat the buſhes with the driver, or only lightly draw it over them; the little noiſe this makes will terrify theſe timorous creatures, and they will gather together in the track, and run a little way forward, and then all ſtop and turn about; on this the perſon is to make the ſame noiſe again, upon which they will run farther; and when they ſtop again, the ſame noiſe will again ſend them forward. Whatever other powts are in the way will join the main body in the fright, and the whole will be driven in this manner, like a flock of ſheep, and by a little addreſs of the ſportſman be ſent into the nets; ſo that out of a whole eye, it often happens that not one is miſſed. If in the fright the birds happen to run out of their track, and take a wrong way, then the driver is to make a raking noiſe with his inſtrument dragged along the ground, on that ſide on which they are running; this will amaze and terrify them ſo, that they will immediately ſtart back, and come into the beaten track that leads directly to the haunt. There are but two cautions neceſſary to the ſucceeding perfectly in this method of taking them: theſe are ſecrecy and patience. Whatever ſtops they make, or however tediouſly they move, the ſportſman who would make ſure of them, muſt bear with it; for over-raſhneſs and hurrying will ſpoil all, and he muſt content himſelf with terrifying them by the noiſe alone, keeping himſelf carefully out of their ſight; for if they eſpy him, all the plan is diſconcerted, and they will no more move forwards, but will every one run a different way, and hide under the roots of trees, and thick buſhes, and all the art in the world will never bring them out again till night, when it will be too dark to watch them.

Driving *of wild Fowl*, is only practicable in the moulting time, which is in July and Auguſt; and it is to be done by means of a ſpaniel, well trained to the purpoſe. The nets are to be ſet in creeks and narrow places, or at their uſual night retreats, and the dog is to put them up, and driving them forward, they will be ſent immediately into the nets, not being able to fly away from the dog, from the want of their wing-feathers. The people who live in the fens find great account in this practice, taking very great numbers of wild-ducks by it. They are uſually indeed poor and out of fleſh at this time, but as they are always taken alive, and without any hurt, the people find it eaſy to fatten them with beaſts' livers, barley, paſte, ſcalded bran, and the like; and they will on this become, in a very little time, fat and well taſted, excelling in flavour both the tame ducks commonly kept in the yards, and the wild ducks in their natural ſtate. When the ſportſman takes the dog into places where they are not ſo frequent, he may hunt them ſingly, and the dog alone will take them.

Driving, in *Metallurgy*, is uſed by the refiners of ſilver to expreſs the riſing up of copper from its ſurface in red fiery bubbles. When the lead that was added for refining the ſilver is burnt away before the copper is gone from it, theſe bubbles appear very fiercely on the ſurface. They ſay, on this occaſion, that the metal drives, and then add more lead till the remainder of the copper is conſumed. Phil. Tranſ. No. 142.

Driving, among the workmen in canals, &c. denotes the ſame with digging, or conſtructing a heading or tunnel under ground.

Driving-*Notes*, in *Muſic*. See Binding-*Notes* and Syncopation.

In driving-notes the firſt part of the ſound begins generally on the unaccented parts of a bar, and ends on the accented parts. See Ligature.

DRIUM, in *Ancient Geography*, a temple ſituated in Apulia, at the foot of mount Garganus.

DROCI, in *Geography*, a town of Italy, in the kingdom of Naples, and province of Calabria Ultra; nine miles S.S.E. of Nicotera.

DROCK, in *Huſbandry*, a name given by our farmers to a part of the common plough. It is an upright piece of timber, running nearly parallel with the hinder part of the plough, but belonging to the right ſide of the tail, as that does to the left. The ground-wreſt of the plough is faſtened

to

to this, as alſo is the earth-board. See WRIST, EARTH-BOARD, and PLOUGH.

DROFFAND, or DRYFFAND, in our *Old Writers*, was a quit-rent, or yearly payment made by ſome tenants to the king or their landlords, for driving their cattle through the manor to fairs or markets.

The word comes from the Saxon *dryfene*, driven.

DROGHEDA, in *Geography*, a town in Ireland, ſituated between the counties of Louth and Meath, which has the privilege of a diſtinct county and its own aſſizes. It is a large well built town on both ſides of the river Boyne, about five miles from the Iriſh ſea. The ground riſes from the river on both ſides, and the houſes, overtopping one another on the aſcent, ſhew the town to great advantage. The Boyne is navigable for ſhips of 150 tons burden to the town, where there is a handſome convenient quay for their reception, and the diſcharge of their cargoes. It has an excellent market, moſt plentifully ſupplied with proviſions of all kinds, the country around being one of the richeſt and beſt cultivated in Ireland. The great flour-mills of Slane are only ſeven miles diſtant, and they have the advantage of water-carriage by a canal. A great deal of coarſe linen and linen yarn find a ready market here, and there is a great export trade in proviſions and grain. This port alſo ſupplies the neighbouring country for many miles round, with Engliſh coals, and other heavy goods, and muſt of courſe derive conſiderable advantage from the meaſures taken of late years to improve the navigation of the river Boyne. Drogheda, or as it was formerly called, *Tredagh*, is often mentioned in hiſtory. It was fortified, and was one of the ſtrongeſt poſts belonging to the Engliſh. Parliaments were repeatedly held there, and amongſt others, that which enacted the memorable Poynings' law, in 1494. In the inſurrection of 1641, the Iriſh endeavoured to get poſſeſſion of this town, but it was defended with great vigour by ſir Henry Tichbourne, until the arrival of a force which enabled him to raiſe the ſiege. It was afterwards held by the royaliſts, and taken by ſtorm by Oliver Cromwell, who put all the garriſon to the ſword. About two miles from it up the river Boyne, king William III. defeated James and his French auxiliaries, in 1690, in commemoration of which, an obeliſk has been erected on the ſpot. The walls of Drogheda are in great part ſtill ſtanding, but the town is ſo entirely commanded by the riſing ground on both ſides, as to be incapable of defence, according to the preſent ſyſtem. The population of Drogheda is at preſent about fifteen thouſand. It is governed by a mayor, ſheriffs, and common council; is repreſented in parliament, and acts of parliament have been paſſed for various meaſures of police and local improvement. There is a good ſchool at Drogheda, with a very large endowment. It is nearly 24 Iriſh miles north from Dublin, in N. lat. 53° 42′. W. long. 6° 21′. Beaufort, Dodd, &c.

DROGMAN. See DRAGOMAN.

DROGONE, in *Geography*, a river of Italy, in the kingdom of Naples, which runs into the bay of Squillace.

DROIEZYN, one of the four diſtricts of the new Ruſſian government of Bialyſtock, which was ceded to Ruſſia by the king of Pruſſia, at the peace of Tilſit in July 1807. It had been only twelve years under the dominion of Pruſſia, and was a part of that diviſion of Poland which was occupied by Pruſſia in 1795. In the Poliſh language the name of this town was *Drogiczyn*.

DROIT, Jus, in our *Law-Books*, ſignifies *right*, or *law*; whereof ſome diſtinguiſh ſix kinds, *viz.* 1. *Jus recuperandi*, right of recovering. 2. *Jus intrandi*, right of entering. 3. *Jus habendi*, right of having. 4. *Jus retinendi*, right of retaining. 5. *Jus percipiendi*, right of receiving. 6. *Jus poſſidendi*, right of poſſeſſing. See LAW, and RIGHT; as alſo RECTUM, ENTRY, POSSESSION, &c.

DROIT, *right*, gives name to the higheſt writ of all real writs, becauſe the greateſt regard is paid to it, and it has the moſt aſſured and final judgment, and therefore, it is called, the *writ of right*; and in the old books droit. Co. Litt. 158. Of this kind are the *droit de advowſon*, &c.

DROIT *of Admiralty*, a valuable prerogative of the crown of Great Britain, conſiſting in a claim to property captured from an enemy on the ſeas or in harbour, under particular circumſtances. Such veſſels and property as are ſeized before any declaration of war, or before the iſſuing of letters of marque and reprizals, are ſaid to belong to the king *jure coronæ*, but the captures made afterward belong to him as lord high admiral, the rights of which office accrued to the crown when the office itſelf was put into commiſſion: it has, however, of late years, been the uniform cuſtom, to give up the proportion of prizes which belongs to the king in this capacity, to the captors. Another ſpecies of this property is that which is captured in port, or by ſuch as are not licenſed captors: this was properly the droits of admiralty, and likewiſe came to the king in virtue of the office of lord high admiral.

Before it became the practice to give up the king's ſhare of prizes to the captors, it was in ſeveral inſtances applied to the public ſervice. Thus queen Anne, in a ſpeech to parliament, in 1702, tells them, "I have given directions that my part of all the prizes which have been taken, or ſhall be taken during this war, be applied entirely to the public ſervice." The proportion of the produce of prizes thus applied, was, however, but inconſiderable: in 1702, it amounted to 73.412*l.* 18*s.* 10½*d.*; in 1703, to 65 707*l.* 16*s.* 10*d.*; and in the whole to only 161.591*l.* 5*s.* 8½*d.* At ſubſequent periods more conſiderable ſums have been received from this ſource: thus in 1764, 659 500*l.* was applied to the public ſervice from the ſale of prizes.

Of late years formal notices of war have been much diſuſed, and governments have thought it juſtifiable to do an intended enemy as much miſchief as poſſible before any public notice of attack; this has greatly increaſed the number of captures previous to a declaration of war, which being conſidered as the property of the crown, has very much augmented the ultimate ſum which theſe condemnations place at its diſpoſal. Thus, the Spaniſh property ſeized before the iſſuing of letters of marque and reprizals in 1796, and which was of very conſiderable value, was condemned as the droits of admiralty; and on the breaking out of the war, in May 1803, though hoſtilities were not commenced againſt Holland till 16th June following, Dutch property was in the mean time detained, and afterwards condemned as prize to the crown. Spaniſh, Pruſſian, and Daniſh property was afterwards condemned under ſimilar circumſtances, the captors thereof being conſidered as having no claim to any ſhare in it. But though the captors have no legal claim, it has been uſual in the diſtribution of the produce of this property to grant a moiety, and in ſome inſtances two-thirds, as a reward to the captors; out of the remainder grants are made to perſons who have been ſufferers by the war, and to ſuch other perſons as his majeſty thinks proper to direct. The great amount of the property thus condemned has enabled his majeſty to direct two millions to be applied to the public ſervice.

DROIT *cloſe*. See RECTO.

DROIT *de advowſon*. See RECTO *de Advocatione Eccleſiæ*.

DROIT DROIT, *Jus Duplicatum*, or double right, is the right of poſſeſſion, joined with that of property; and when actual

actual possession is joined to this double right, then a title is completely legal.

Droit *de dower*. See Recto *De dote*.

Droit *patent*. See Recto.

Droit *de rationabili parte*. See Rationabili, &c.

Droit *sur disclaimer*. See Recto *sur Disclaimer*.

Droit, *monstrans de*. See Monstrans.

DROITWICH, in *Geography*, a market and borough town in the hundred of Halfshire, county of Worcester, is seated on the navigable river Salwarp, and has been noted from time immemorial for its fine salt-springs, or brine-pits. It is supposed to have been well known to the Romans, and was certainly occupied by the Saxons. At the time of compiling the Domesday book, the salt-works here were very considerable; as it appears from that record, that every week during the season of "Wealing," the manufacturers paid a tax of sixteen bullions.

At an early period the town was populous, and divided into different parishes. In 1290, St. Andrew's church, with many houses, were burnt. King John granted several privileges to the town: these were confirmed and augmented by Henry III., and by different subsequent monarchs. As a *borough* it sent members to all the parliaments of king Edward I.; and again in the 2d and 4th of Edward II. This privilege, however, then ceased till 1554, when it was restored by Philip and Mary. The right of election is now vested in a recorder, two bailiffs, and eleven burgesses, who are denominated the 'Corporation of the Salt-springs of Droitwich.' The bailiffs are the returning officers, and justices of the quorum, and the recorder is a justice of the peace.

Here are several public buildings. The exchequer-house, built in 1580, has some windows of fine painted glass. In 1763 a chapel was built here, in the room of one pulled down on the bridge. In that part of the town called Dodderhill, was formerly an hospital for a master and poor brethren, under the priory at Worcester. Here was also a monastery of Augustine friars. The town comprises three parishes, besides one in the suburb called *Dodderall*, which is a vicarage. That of St. Nicholas is a rectory; that of St. Peter is a vicarage; St. Andrew's, united to that of St. Mary Witton, is a rectory.

A canal, about six miles in length, communicates between this town and the Severn, by which the salt is conveyed to various parts of the kingdom. Here are a market on Friday; and four annual fairs.

The Droitwich salt is noted for its purity and whiteness; and the springs for their abundant supply. The water is estimated to contain about one-fourth of salt, while those of Nantwich, in Cheshire, contain only one sixth. As we shall have occasion, under the term Salt, to enter pretty fully into the chemical properties, natural history, processes of making, &c. we must refer our readers to that head. Droitwich contains 419 houses, and 1845 inhabitants. It is $5\frac{1}{2}$ miles from Worcester, and 118 west of London.

Droitwich *Canal*, is the parliamentary name of a navigable canal of near six miles in length, in Worcestershire, commencing in the Severn river at Hawford, and extending to the town of Droitwich, whose copious salt springs occasion the water in this canal (like that in the Wirral branch of the Ellesmere canal) to be so salt as to destroy all the species of fresh-water fish. (See Canal.) About the year 1793 a branch of the Worcester and Birmingham canal was proposed to join this canal at Droitwich.

DROLSHAGEN, a small town of Germany, in Westphalia, remarkable for an ancient abbey of Bernardine nuns.

DROMAHAIRE, a post town, or rather village, in the county of Leitrim, Ireland; 98 Irish miles N. W. from Dublin.

DROME, a town of Africa, on the Grain coast, famous on account of its market for pepper.

Drôme, *the Department of the*, is the third department of the fifth, or south-east region of France. Its capital is Valence. It consists of the provinces formerly called the Valentinois and the Diois, which were parts of Dauphiné, and owes its names to the river Drôme, which traverses it from east to west.

To the north and north-west the department of the Drôme is bounded by that of the Isere; to the south-east by that of the Upper Alps; to the south by that of Vaucluse; and to the west by the river Rhône, which separates it from the department of the Ardèche. Its principal rivers are the Rhône, the Isère, the Drôme, Galaure, Herbasse, Roubion, Aigues, Ouvèze. All these rivers abound in excellent fish, particularly trouts. There are also several small lakes well stocked with fish; the principal of these lakes is called le Lac de Luc.

The department of the Drôme had anciently a canal from the Rhône, near the rocks of Robinet, in the parish of Douzere, to the limits of the commune called la Palud. It has been neglected for the last 30 years, but it would be easy to restore it, and to render it navigable at a small expence. By its means the dangerous parts of the Rhône near Bourg St. Andéol, Blanc Rouge, and Pont St. Esprit, would be avoided.

The soil of the department of the Drôme, being almost every where mountainous, is not very favourable to agriculture. It is rather dry, and this dryness proceeds partly from the ground being sandy, and not retaining any moisture, and partly from the injudicious cultivation of the declivity of the mountains, which nature destines to be covered with woods, and the soil of which is rapidly washed away. The mountains, besides, are no longer able to keep any moisture, having been stripped of their trees. The summits of the mountains afford some pasture. The best pastures are at Gresse, Valdrôme, and Vercors. There are also medicinal plants in the mountains.

In general the department of the Drôme does not grow corn enough for its consumption. The banks of the Rhône, and the hills in the districts of Die and Nyons, yield more wine than the department consumes. It has also plenty of nut oil, and some olive oil. The mulberry tree succeeds uncommonly well. Vast numbers of silk-worms are reared; the annual amount of their produce is upwards of three millions of French livres.

The forests of oak and pine are occupied by bears, chiefly at Orbon and Valaurié. The mountains abound with goats, of the kind called Chamois. There is plenty of game, white hares, white partridges, pheasants, and also some eagles and vultures.

On a mountain named Orel, near Die, is a spring of mineral water, which is reported to be an excellent specific against intermittent fevers.

The principal trade of the department of the Drôme is with the productions of its soil, cattle, butter, and cheese, and the produce of several manufactures, chiefly of woollen and linen cloth, hosiery, hats, stuffs, thread, paper, and gloves.

Besides Valence, the capital, the principal towns are Romans, Chabeuil, Die, Crest, Nyons, and Montélimart. The territorial extent of the department of the Drôme is 6927 kiliometres and a half, or 1,324,227 arpens, 147,381 of which are forests. It contains four districts, *viz.* Valence, Die, Nyons, and Montélimart; 28 cantons, 360 communes, and 231,188

221,[illegible] inhabitants, or 737 individuals *per* ſquare league. The average contribution of each individual annually, is about 6*s.* 8*d.* ſterling. (Herbin. Statiſtique de la France.)

Drôme, *La*, a river of France, which gives its name to one of the twelve ſouth-eaſt departments of France. It has its ſource in the valley of the Drôme, near Serres, in the department of the Upper Alps, from whence it enters the department to which it gives its name, paſſes by Die, Saillans, Creſt, between Livron and Lauriol, and not far from thence falls into the Rhône, 15 kiliometres, or about 9 miles below Valence. Its ſtream is ſupplied by the Mayroce, Sure, Rhoane, Gervane, Veoure, and Beſe. Its total courſe is about 90 miles, the laſt 30 of which only are navigable. The embankment of the Drôme, which at preſent does conſiderable miſchief by its overflowings, would confer eſſential benefits on the fertile vallies through which it runs. (Herbin. Statiſtique de la France.)

DROMEDARY, in *Zoology*, the Camelus *dromedarius*. See Camelus.

Dromedary, *Cape*, in *Geography*, a cape on the eaſt coaſt of New Holland. N. lat. 36° 50′. W. long. 210°. On this coaſt there is alſo a high mountain, lying near the ſhore, which, on account of its figure, Cook called *Mount Dromedary:* under this mountain the ſhore forms a point, to which he gave the name of *Point Dromedary*, and over it there is a peaked hillock. At this time, *viz.* April 21, 1770, being in S. lat. 36° 18′, and W. long. 209° 55′, the variation was found to be 10° 42′ E.

DROMESNIL, a ſmall town of France, in the department of the Somme, with a handſome caſtle; 12 miles W. of Amiens.

DROMEUS, from δρομω, *I run*, in *Natural Hiſtory*, a word uſed by the ancients, as the name of two very different animals, the ſtag and the dromedary. The meaning of the word is *ſwift in running;* and the ſtag had this name as being ſwifter than any other animal, and the dromedary as being ſwifter than any of the camel kind beſide.

DROMISCOS, or Dromiscus, in *Ancient Geography*, a place of Aſia Minor, in the neighbourhood of the town of Miletus. Pliny ſpeaks of it as an iſland, which had been joined to the continent.

DROMO, in *Geography*, a ſmall iſland in the Grecian Archipelago. N. lat. 39° 28′. E. long. 24°.

DROMONARII, in *Antiquity*, rowers belonging to the ſhips called dromones.

DROMONES, a kind of yachts or expeditious ſhips uſed in carrying proviſions, or other neceſſaries. Pitiſc. Lex. Ant. in voc.

Dromones, *Dromos*, or *Dromunda*, in *Middle Age Writers*, ſignified any large ſhips; but afterwards it was uſed chiefly for men of war; and in this ſenſe it is uſed in Walſingham, anno 1292, and in Knighton, lib. iii. cap. 14, &c.

DROMORE, or Drumore, in *Geography*, a townſhip of America, in the ſtate of Pennſylvania, and county of Lancaſter; containing 1077 inhabitants.

Dromore, a market and poſt town in the county of Down, Ireland. It ſtands upon the river Lagan, and has a ſhare of the linen manufacture which enriches the county. It is a biſhop's ſee, and a place of great antiquity, but in no other reſpect remarkable. The reſidence of the biſhop is at a reſpectable country-houſe near the town, ſurrounded by a handſome demeſne. The biſhopric is very compact, and the ſmalleſt in extent of any in Ireland, which is not annexed to another ſee. It contains 26 pariſhes. Dromore is on the great north road leading to Belfaſt, and is 66 Iriſh miles north from Dublin.

DROMOS Achillis. See Achillis *Dromos*.

DROMWA Petri, in *Geography*, a town of Africa, on the Ivory coaſt.

DRONE-Base, in *Muſic*, a continuation of the ſound of the key-note, as on the bag-pipe. Sometimes the [illegible] of this inſtrument is doubled by the 5th of the key-note. See Bag pipe. The ſame drone-baſe, or baſes, belong to the *Piva*, and *Como muſa*, Italian bag-pipes.

Drone, in *Natural Hiſtory*, a ſort of bee of a larger ſize than the common working bee, which being unprovided with the neceſſary apparatus, never goes out to work, in collecting either wax or honey, but lives on the honey collected by the reſt. Theſe are the males of the ſwarm; the common working bees are of no ſex at all, or rather females in diſguiſe, and the female is uſually only one in a hive, for there is reaſon to conclude, from numerous late experiments, that the queen-bee lays only two kinds of eggs, thoſe that are to produce drones, and thoſe from which the working bees are to proceed. The proportion of drones to other bees in ſwarms is various; ſome having more than others. See Queen *Bee*.

This larger ſpecies of drones may be eaſily diſtinguiſhed from the working bees, by being nearly double their ſize. Their head is round, their eyes full, their tongue ſhort, and belly broader and more obtuſe than that of the other claſſes; they are likewiſe of a darker colour, and more thickly clothed; and they make a much greater noiſe in flight, ſo that they may be eaſily known though unſeen. They have alſo no ſting, as the other bees have.

The diſſection of the drone-bee gives as great a proof of its being the male, as that of the queen does of her being female. In this creature there is no appearance of ovaries or eggs, nor any thing of the ſtructure of the common working bees, but the whole abdomen is filled with tranſparent veſſels, winding about in various ſinuoſities, and containing a white or milky fluid. This is plainly analogous to that fluid in the males of other animals, which is deſtined to render the eggs of the female prolific; and this whole apparatus of veſſels, which much reſembles the turnings and windings of the ſeminal-veſſels in other animals, is plainly intended only for the preparation and retention of this matter, till the deſtined time of its being emitted on the eggs. At the extremity of the laſt ring of the body is placed the aperture of the anus in the female, and in the working-bees: and it is at this aperture, that the ſting is alſo thruſt forth; but the caſe is quite otherwiſe in the drone or male bee; for the extremity of that ring is not open, but abſolutely cloſed; and the aperture of the anus is in the under part of that ring about its middle. On preſſing the body of this bee, there is alſo forced out at this part the penis; this is a ſmall and ſlender fleſhy body, contained between two horns of a ſomewhat harder ſubſtance, which join at their baſe, but gradually part aſunder as they are continued in length. When the preſſure is continued, there are finally thruſt out at the ſame aperture a part of the internal apparatus of the ſeminal veſſels, and, in fine, there is uſually ſome of the milky liquor extravaſated: but this ſeems rather to be let out by the burſting of a veſſel, than by any natural paſſage. Theſe parts found in all the drones, and none of them in any other bees, except theſe, ſeem to prove very evidently the difference of ſex; but there is one thing extremely remarkable in regard to them, which is, that though they appear ſo evidently on being forced out of the body by preſſure, yet it is very difficult to find them in it on diſſection. The cauſe ſeems to be their ſwelling when expoſed to the air; and Swammerdam ſuppoſes, that to this purpoſe they are furniſhed with a great number of tracheæ, which readily admit the air as ſoon as ever they are expoſed to it.

Maraldi,

Maraldi, as well as Swammerdam, discovered in the structure of the drones some resemblance to the male organs of generation, and from thence concluded that they were the males; but neither of these accurate and industrious observers could detect them in the act of copulation. Swammerdam, therefore, entertained a notion, that the female or queen-bee was fecundated without copulation; that it was sufficient for her to be near the males, and that her eggs were impregnated by a kind of vivifying aura, exhaled from the body of the males, and absorbed by the female. Maraldi adopted a similar opinion. Hist. Acad. Sci. 1712, p 332. This opinion has been at a later period strenuously maintained by Mr. Debraw of Cambridge. Phil. Transf. vol. lviii. p. 1, art. 3. However, M. Reaumur thought that he had discovered the actual copulation of the drones with the female bee, and he has very minutely described the process of it. Hist. Insect. tom. x. p. 128. 149. 157. The fact has been since demonstrated by Huber. See *Generation* of Bees.

Maraldi and Reaumur had long ago discovered, that there were drones of the same size with the common bees; but the curious experiments of Debraw, besides ascertaining the fact, throw a new light on their importance and use, and remove considerable difficulties, which embarrassed the process of generation among these useful insects. It is well known that the large drones never appear in the hive before the middle of April, and that they are all dead before the end of August, when the principal breeding season terminates; and they are destroyed, together with all their worms or nymphs, by the working bees; probably by order of the queen to save honey; and yet it is equally certain that the bees begin to breed early in the spring, sometimes in February, if the weather is mild; and that many broods are completed before the drones appear. But if drones of a smaller size are suffered to remain, which in a time of scarcity consume less honey than the others, these will answer the purpose of supplying the early broods, and the larger drones are produced against a time of greater plenty.

An ingenious friend of the editor, who amused himself with observing the economy of bees, and who long ago discovered the small drones, assured him, that these smaller drones are all dead before the end of May, when the larger species appear, and supersede their use.

It was not without reason that a modern author suggested, that a small number of drones are reserved to supply the necessities of the ensuing year; and that these drones are very little, if at all larger, than the common bees. Nat. Disp. p. 90.

DRONERO, in *Geography*, a small town of France, in the department of the Sture, which formerly was a part of Piedmont in Italy. It is situated at the foot of the Alps, on the river Macra, over which there is a very high bridge.

Dronero is the chief place of a canton in the district of Cuni, and has a population of 6342 individuals. Its canton contains four communes and 10,136 inhabitants.

DRONFIELD, a town and parish in the hundred of Scarsdale, in the county of Derby, England, is pleasantly seated in a valley, which abounds with springs. The town consists of 231 houses, and contains 1182 inhabitants. Here is a well endowed free school, which was founded by Henry Fanshawe, esq. in the reign of queen Elizabeth. The church is a large handsome building; and near it was formerly a chantry, now converted into a public house. The market is discontinued. Abundance of coal is obtained in the vicinity of the town, which is six miles from Chesterfield, and 157 N. W. from London. About two miles from Dronfield are the remains of Beauchief Abbey. This was seated in a pleasant, fertile valley, and was appropriated by Robert Fitz-Ranulph, lord of Alfreton, circa 1172, for regular canons of the Premonstratensian order. See Pegge's History, &c. of Beauchief Abbey, and Pilkington's History of Derbyshire, 2 vols. 8vo. 1789.

DRONGO, in *Ornithology*, the name given by Buffon to the Lanius *forficatus*, which see.

DRONNE, in *Geography*, a river of France, which rises about six miles from Thiviers, in the department of the Dordogne, and joins the Ille, near Contras, in the department of the Gironde.

DRONNINGBORG, a small town of Denmark, in the peninsula of Jutland, in the diocese or general government of Aarhuus. Its district contains the herred of Rougsad, with five parishes; that of Stoffring with eight parishes, and Stoffringgaard a convent for ladies of noble birth; the herred of Galthen with eight parishes; that of Gierlev with ten, and that of North Hald with twelve parishes.

DRONONCA, in *Ancient Geography*, a river of Gallia Aquitanica, now *Dordogne*, which see.

DRONTE, in *Ornithology*. See Dirus *Neptus*.

DRONTHEIM, in Latin *Nidrosia*, in *Geography*, a considerable town of Norway in Drontheimhus, or general government of Drontheim, of which it is the capital, is situated at the mouth of the river Nid, 285 miles N. E. of Bergen, 408 miles N. by W. of Copenhagen, and 324 N.W. of Stockholm. It was anciently called Nideroos, or the outlet of the river Nid, from which it still derives its Latin name. Its present name arose from that of the province of Trondheim, of which it is the principal town, and the inhabitants of which are called Tronder.

Drontheim is said to have been built by king Oluf Tryggeson; it was originally the residence of the Norwegian kings, and afterwards of the archbishops, but the archiepiscopal see was suppressed at the Reformation. At present it has only a bishop. The cathedral, which was a superb edifice built with marble, was burnt down in 1530, excepting the choir which still forms a part of the present cathedral, for which it is however too large. There are two churches, a public school, a seminary for missionaries, an orphan-house, a poor-house, an infirmary, and a house of correction. The town is governed by a stadtvogt and other magistrates. It has two suburbs, Bakkelaudet and Ladegaard, which have each their separate church. The number of inhabitants amounts to 9000.

The general governor of the province resides at Drontheim. The town is defended by the fort of Christianstein, erected in 1680, and by the castle of Munkholmen, which stands on a rock in the harbour, and protects both the city and the harbour towards the sea. In the month of July, 1685, the king of Denmark, Christian V., passed a few days at Drontheim, and supped at midnight without candle-lights, the twilights being sufficiently luminous.

In the museum at Copenhagen there are several medals and coins found in the neighbourhood of Drontheim; among others, a medal struck by order of king Sverre. In 1786, 48 silver pieces of a large size, some round, some square, and some triangular, with very ancient inscriptions, were dug out of a field. In 1789, a sort of a copper trunk was found, containing several coins of the reign of Frederick III.; and in 1805, 32 silver coins were discovered at a very inconsiderable depth, of the reign of king Eric of Pomerania. Later still, some inhabitants of the parish of Maldalen, near Drontheim, discovered in a sand-bank 70 or 80 ancient silver coins, and four or five urns of a rare metal, containing nothing but blue ashes. Some of the coins are of the reign of king Ethelred of England. One of them has a crucifix and a temple:

a temple: it appears to have been coined towards the eleventh century.

The principal trade of Drontheim is with all ſorts of ſalt fiſh, herrings, timber, tallow, copper of the celebrated copper-works at Röraas, and ſome other leſs important articles. Its exports and imports occupy from 400 to 500 ſhips annually. The number of veſſels which arrived at Drontheim in 1785 was 250.

The prefecture of Drontheim comprizes the diſtricts of Romſdal, Nordmor, Foſen, Oeckedalen and Guldalen, Strinden, Stordalen and Verdalen and Inderoen. The town of Drontheim itſelf is in the diſtrict of Strinden. In 1760, a literary ſociety was eſtabliſhed at Drontbeim. Its tranſactions, which are regularly publiſhed ſince 1784, are leſs known abroad than they deſerve to be from their merit.

DRONTHEIMHUS, Drontheimhuus, in Daniſh *Trondheimhuus*, is the moſt extenſive province of Norway, being above 150 Norway miles in length. It ſtretches along the coaſt, and is bounded on the weſt by the North ſea, on the north by the gulf of Wardhus, on the eaſt by Sweden, and on the ſouth by the gulf of Bergen. A long chain of high mountains, called Kolen, ſeparates it from Sweden. It forms a dioceſe, with one biſhop and 13 archdeacons. Its population is ſo very thin, that it reckons only nine or ten individuals on the Engliſh ſquare mile.

The province of Drontheim is under a general governor, who reſides at Drontheim. It is divided into three prefectures, *viz.* Drontheim, Nordland, and Finmark, which are ſubdivided into diſtricts.

DROOGSLOOT, N., in *Biography*, painter of landſcape and fairs; born in 1650. He practiſed chiefly at Do t, in Flanders, where he was greatly encouraged and much employed. He drew his ſcenery always from nature, and painted towns, cities, and villages, with great truth and accuracy of reſemblance. His colouring is pleaſing. He took his ſubjects from the loweſt life, from fairs and markets; with a multitude of figures and military groups. The attitudes and actions of his figures are very natural; but they are without elegance, and generally of diſagreeable forms. Deſcamps and Pilkington.

DROP, in *Sea-Language*, is a name ſometimes given to the depth of the principal ſails: thus, a main-top-ſail drops ſeventeen yards. To *drop* anchor is uſed ſynonymouſly with *to anchor;* and *dropping* a-ſtern denotes the retrograde motion of a ſhip.

Drop-*Stile*, a kind of moveable fence, at the partings of the fields, on the towing path of a canal.

Drop-*Planks* are planks let down into a groove prepared under a bridge, or other walled place, for ſtopping the water of a canal.

DROPALACH, in *Geography*, a town of Germany, in the duchy of Carinthia; 12 miles S. of Saxenburg.

DROPAX, Δρωπαξ, in *Pharmacy*, an external medicine in form of a plaſter, uſed to take off the hairs from any part. See Hair, and Depilatory.

The dropax is of two kinds, ſimple and compound. The ſimple is made of an ounce of dry pitch, and two drachms of oil.

The compound is made with pitch, wax, colophony, common ſalt, bitumen, ſulphur vivum, pepper, euphorbium, cantharides, and caſtor. There are alſo other ways of making it, to be found in the diſpenſatories.

It was anciently much in uſe alſo to warm the parts, to draw the blood and ſpirits to them, and to cure atrophies. To this purpoſe it was applied hot on the part affected, after firſt ſhaving it; and was pulled off again before it became quite cold; then heated afreſh, and applied again; and the operation thus repeated, till the part was rendered very red.

DROPPER. See Fishing.

DROPPING, or Dripping, a term uſed among *Falconers*, when a hawk mutes directly downwards, in ſeveral drops, not throwing out her dung ſtraight forwards.

DROPS, in *Architecture*, are ſmall bodies of a circular horizontal ſection, either of a cylindric, conic, or of a form ſpreading towards, and concave at, the bottom. They are placed in the mutules of the Doric order, where they are always ſix in number, upon the fronts of the mutules, in three rows. In the Roman Doric, the ſurface of the metops is the ſame with that of the architrave; and the vertical ſurface of the triglyph projects equally with the drops, which are hung to the tenea. In the Grecian Doric, the faces of the triglyphs are generally diſpoſed in the ſame vertical ſurface with the face of the epiſtylium, and conſequently the regula and the drops pending therefrom project. In the Choragic monument of Thraſyllus, the tenea of the epiſtylium has a continued row of drops. This is not a regular Doric. The temple of Apollo at Cora in Italy has a row of drops pending from the ſoffet of the corona, continued from end to end without interruption, which are, as well as thoſe of the preceding example, of a cylindric form, though thoſe under the triglyphs are conical, with inclined ſoffets. The drops pending from the ſoffets of the mutules under the corona have their ſoffets in a plane, parallel to the ſoffets of the mutules, and conſequently inclining; while thoſe of the epiſtylium have their ſoffets in a horizontal plane. Drops vary much in their proportion. The height of thoſe in the cornice of the Doric portico at Athens is little more than a quarter of their diameter; while thoſe of the epiſtylium have their heights more than half their diameters. In the theatre of Marcellus at Rome, and in the peripteral temple at Paeſtum, the cornice is without either mutules or drops. In the eneaſtyle, or nine-columned temple at Paeſtum, the cornice is deſtroyed, and the architrave ſeems to have been originally without either mutules or drops.

Drops, in *Medicine*, a liquid remedy, whoſe doſe is eſtimated by a certain number of drops.

Drops, in *Meteorology*. See Rain.

The ſpherical figure, into which the drops of fluids conform themſelves, is a phenomenon that has a little perplexed the philoſophers. The ſolution commonly given was, that the equable, uniform preſſure of the ambient, or incumbent atmoſphere, cloſed them into this form. But this account will no longer paſs; now that we find that the phenomenon holds in vacuo as well as in air.

The Newtonian philoſophers, therefore, aſcribe it to their attraction, which being greater between the ſeveral particles of the fluids, than between them and thoſe of the medium, they are, as it were, concentrated, and brought as near each other, and into as little compaſs, as may be; which cannot be, without their being ſpherical.

Thus, ſir Iſaac Newton: "Guttæ enim corporis cujuſque fluidi, ut figuram globoſam inducere conentur, facit mutua partium ſuarum attractio; eodem modo quo terra mariaque in rotunditatem undique conglobantur, partium ſuarum attractione mutua, quæ eſt gravitas." Opt. p. 338.

Drops, *Engliſh*, or *volatile Engliſh drops*, *Guttæ Anglicanæ*. See Guttæ *Anglicanæ*.

DROPSY, in *Medicine*, a preternatural collection of ſerous or watery fluids in ſome of the cavities of the body.

The word is a corruption of the Greek ὑδρωψ, *hydrops*, derived from ὕδωρ, *water*.

From ancient times dropſy has been divided by medical writers into different genera, according to the part of the body

body in which it is seated; and the different denominations, which were given by the Greeks to the different varieties of the disease, are still retained in medical language. They are compounded of the word ὕδρωψ with the name of the part affected. Thus, *hydrocephalus* signifies dropsy of *the head; hydrothorax*, dropsy of *the chest; hydrocardia*, dropsy of *the heart* or *pericardium; hydrophthalmia*, dropsy of *the eye; hydarthrus*, dropsy of *a joint*, &c. The subcutaneous dropsy, in the interstices of the cellular membrane, was called *hydrops anasarca*, ανασαρκα, or dropsy *between the flesh;* and the dropsy of *the belly*, *hydrops ascites*, ἀσκίτης, from ασκος, *a bottle:* the belly, when distended with water, being thought to resemble a full bottle. The dropsical accumulations, however, under all these forms, partake of one common nature, and depend very much upon some general causes, which it may be expedient to endeavour to explain, before we consider the several varieties alluded to.

It has been ascertained by physiologists that, in the healthy condition, a serous or watery fluid is constantly poured out, or exhaled, from what are termed the exhalent extremities of the arteries, into every cavity and interstice in the body, by which the parts are constantly moistened, and their adhesion, or painful attrition, is prevented. But upon the surfaces of the same cavities and interstices the mouths of another set of vessels, the absorbents or lymphatics, open, and take up or absorb this effused fluid, before it has remained long, or been accumulated in those spaces, and carry it back into the circulating blood, through the thoracic duct or general trunk of the absorbents. See Absorbents. From this view of the animal economy it will be obvious, that a perfect balance between these opposite functions of exhalation and absorption must exist, in order to maintain the health of the system; and that a dropsical accumulation must be the consequence of the loss of such balance, and must be occasioned in one or other of the two following ways: 1. If the quantity of fluid poured out into any space be greater than the absorbent vessels can at the same time take up, it must necessarily accumulate in such parts; or, 2. Although the quantity poured out be not greater than usual, yet if the absorption be any how interrupted or diminished, an unusual accumulation will from this cause also ensue. Dropsy may, in general, therefore, be imputed to an increased exhalation or a diminished absorption, in the cavities in which it occurs. It will be found, however, upon an investigation of the various causes which are capable of producing these morbid conditions, that the exhalent vessels are most commonly in fault, and that preternaturally increased effusion is most frequently the chief source of dropsy.

Causes of Dropsy.—The ordinary exhalation may be increased in various ways: but one of the most direct causes of such an increase is an interruption or obstruction to the free return of the venous blood from the extreme vessels of the body to the right ventricle of the heart. Such an obstruction, by impeding the free passage of the blood from the arteries into the veins, while the action of the heart continues to propel it, necessarily occasions the blood to pass more forcibly into those avenues, where less resistance to its progress exists, *viz.* into the exhalent branches of the arteries, and thence into the cavities into which they open. This is not a mere hypothesis: for Lower proved and illustrated the fact by most satisfactory experiments, which leave no room to doubt, that simple obstruction to the free passage of the blood through the veins is adequate to produce dropsy. He made a ligature on the ascending *vena cava* of a dog, which occasioned its death in a few hours; and upon dissecting the animal, a great collection of water was found in the abdomen, as if it had long laboured under an *ascites*. In other experiments, in which the *jugular* veins of a dog were tied, a considerable general swelling of the parts above the ligature were observed by the same physiologist, who expected to find a great extravasation of blood in those parts, after the death of the animal; but, on dissection, he found all the interstitial cavities of the muscles and integuments distended with a colourless and transparent water, or in a true dropsical state. Tractatus de Corde, cap. ii.

This origin of dropsy is farther illustrated by the numerous internal causes of obstruction, with which both partial and general dropsy are observed to be connected. One of the most frequent and remarkable instances of the occurrence of dropsy from obstruction to the circulation through a particular vein, is found in the case of *ascites*, originating from diseased liver. The blood, which circulates to the intestines, is collected, in its return to the heart, into one great vein, (the *vena portæ*,) which conveys it through the liver by numerous branches, before it reaches the organ of its motion: when the liver, therefore, is greatly diseased, the passage of the blood through it is impeded or prevented, as much as by the ligature of Lower; and the exhalent arteries of the intestines and *peritoneum* pour out water into the cavity of the belly.

Hence dropsy, especially in the form of *ascites*, is frequently the consequence of intemperance in the use of spirituous and fermented liquors, which commonly excites schirrous tumours, tubercles, and other obstructions in the liver. From a similar circumstance, dropsy is sometimes one of the *sequelæ* of fevers, especially of intermittent fevers, which, when they continue long, occasion obstructions in the liver, or enlargement and obstruction of the spleen and other viscera. These, when they press upon any considerable vein, bring on dropsy, and particularly by compressing the *vena cava* give rise to *anasarca* of the lower extremities. Dropsy is a common consequence or concomitant of diseases of the lungs, in which the circulation of the blood through those organs is considerably impeded, as happens in peripneumony, in asthma, in the catarrh of old people, &c. Not only *hydrothorax*, or dropsy of the chest itself, but anasarca generally, and sometimes universal dropsy, are thus occasioned. For if the great mass of blood is prevented from passing freely through the lungs from the heart, the return of blood from the extremities of the arterial system to the heart is likewise impeded; and a greater tide, therefore, is turned upon the exhalents in general. Imposthumes in the lungs, and pulmonary consumption, produce dropsical effusions in a similar manner. And still smaller obstructions to the circulation produce the same effects; such as ossification of the valves of the heart. (See Monro on the Dropsy, p. 1.) It may serve as a farther illustration of the operation of these general causes to remark, that where the force of the circulation is weak, if the posture of the body is such as gives occasion to the gravity of the blood to oppose in some measure the motion of it in the veins, the return of the venous blood being thus resisted, a sufficient pressure on the exhalents is produced to give rise to effusion. Whence it partly arises, that an upright posture, especially if long continued, produces or increases serous swellings in the lower extremities; and such swellings are always great in the evening, and smaller in the morning. Even in the smaller portions of the venous system, the interruption of the motion of the blood in particular veins has had the same effect. Thus a polypus formed in the cavity of a vein, or tumours in its coats, or compressing it externally, and preventing the free passage of the blood through it, have had the effect of producing dropsy in parts towards the extremity of such veins. A schirrous tumour in the arm-pit often causes the arm to

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become extremely anasarcous; and anetrisms in the arteries, abscesses, and steatomatous or other tumours in the adjoining parts, are the most common causes of dropsy from venous compression. To this head may be referred the compression of the descending *cava* by the bulk of the uterus in pregnant women, as well as by the bulk of water in *ascites;* both of which frequently produce serous swellings in the lower extremities.

The suppression of natural or customary evacuations, as of urine, perspiration, piles, menses, &c. has been often deemed the cause of dropsy; and it has been supposed to have the effect of increasing the exhalation, by producing a preternatural plethora in the venous system, and therefore obstructing the freedom of the arterial circulation. This hypothesis, however, appears to be fanciful, and altogether gratuitous; and a dropsy from such a cause has been at least a rare occurrence. Dr. Cullen justly observes, that when such a dropsy seems to have originated in this way, it was more probably owing to the same causes as the suppression itself, rather than to the plethora produced by it. (First Lines, § 1655.) In the cases in which a spontaneous suppression of such evacuations occurs, there is generally more or less of a morbid condition of the habit, connected with a *debility of the solids*, and indicated by languor, paleness, and pastiness of the countenance, (termed by the ancients *leucophlegmatia*, from a supposed prevalence of *white phlegm* in the humours,) loss of appetite and strength, and other failures of the functions. To this state of disease, whether belonging to *chlorosis*, consumption, &c. or whether the result of cold, intemperance, or other morbid cause, both the suppression of the discharges alluded to, and the appearance of the dropsical effusions, are to be attributed: for, as we shall attempt to shew, *debility of the solids*, both in the exhalent arteries in particular, and in the system at large, is a frequent cause of dropsy.

That a debility and laxity of the exhalent vessels is occasionally the cause of increased exhalation, by permitting the thinner parts of the blood to pass too readily through them, appears to be proved from the circumstance, that palsied limbs, in which such a laxity is to be presumed, are frequently affected with dropsical, or, as they are called, *œdematous* swellings. But a great general debility is still more remarkably and frequently attended with dropsy; and dropsy is a most common consequence of the operation of all powerfully debilitating causes. Hence fevers, whether of the intermittent or continued sort, which have lasted long; long continued and somewhat excessive evacuations of any kind; and, in short, almost all diseases, which have been of long duration, and have at the same time induced the other symptoms of debility, are followed by dropsy. Intemperance in the use of intoxicating liquors, besides exciting disease in the liver, is a frequent cause of general debility of the system: whence it partly happens, that drunkards of all kinds, and especially dram-drinkers, are so often affected with dropsy.

The fact, that serous effusions are observed to take place in every cavity and interstice of the body, at the same time, —into the cavity of the cranium, of the thorax, and of the abdomen, and likewise into the cellular tissue throughout,—is adduced by Dr. Cullen in proof of the operation of a general cause; which is rendered still more evident by the circumstance, that these several dropsies have increased in one part as they diminished in another, and this alternately in the different parts. In most instances, he adds, hardly any such cause can be thought of, except a *general laxity* of the exhalents. This *hydropic diathesis*, he observes, frequently operates by itself; and frequently, by concurring with the other causes, contributes to give them their full effect. Loc. cit. § 1657.

There is a third cause by which an increased exhalation may be brought on, and dropsy be produced. This is a preternatural abundance or proportion of serous or watery fluids in the blood vessels, and more especially when such a condition concurs with the causes above-mentioned. The experiments of Dr. Hales establish the truth of this fact, as fully as those of Lower evince the effect of venous obstruction. Dr. Hales supposed that water, being thinner than the red blood, would pass more readily from the extremities of the arteries into the veins; and he injected warm water into the arteries of dogs: the event did not answer his expectation; for the water did not return by the veins, but escaped through the exhalent arteries, through which the red blood could not pass into the interstices of the cellular membrane, occasioning a dropsical swelling. (Hales Hæmastat. Exp. xxi.) When he persisted to inject water through a tube fixed to the carotid artery, although the jugular veins were cut longitudinally, the water did not issue freely by these apertures; but all the parts of the body began to swell, and an universal dropsy took place; the lungs were distended, all the muscles grew turgid, the interstices between the fibres being filled with water: yet the water was not propelled through the arteries with a greater force than the power of the heart in its natural state. (Ibid. Exper. xiv.) It appears evident, therefore, that a mere increase of the watery portion of the blood disposes the body to dropsy.

This over-proportion of watery fluids may be occasioned by various circumstances. Excess in the use of thin and watery liquids is one of the most obvious of these; and it is certain that dropsy has been induced by drinking an unusual quantity of water, tea, &c. Large quantities of water, it is true, are on many occasions taken in; and being as readily thrown out again by stool, urine, or perspiration, have not produced any disease. But it is also certain, that, upon some occasions, they have run off by the internal exhalents, and produced a dropsy. This seems to have happened either from the excretories not being fitted to throw out the fluid so fast as it had been taken in, or from their having been obstructed by accidentally concurring causes. Accordingly, the sudden drinking of a large quantity of *very cold* water has produced the dropsy, probably from the cold producing a constriction of the excretories. An interruption of the ordinary watery secretions is apparently alone the cause of dropsy, by occasioning a preternatural proportion of the watery fluids in the blood-vessels; accordingly, it is alleged, that persons much exposed to a cold and moist air are liable to the disease; to the production of which the general debility, thus occasioned, may also contribute. An interruption, or considerable diminution of the urinary secretion, is also said to have produced the disease; and it is certain, Dr. Cullen affirms, that in the case of an *ischuria renalis*, or stoppage of the secretion, the serosity retained in the blood vessels has been poured out into some internal cavities, and has occasioned dropsy.

Dropsy, again, is a common consequence of very large evacuations of blood, whether spontaneous or artificial, as well as of profuse discharges of other kinds; as of bile, in *cholera;* of *pus*, from extensive ulcerations or abscesses, &c.; which last, being secretions from the blood, contribute to impoverish the blood; or to increase the proportion of its watery part. But from the effect of great general debility in producing dropsy, as we have already stated, and from the consideration that excessive debility results from all such evacuations, especially of the blood itself, the debility will perhaps afford a larger share of the explanation, than the mere tenuity of the remaining blood, thus occasioned.

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The same remark also applies to the dropsy, which ensues after long subsisting upon scanty, poor, or indigestible diet. Dr. Cullen is disposed to explain the dropsical appearances, occurring from such a cause, to the want of a due proportion of the gluten and red globules of the blood, while the watery parts are continually supplied: and thus, being in an over-proportion, are ready to run off in too great a quantity by the exhalents. Hence the dropsy, so often attending *chlorosis*, appears at first by a pale colour of the whole body, shewing a manifest deficiency of the red blood; which in that disease can only be attributed to an imperfect digestion and assimilation of the food. (First Lines, 1660.) It cannot, indeed, be doubted that both the causes operate together.

The fluids exhaled into the cavities and interstices of the body, although not in a preternatural quantity, may nevertheless be accumulated, and occasion dropsy, as already observed, if any interruption or diminution of the action of the absorbents should take place. The occurrence of such an interruption of absorption is, however, not very frequent, and the causes of it are not easily ascertained. It is not improbable that a loss of tone in the absorbent extremities of the lymphatics may occasion a diminution, or even a cessation of the action of absorption. For it cannot be doubted, that a certain degree of tone or active power is necessary in these absorbent extremities; and it is probable that the same general debility, which produces laxity of the exhalent vessels (in which the *hydropic diathesis* appears to consist) will at the same time occasion a loss of tone in the absorbents; and therefore that a laxity of the former will generally be accompanied with some loss of tone in the latter, both of which will contribute to the production of dropsy. It may be observed too, that medicines which seem to act by exciting the action of the absorbents, have often cured dropsical disease.

It has been supposed that absorption may be interrupted by an obstruction of the lymphatic vessels, or at least of the conglobate glands through which they pass. But this is very doubtful; since the lymphatics have branches frequently communicating with one another, which renders it improbable that the obstruction of any one, or even several of these, can have any considerable effect in interrupting the absorption of their extremities. The same reasoning will apply to the interruption in consequence of obstruction in the conglobate glands; at least it is only an obstruction of the glands of the mesentery, through which so considerable a portion of the lymph passes, that can possibly have the effect of interrupting absorption. And even these glands are often considerably tumefied, without either interrupting the transmission of fluids to the blood-vessels, or occasioning any dropsy.

A rupture of the lymphatic vessels may occasion an effusion of watery fluids, and thus produce a dropsical swelling. In this way a rupture of the thoracic duct has given occasion to an effusion of chyle and lymph into the cavity of the thorax; and a rupture of the lacteals has occasioned a like effusion into the cavity of the abdomen; and in either case a dropsy has been produced. It is sufficiently probable that a rupture of lymphatics, in consequence of strains, bruises, or the violent compression of neighbouring muscles, has occasioned an effusion, which, being diffused in the cellular texture, has produced a considerable anasarca.

Varieties of Dropsy.—As the symptoms attending dropsical effusions vary materially, according to the part of the body in which the fluid is deposited, it will be necessary, before we proceed to detail the methods of cure, to notice those species of the disease which most frequently occur, and are the most common objects of practice.

Dropsy of the Integuments.—Anasarca, or dropsy of the cellular membrane, has been already described at length. See ANASARCA.

DROPSY *of the chest, Hydrops pectoris*, or *Hydrothorax*, in which the water is effused into the cavity of the breast, between the membrane lining the ribs, and the external covering of the lungs, is a common form of dropsy. The symptoms, by which the existence of water in the chest is to be ascertained, are various in degree and in combination, so as to render it very difficult, in many cases, to find any better guide than probable conjecture, in determining the presence of the disease. The following are the leading symptoms, which characterize this affection, when it is fully formed: shortness of breath, which is much increased by lying in a recumbent or horizontal posture, and is usually attended with a frequent cough, at first dry, but afterwards accompanied with an expectoration of thin mucus;—paleness or purple hue of the face, particularly of the lips;—frequent, sudden, and spontaneous starting from sleep, accompanied with a sense of suffocation, anxiety, and palpitation of the heart, which immediately require an erect posture;—a paucity of the secretion of urine, which is always of a high colour, and, when cooling, deposits a copious reddish sediment;—and lastly, an œdematous swelling of the feet and legs, and a puffiness about the lower eye-lids. When all these symptoms are present, they will leave no doubt as to the existence of hydrothorax. The great difficulty of breathing arises from the compression of the lungs by the surrounding water, and the consequent inability to admit a sufficiency of air into the cells, or a free transmission of the blood through them. This difficulty is increased by the horizontal and diminished by the erect posture; because, while the body is erect, the pressure of the abdominal viscera upon the diaphragm is removed by their own gravity, and the gravity of the inclosed water pressing down the upper surface of the diaphragm, tends also to enlarge the space in which the lungs move; but the contrary occurs in the horizontal position. The starting from sleep does not always accompany hydrothorax, but it does generally, and is not found in *empyema*, or other diseases of the thorax.

The most decisive symptom of hydrothorax is a fluctuation of water in the chest, perceived by the patient himself, or by the physician, upon certain motions of the body, according to Dr. Cullen. He does not, however, seem to have made much use of this test. Professor Gregory, his successor, states, that he has never been able to discover fluctuation in the chest in hydrothorax, although in empyema he has easily perceived it. He properly suggests that great caution should be used in making the experiment; inasmuch as patients under hydrothorax occasionally die suddenly from slight agitation or exertion, and at all events it greatly alarms the patient, when he thus ascertains the actual existence of water in the chest. Besides these objections, it may be added, that when the stomach is moderately distended with liquid nutriment, the fluctuation from that cause, which is readily perceived, may be easily mistaken for a fluctuation in the chest. The test proposed by Auenbrugger of a percussion of the thorax, and an observation of the sort of sound thus occasioned, appears to be altogether futile. (See Invent. nov. ex percuss. thorac. ut signo, &c. 1763. Vindob.)

When the disease is advanced, a numbness or palsy in one or both arms has been frequently observed to come on, and the pulse commonly becomes irregular and often intermitting; but this last symptom occurs in so many other diseases of the chest, that its importance can only be estimated in conjunction with the other appearances.

The hydrothorax sometimes appears alone without any other

species

ſpecies of dropſy being preſent at the ſame time; and in this caſe the diſeaſe is for the moſt part a partial affection, ſometimes of one ſide of the thorax only, ſometimes conſiſting of a collection of hydatids in one part of the cheſt. Occaſionally an univerſal dropſy has begun by effuſion into the cheſt: it more frequently, however, comes on from an anaſarca gradually increaſing; and the general dropſical diathesis ſeems often to affect the thorax ſooner than either the head or the abdomen.

The *prognoſis* in hydrothorax is generally unfavourable, as it originates moſt frequently from local organic diſeaſe in the viſcera of the thorax. By ſome writers it has been deemed the moſt dangerous form of dropſy; but from a judicious compariſon of facts by Dr. Ferriar of Mancheſter, it appeared to be at leaſt as often removed, as the other forms of dropſical effuſion. We have occaſionally ſeen examples of recovery from hydrothorax under very unpromiſing circumſtances: ſo that the event of the diſeaſe cannot be predicted with too much caution.

Dropsy *of the lungs*, *hydrops pulmonum*, or *anaſarca pulmonum*, in which the watery effuſion is made into the cellular membrane, in the ſubſtance, or rather between the cells, of the lungs themſelves, and not into the cavity of the thorax, is attended with nearly the ſame ſymptoms as the hydrothorax; and it is often difficult, if not impoſſible, to diſtinguiſh them. But the *œdema*, or dropſy of the cellular membrane of the lungs, when its attack is ſudden, Dr. Perceival obſerves, may often be diſtinguiſhed by the following ſigns, although it muſt be acknowledged that they often prove equivocal. "The difficulty of reſpiration is conſtant, and increaſed by the leaſt motion, though not much varied by different attitudes of the body; the patient complains of great anxiety about the *præcordia*, and when he attempts to take a deep inſpiration, he finds it impoſſible to dilate his cheſt, and his breath ſeems to be ſuddenly ſtopped, &c." (Eſſays Med. and Experimental, vol. ii. p. 177.) The principal diagnoſtic ſymptom, it will be obſerved, is the circumſtance, that the dyſpnœa is not increaſed by change of poſture; the water, not being in the cavity of the thorax, but confined in the body of the lungs, cannot change its place by change of attitude, but muſt equally compreſs the cells in all poſitions of the body. This diſtinction, however, of the two forms of dropſy, is of little practical utility, unleſs with a view to the operation of tapping.

Dropsy *of the pericardium*, or of the inveſting membrane of the heart, *hydrocardia*, *hydrops pericardii*. It will perhaps be ſufficient to ſtate here, in the words of Dr. Donald Monro, that "the dropſy of the pericardium can ſcarce be certainly known till after death, by diſſection; for all the ſymptoms of this diſeaſe, that have been ſpecified by the moſt accurate phyſicians, are ambiguous; for inſtance, an unequal pulſe, an uneaſineſs in lying, a frequent neceſſity of ſitting down, an oppreſſion within the ſternum after motion, difficulty of breathing, attended with a ſenſe of pain and reſtleſſneſs, either no cough at all, or a very moderate and dry one, all which ſymptoms become milder or go off altogether when the patient is at reſt. And could the dropſy of the pericardium," he adds, "be diſcovered, it ſcarce ever yields to internal remedies; and it would be a bold, not to ſay a raſh attempt, to make an aperture into the pericardium." (Eſſay on the Dropſy, p. 166.) Sauvages mentions the occurrence of frequent faintings, or *ſyncope*, and an obvious tremulous or undulatory motion between the third and fifth ribs, correſponding with the pulſations of the heart, as conſtituting, in addition to the ſymptoms of hydrothorax, the ſigns of dropſy in the pericardium. (Noſolog. Method. Claſs v. Genus xiii. ſp. 8.) But ſimilar ſymptoms are attributed to other diſeaſes of the heart, as to inflammation and dilatation of that organ. See Carditis, and Cardiognus.

Dropsy *of the belly*, *Aſcites*, is the name given to every collection of waters that cauſes a general diſtenſion and ſwelling of the abdomen, or lower belly. Such collections are more frequent than thoſe which occur within the thorax, and, like them, are found in different ſituations. The moſt common form of abdominal dropſy is that which takes place in the general cavity of the belly, or, as it is more ſtrictly expreſſed, in the ſac of the *peritoneum*. Occaſionally, however, the water is contained in a preternatural ſac, formed upon and connected with one or other of the viſcera; the moſt frequent inſtances of which occur in the *ovaria* of females. Sometimes the collection conſiſts of ſpherical membranous bags of fluid, generally encloſing other ſimilar bags, which appear to be of an animalcular nature, and are termed *hydatids*. Very rarely the ſac of the *omentum* has been the ſeat of a dropſical collection; and in other rare inſtances water is found entirely without the *peritoneum*, or lining membrane of the abdomen, and between this and the abdominal muſcles. The collections of fluid connected with the viſcera, in preternatural ſacs or cyſts, have been denominated *encyſted dropſy*, or *hydrops ſaccatus*. The ſame term has been applied by ſome authors both to the collections of hydatids, and to the dropſy external to the peritoneum. See Hydatids.

The diſtinguiſhing characteriſtic of the ordinary form of aſcites, in the cavity of the belly, is an uniform, tenſe, and nearly inelaſtic ſwelling of the belly, in which the fluctuation of the water within may be perceived by the practitioner's feeling, and ſometimes by his hearing. The ſwelling is accompanied with a ſenſe of weight and diſtenſion, which vary a little according as the poſture of the body is changed, being felt the moſt on the ſide on which the patient lies. When the collection of water becomes conſiderable, it is always attended with a difficulty of breathing, even though there be no water in the thorax; becauſe, as the abdomen is diſtended in all directions, the diaphragm is neceſſarily preſſed upwards, and the cavity of the thorax ſtraightened. The fluctuation may be readily felt, by applying one hand open to one ſide of the abdomen of the patient, and gently ſtriking the other ſide. Where this is diſtinctly perceived, it affords a ſatisfactory diagnoſis, by which the diſeaſe may be pronounced to be neither *tympanites*, or windy dropſy, nor *phyſconia*, or ſolid tumour, nor pregnancy, when the patient is a female. It may be remarked, however, that when the diſtenſion of the belly is extremely great, it acquires a conſiderable degree of elaſticity, by which an incautious examiner might be led to ſuſpect *tympanites*. In aſcites, as in the other forms of dropſy, the urine is ſcanty, high-coloured, and generally thick after ſtanding. There is ſometimes a ſlight degree of fever preſent. Aſcites frequently occurs, when there is no other dropſical appearance; but it is often only a part of univerſal dropſy, and comes on from a gradually increaſing anaſarca. Sooner or later, however, it for the moſt part occaſions anaſarcous ſwellings of the lower extremities, although there is no general hydropic diathesis preſent.

Encyſted Dropsy, or *hydrops ſaccatus*, is often extremely difficult to aſcertain from its ſymptoms, eſpecially when the progreſs of the diſeaſe has not been accurately noticed; for where the ſac has already attained a large ſize, the ſwelling and fluctuation are ſimilar to thoſe of aſcites. In the *encyſted* dropſy, the ſwelling is at firſt confined to one part of the abdomen, and is often attended with an obtuſe pain; the fluctuation is for ſome time obſcure, or altogether imperceptible; and there is often a ſenſe of dragging and uneaſineſs

ſineſs on turning in bed. If theſe ſymptoms have not been preceded, or for ſome time accompanied by any remarkable derangement of the general health: if the ſtrength be little impaired, the appetite continue pretty good, and the natural ſleep be little interrupted; if the menſes in the female continue to flow, and there be no leucophlegmatic paleneſs or ſallowneſs of the complexion, and leſs thirſt or ſcantineſs of urine, than occur in dropſy in general;—according as more of theſe circumſtances take place, there will be ſtronger ground for ſuppoſing the *aſcites* to be of the *encyſted* kind.

Encyſted dropſy occurs in connection with moſt of the viſcera of the abdomen, but the form moſt frequently ſeen, is the HYDROPS *ovarii*, or encyſted dropſy attached to the *ovarium* in the female. In this caſe, the diſeaſe commences in one or other ſide of the hypogaſtric region, or lower part of the body, to which part the tumour is for ſome time circumſcribed, and is often moveable under the hand. There is ſometimes an uneaſineſs in the part, amounting rather to a ſenſe of weight, than of ſevere pain; and the health ſuffers little. By degrees the tumour becomes more fixed, more extended both forwards and upwards in the belly, and more painful and oppreſſive to the patient. When the cyſt is ſingle, and at length extended over the whole abdomen, it cannot be diſtinguiſhed by the feel from a common aſcites: till which period, however, it can hardly be ſaid to reſemble it. "I have had occaſion to ſee a great number of encyſted dropſies," Dr. Hunter obſerves, "many of them treated by phyſicians of the firſt rank, and yet have never ſeen one cured; nor have I ever known one caſe of that kind where the cyſt has been ſenſibly diminiſhed in bulk, by any other means than by the *trocar*. If I may form a judgment from what I have ſeen, both in the living and in the dead body, I ſhould believe that the dropſy of the *ovarium* is an incurable diſeaſe; and that a patient will have the beſt chance of living longeſt under it, who does the leaſt to get rid of it. The *trocar* is almoſt the only palliative." (See Med. Obſ. and Inquiries, vol. ii. p. 41,) This opinion is but too well founded. Nevertheleſs patients have in ſome inſtances lived to old age under the influence of this diſeaſe. The caſe of an unmarried woman is related in the Mem. de l'Acad. de Chirurg. tom. ii. who was attacked with this diſorder at the age of thirty, and lived to be eighty years old, when the ſwelling filled the abdomen. Mr. Martineau of Norwich communicated to the Royal Society, a caſe of *ovarial* dropſy, which began after a miſcarriage in the 27th year of the patient's age. She was firſt tapped in 1757, and afterwards had recourſe to the *trocar* three, four, or five times a year, till her death in 1783. She was tapped 80 times, and loſt 6631 pints of fluid. (See Lond. Med. Journal, vol. v. for 1784, p. 315.) Profeſſor Morand aſſerts, that he ſeveral times performed this operation upon a lady of quality, who ſuffered ſo little from it, that ſhe frequently went into the country the day after the operation, although generally eighteen pints of water were drawn out: nor did ſhe die at laſt of the dropſy, but of ſome other diſeaſe. (Van Swieten Com. ad Aph. 1223.)

Sometimes the cyſt in *ovarial*, or other encyſted dropſy, has burſt, and produced an aſcites of the abdomen, by pouring out the fluid into that cavity.

There is occaſionally a matter of great delicacy and difficulty of deciſion, which the phyſician is called upon to determine, namely, whether an abdominal enlargement be the conſequence of this diſeaſe, or of pregnancy. So much of character and feeling is concerned in ſuch a queſtion, that the utmoſt caution is neceſſarily requiſite, and the moſt comprehenſive inquiry into the circumſtances and ſymptoms ſhould be inſtituted, before any deciſion can be made. The ſymptoms of pregnancy in the early months are various and ambiguous, and thoſe of *encyſted* dropſy are perhaps ſtill more uncertain. A careful compariſon of both, and of the general circumſtances of the health, can alone enable us to form a correct judgment. See PREGNANCY.

The DROPSY *of the Peritoneum*, as it has been termed by ſome writers, (See Med. Obſ. and Inq. vol. i. p. 7.) or dropſy between the peritoneum and abdominal muſcles, has been included under the term of encyſted dropſy by Dr. Cullen and others. (Monro loc. cit. p. 118.) It is the ASCITES *internus* of Sauvages, Spec. 14, who quotes La Mothe Obſ. 100. Van Swieten has entered into a long diſcuſſion of a queſtion, reſpecting the ſeat of this effuſion, *viz.* whether the fluid is collected between the duplicature of the peritoneum, as the ancients ſuppoſed, or between the peritoneum and muſcles. It is probable the older phyſicians were miſled, in believing the peritoneum to be double, by the thickening of the cellular membrane, external to the peritoneum. (See Mead, Monit. et Præcep. p. 128.) Liſtre has deſcribed the diagnoſtic ſymptoms of this form of dropſy. It agrees with the encyſted dropſy, he obſerves, in the locality and ſlow progreſs of its ſymptoms, for a conſiderable period after the commencement; the ſwelling does not alter much in form by change of poſition, as in aſcites; it does not begin in the lower part of the body, nor is accompanied with obtuſe pain, as in ovarial dropſy; the fluctuation is confined within the limits of the ſwelling; the lower extremities do not ſwell, or very little; and the patient ſuffers ſcarcely any other inconvenience, than what ariſes from the ſize and weight of the tumour gradually increaſing. (Van. Swieten ad Aph. 1226.) A caſe of this ſpecies of dropſy is related in the Philoſophical Tranſactions, which occurred in a woman, whoſe belly was amazingly ſwelled, but who lived upwards of 30 years, in other reſpects healthy. And a ſtill more extraordinary inſtance of the ſame ſpecies of dropſy, in the perſon of Elizabeth Boucheret, of Spitalfields, is recorded in the firſt vol. of the Med. Obſ. and Inquiries. She continued 44 years without any perceptible change in the ſize of her ſwelling, (ſhe meaſured upwards of three yards round the waiſt,) and died at the age of 82. She would never conſent to be tapped.

DROPSY *of the Head*, or *chronic hydrocephalus*. The title of dropſy of the head has been given to two very diſtinct forms of diſeaſe, differing widely in their nature, origin, progreſs, and appearances from each other; one of which has been denominated the *acute*, and the other the *chronic* hydrocephalus. It is the latter only which, in its general characteriſtics, partakes of the true dropſical nature, and therefore falls under our cognizance in this place. The other diſeaſe, which has been variouſly named hydrocephalus *internus*, and *acutus*; *Apoplexia hydrocephalica*, and *Phrenicula*, will be deſcribed hereafter under its moſt common appellation, HYDROCEPHALUS.

The chronic dropſy of the head is a diſeaſe, which commences in early infancy, or ſubſiſts from or even before birth, and conſiſts in a ſlow effuſion of water, ſometimes external to the brain, but within the bones of the ſkull, before thoſe bones have united by their ſutures, and thus preventing their union, and diſtending the head to an indefinite ſize, while the face remains unchanged, or at all events very diminutive in compariſon with the cranial tumour. The head, thus enlarged, is ſoft to the touch, and ſomewhat elaſtic, and the openneſs of the ſutures may be perceived by the touch. This is an irremediable diſeaſe, and fortunately rare. Inſtantaneous death is ſaid to have followed every attempt to relieve the diſorder, by opening the ſwelling. We are acquainted

quainted with one case of this species of dropsy, in a female, who lived to the age of 16 years. She was blind, and without the power of locomotion; the head had attained an enormous and unwieldy magnitude, so that a hollow support, in the back of the chair in which she sat, was constructed to receive it.

The Dropsy *of the spinal marrow*, *spina bifida*, or *hydrorachitis*, is also a congenital and universally mortal disease, in which there is a deficiency in some part of the spine, and a watery tumour communicating with the spinal marrow. See Hydrorachitis.

Dropsy *of the scrotum*, in *Surgery*. See Hydrocele.

Dropsy *of the eye*. See Hydrophthalmia.

From the preceding view of the various forms and causes of dropsy, it must be obvious, that the general *prognosis* must be, on the whole, unfavourable. The difficulty of removing the disease was thus long ago noticed by Aretæus. "Ab ipso pauci liberantur, idque felicitate, ac deorum potius quam artis auxilio." And modern physicians, says Dr. Home, were they as honest, could say little more. Of thirty cases, however, which this intelligent physician has detailed, twenty are reported as cured. (See Clinical Experiments and Histories, p. 349, *et seq.*) And of 47 cases, related by Dr. Ferriar, 22 are described as cured, five relieved, seven not relieved, ten dead, and three convalescent. (See Medical Hist. and Reflec. vol. i. p. 108.) It appears, from Dr. Ferriar's table, "that cases of anasarca alone, or of anasarca and ascites complicated, are the most curable species of dropsy;—next to these ascites;—and that the most intractable kind is the complication of ascites and anasarca, or of either, with hydrothorax. The cases of hydrothorax alone were very favourable; but they are not in sufficient number to justify a conclusion." Of *four* such cases, *two* were cured, *one* relieved, and *one* convalescent. But in these diseases relapse is so frequent, that several of these cures would probably prove to be but instances of a temporary removal of the swellings.

In forming a judgment respecting the ultimate event of dropsies, the age and constitution of the patient, the nature of the causes, the symptoms and duration of the complaint, its simplicity or combination with other disorders, and the effects which remedies, already applied, have produced, must be taken into consideration. Universally, however, the less the strength of the constitution is impaired, or the blood impoverished, the more readily may the disease be expected to be ameliorated by remedies. On the contrary, if the disease occurs in advanced life, in a leucophlegmatic or broken habit, and has been brought on by intemperance, or is connected with organic disease of the heart, lungs, liver, ovarium, &c. medicine may alleviate it, but will seldom effect a cure. Among the *unfavourable signs*, are progressive wasting of the flesh, purple, or livid spots, or erysipelatous eruptions on the skin, spontaneous hæmorrhages from different parts, or diarrhœa, without relief, the swelling, when reduced by medicine, returning more quickly than before;—all implying the great prostration of the living powers: and constant feverish heat, and intense thirst, indicating the existence and progress of organic disorder. Among the *favourable signs* may be mentioned the absence of those just enumerated, the pulse remaining of good strength, steady, and not quick, the deficient excretions, especially the urine and perspiration, being sensibly increased by remedies of moderate power, and the appetite, respiration, and sleep, not suffering severely.

Cure of Dropsy.—In attempting the cure of dropsy, three indications present themselves to the practitioner: the first object to be accomplished, is the removal of the fluid already effused; the second, to obviate or remove the causes which gave rise to it; and the third, to restore the strength of the system, and prevent the return of the disease.

1. The fluids already collected may be evacuated either *indirectly*, through the natural excretories of the body, by exciting them to increased action; in consequence of which an absorption may be excited in the dropsical parts, and the serum, thus absorbed and carried into the blood-vessels, may pass out by one or other of the common excretions. The principal emunctories, through which the effused fluids may be made to pass off, are the stomach, the intestines, the kidnies, and the skin, by means of their corresponding evacuants, emetics, cathartics, diuretics, and diaphoretics. Or they may be drawn off *directly*, by artificial openings, produced by punctures, blisters, &c.

Spontaneous vomiting has sometimes been observed to occasion absorption in dropsical parts, and to evacuate the fluids contained in them: and hence perhaps the use of *emetics* was first suggested in the cure of dropsy. The practice is very ancient; Aëtius recommends emetics in simple anasarca. Our countryman, Sydenham, used them largely in the cure of dropsy, especially the drastic antimonial emetics, which he prescribed in large doses, frequently repeated, and at short intervals. A copious purging generally followed the emetic effect of these remedies. Sydenham, as well as the ancient writers, seems to have considered the concussion and commotion of the viscera, as the chief curative effect of emetics, which thus were supposed to occasion the resorption of the fluids, as well as to open obstructions of the viscera. And if purging did not ensue, after the concussion of vomiting, Sydenham ordered a brisk purgative to carry off the water, so absorbed, from the intestines. (Syden. Tract. de Hydrope.) It is obvious, however, that the antihydropic effects of vomiting are extremely uncertain; and that, where the patient is already much debilitated, their operation in a violent way must be attended with detriment, if not with danger. The practice is, on the whole, therefore, little resorted to at present.

The emetic operation of a substance much used in dropsy, the *scilla*, or squill, has been the subject of some difference of opinion. Van Swieten, Russell, and others, consider this medicine as more effectually relieving dropsy, when its emetic operation is avoided; (Swieten ad Aph. 1243. Russell de tabe glandul. p. 68.) whereas Dr. Home deems it most chiefly useful, when vomiting is excited by it. Of *ten* hydropic patients, who took the squill, seven were cured, in each of whom it produced vomiting; and three were not cured, none of whom had any vomiting, but in all of whom the other evacuations were increased. "During the vomiting," he observes, "much fluid is thrown up, and the abdomen falls in proportion. Sometimes a pint or two only, sometimes twelve pints are evacuated, in one paroxysm. In this way the hydropic symptoms disappear, and take from two to sixteen days before that happens." (Clin. Exper. p. 371.)

Cathartics, however, are among the more powerful remedies against dropsy, and patients more readily submit to purging, than to the operation of emetics. This practice was also employed by the ancients, and was suggested probably by the occasional natural cure of dropsy, by a spontaneous diarrhœa. Hippocrates, in several places in his writings, notices the salutary effects of such a diarrhœa in the *beginning* of dropsy. "If a spontaneous diarrhœa come on," he says, "in the beginning of the disease, the patient will probably recover: but if there be no such diarrhœa, let a cathartic be given." (De Morbis, lib. ii. cap 28.) There are certainly no means in our power of procuring a copious

evacuation

evacuation of ferous fluids more effectually than by the operation of purgative medicines, and none perhaps more fucceſsfully employed in the cure of dropſy. (See CATHARTICS.) The relief is generally in proportion to the quantity of fluids diſcharged; whence it is the cuſtom to employ purgatives of the more active or draſtic kind, ſuch as jalap, alone, or combined with calomel, gamboge, or cryſtals of tartar, ſcammony, and even elaterium. The employment of cathartics ſhould be regulated, however, with ſome caution and diſcrimination. Where the conſtitution is obviouſly much broken by age, long continued diſeaſe, or intemperance, all violent operations and copious diſcharges will be detrimental; they will tend but farther to weaken the body, and to render it leſs able to ſupport the ravages of a ſevere diſorder. When the ſtrength, age, and other circumſtances of the patient admit of the uſe of cathartics, they ſhould be repeated at ſhort intervals. They are more beneficial and ſafe in ſimple *aſcites*, than in the other forms of dropſy, or in the combination of them. For the watery fluids diſcharged by purging, are evacuated from branches of the ſame arteries, which pour out water into the abdomen, and the ſtimulus of the purgative is moſt directly communicated to the abſorbents of the abdominal ſurfaces.

It has been obſerved, however, of late years, that ſome cathartic medicines, of milder qualities than thoſe juſt enumerated, are beneficial in dropſy, eſpecially the *cryſtals of tartar*, or acidulous tartrite of potaſs. In conſequence of the ſuggeſtions of Manghini. (in the Comment. Bonon. tom. 4.) Dr. Home inſtituted a ſeries of experiments upon the effects of this ſalt in the various forms of dropſy; and his report of the reſult was very favourable. Since that period, the medicine has been again made the ſubject of comparative trial by Dr. Ferriar, who has alſo experienced much benefit from its adminiſtration. Of twenty caſes under Dr. Home's care, the dropſical ſymptoms diſappeared in thirteen, under the uſe of the cryſtals of tartar, and in ſeven they were not removed. He obſerved it to be more ſucceſsful in anaſarca, next in aſcites, and leſs in hydrothorax than in the other two. He generally ordered half an ounce to be taken in the morning, at different times, before breakfaſt, diſſolved in about ten ounces of water; afterwards increaſing the doſe. It generally purged the patient twice or thrice a day with eaſe, and alſo acted as a diuretic. But Dr. Home remarks that its antihydropic powers were much greater than thoſe of many articles which are much ſtronger diuretics; and, therefore, he conſiders that its principal mode of operation is deobſtruent: for it ſometimes cured the dropſy, when little or no evacuation, either by ſtool or urine, was produced. (Clin. Exper. p. 326 *et ſeq.*) Dr. Ferriar found the cream of tartar the moſt effectual remedy for dropſy. He gave it, after the manner of Dr. Home, in forty-three caſes; of theſe thirty-three recovered, nine died, and three were relieved. He generally found it purge the patient four or five times a-day; ſo that inſtead of increaſing the doſe, he was often obliged to order tonics and cordials, to enable the patient to bear the uſual quantity. In the ſucceſsful caſes, it operated early, and generally produced alſo an increaſed flow of urine within twenty-four hours. But he adds, that it diminiſhes the ſwellings more ſpeedily than the increaſe of urine would lead us to expect. (Med. Hiſt. &c. vol. i. p. 88, & ii. p. 162.) This medicine, however, like all other evacuants, employed for the cure of dropſy, frequently diſappoints the practitioner.

The kidneys afford a natural outlet for the watery part of the circulating fluids; and the diminution of the urine being a prominent ſymptom, under every form of dropſy, the re-excitement of that excretion at once ſuggeſts itſelf as a probable means of carrying off the preternatural accumulation of water, which conſtitutes the diſeaſe. *Diuretic* medicines have, therefore, been always properly adminiſtered in the treatment of dropſies. Unfortunately, however, all medicines of this claſs are very uncertain in their operation; and we are ignorant of the circumſtances which cauſe them ſometimes to ſucceed, and ſometimes to fail, and which render one article beneficial, and another inert. At all events diuretics, like other evacuants, are rarely of themſelves adequate to a cure, inaſmuch as the effuſion of the water, which they remove, generally depends upon ſome diſeaſe of the conſtitution at large, or upon ſome local obſtruction.

The *ſquill*, in a variety of forms of preparation, is often uſeful as a diuretic, and has been uſed from ancient times for the purpoſe of increaſing the urinary diſcharge. The *digitalis*, or foxglove, has been introduced in our own time by Dr. Withering, as a powerful diuretic: but on account of its powerful effects on the pulſe and nervous ſyſtem, much caution is requiſite in adminiſtering it. It appears that, where it proves ſucceſsful, it generally gives relief early, and in ſmall doſes; hence, if it do not produce any deciſive effects within the firſt week or ten days, it is adviſeable to exchange it for ſome other diuretic, or to interpoſe a cathartic. This obſervation, indeed, is applicable to diuretic medicines in general. It has been obſerved, that when given in ſuch quantities as to excite nauſea, or to produce evident narcotic effects, the digitalis does not oprrate as a diuretic. Others, however, have aſſerted the contrary. Dr. Withering early remarked, that a relaxed, weakened, and depreſſed ſtate of the ſyſtem, was moſt favourable for procuring the full effects of this medicine; and that in perſons of tenſe fibre, florid complexion, and much natural ſtrength, labouring under dropſy, it ſeldom ſucceeded; whereas, when the pulſe was feeble or intermitting, the anaſarcous limbs and body ſoft and yielding, the countenance pale, and the ſkin cold, the diuretic powers of the plant were conſpicuous. The laſt writer on the ſubject, Dr. Hamilton, of Bury St. Edmund's, confirms this fact; as does the general experience, we believe, as far as regards *aſcites* and *anaſarca*; but with reſpect to *hydrothorax*, he aſſerts that the digitalis ſucceeds in the oppoſite ſtate of the ſyſtem. (Obſerv. on the preparation, &c. of Digitalis purpurea, 1807.) Dr. Carcno of Vienna affirms, that the digitalis *lutea* poſſeſſes ſtronger diuretic powers than the D. *purpurea*, in common uſe.

Bacher's tonic pills, (the principal article in which is the *melampodium*, or hellebore,) are among the diuretics often employed in dropſy. They generally purge alſo when ſucceſsful; but in caſes of long ſtanding they evidently weaken the patient. Yet whenever they produce a *diureſis*, they reduce the ſwellings, according to Dr. Ferriar. Theſe two effects, Dr. Home long ago obſerved, are by no means reciprocal in the uſe of all diuretics. The *ſpiritus ætheris nitroſi*, for inſtance, is an active diuretic, but has a very feeble antihydropic power.

Among other diuretic medicines, which, in caſe of failure with the more common articles, may be reſorted to, are, the *nicotiana*, or tobacco, in tincture, as recommended by the late Dr. Fowler, of York; the *lactuca viroſa*, as employed by Collin of Vienna, (ſee Lond. Med Journal, vol. i p. 263, for 1781);—the ſulphat of copper, or *cuprum vitriolatum*, uſed with ſucceſs by Dr. Wright, (ſee the ſame Journal, vol. i. and x.);—and the mild neutral ſalts, ſuch as nitre, *kali acetatum*, &c. A number of more ſtimulant diuretics may likewiſe be employed on particular occaſions, eſpecially in the dropſies of the old and debilitated. The tincture of *cantharides*, the turpentines, and the æthers are medicines of this claſs;—and ſeveral vegetable ſubſtances may be alſo included

cluded under this head, such as an infusion of mustard seed, of the wild carrot, of the *raphanus rusticus;*—a decoction of the tops of green broom, (*genista,*) of the *petroselinum,* of the artichoke, &c.

It must be particularly observed, that a practice prevailed for many ages of interdicting the use of drink of any kind in dropsies, and that such an opinion is still extensively prevalent among the vulgar. It was supposed that watery liquors taken in by drinking must run off by the exhalents into the dropsical parts, and augment the disease. "Crescit, indulgens sibi, dirus hydrops" was the notion of physicians as well as of poets. But a more accurate investigation has taught us, that the thirst attendant on dropsy, like the suggestions of nature in general, is not a deceptive sensation, tending to pernicious ends; but, on the contrary, that a free use of diluent drink is absolutely medicinal, and that, as Dr. Cullen says, "there is hardly any *diuretic* more certainly powerful than a large quantity of common *water* taken in by drinking." Dr. Home observes, "I have known several cured by drinking Dunse water plentifully, even after it had been carried home, and so no better than common water;" and he quotes Dr. Baker, who has related many cases in which cold water, in great quantity, brought on a flow of urine, and cured the dropsy. Dr. Milman has also strongly recommended the use of diluent drink, upon the authority both of his own experience, and of that of several eminent physicians in other parts of Europe. (Tractat. de Hydrope.) In short, the testimonies in favour of this practice are copious and unquestionable; while it is not less satisfactorily ascertained, that abstinence from drink is detrimental, rather than beneficial. Dr. Cullen, indeed, is disposed to attribute much of the good effects of the crystals of tartar, to the quantity of water in which it is administered; since Dr. Home found that it produced no benefit, when given undissolved. Wherever, therefore, diuretics are particularly useful, water may be taken largely with advantage. Dropsy, it is true, has been said to be induced by a free potation of watery liquids; but such a case is, at all events, rare, and occurs only under particular circumstances of the constitution; as when a person is much overheated, or when the hydropic *diathesis* is extremely great. In general, large quantities of diluents excite the action of the kidnies, if not of the bowels and skin, and run off readily by those excretories.

Diaphoretic medicines have also been employed as the means of producing a serous excretion, with a view to the cure of dropsy. But, although there are some instances on record of the success of sweating in dropsical affections, yet they are comparatively rare, and little certainty is to be looked for in the operation of sudorific medicines. This function of the skin is indeed generally impaired in dropsy, and is with difficulty restored; and when it has been readily affected by medicine, we may generally conclude that there was a returning disposition to health already existing in the habit.

Mercury is a medicine often administered in dropsical diseases with much advantage. From its universal stimulant agency on the vascular and absorbent system, it seems particularly calculated to be useful in those species of dropsy in which there is visceral obstruction, by at once exciting the action of the excretory organs, the kidnies, bowels, &c. and of the other glandular viscera, in which disease exists, especially the liver. It is sometimes employed externally by friction on the surface of the abdomen, particularly in ascites, by which means the action of the absorbents is supposed to be aided: and it is often advantageously combined, as an internal medicine, with other diuretics, especially the squill and fox-glove, or with the alcoholized æthers. Dr. Ferriar found the diuretic effect of mercurial friction joined with *spiritus ætheris vitriolici,* so powerful as to produce a constant flow, amounting to an incontinence of urine, in a very old and much enfeebled subject. Mercury seems to be improper where the disease exists in broken down and aged constitutions, or where it arises from an extreme dropsical *diathesis;* and to be chiefly indicated in ascites, connected with visceral disease, and occurring in habits which retain somewhat of their original stamina. The intelligent physician, just quoted, is of opinion, that mercury should be considered as a resource, only after the failure of milder remedies, which produce a less sudden and a less permanent impression on the constitution.

The *direct* methods of removing the effused fluid consist, as we have stated, of artificial openings into the dropsical cavities, by tapping, punctures, issues, blisters, &c. The three last mentioned modes of evacuations apply principally to ANASARCA, which see.

The operation of *paracentesis,* or tapping, may be sometimes resorted to with great benefit, and often at least with temporary relief, in *ascites,* whether of the *encysted* kind, or in the cavity of the abdomen. In the encysted *ovarial* dropsy, we have already remarked, that tapping affords the only means of alleviation which we possess, and we have mentioned some instances in which life was prolonged, even to a late period, by successive repetitions of the operation. It is not easy to determine, under what circumstances of the diffused abdominal ascites the tapping is to be particularly employed. The very early use of it is often injurious; and yet it may be detrimental to postpone it too long: for if the tension is extreme, the functions of respiration, and of the stomach and bowels, are much impaired by the extreme compression of the water upon these organs and upon the diaphragm, and the danger of a fatal inflammation of the intestines is incurred. Such a state of the intestines is often observed on dissection, especially when the patient had been carried off by a diarrhœa, which Hippocrates and his followers have pronounced fatal, when supervening at a late period in a dropsy of long continuance. Tapping must not be employed, of course, in the old and debilitated; and it can only afford an uncertain temporary relief when the disease depends upon a general hydropic diathesis. The water, in most instances, is speedily poured out again, after the evacuation by tapping; but sometimes the removal of it favours the operation of diuretics, and a long interval of freedom from the effusion is thus occasioned.

The manner of performing the operation, and the management requisite during and after the performance of it, belong to the province of surgery. See PARACENTESIS.

The *paracentesis* of the thorax, in dropsy of that cavity, was practised by the ancients, and by some of the moderns, with occasional success. (See many authorities collected by Van Swieten Comment. ad Aph. 1219.) But from the numerous well-founded objections which occur to that practice, it is seldom or never attempted at present. In the first place, the symptoms, we have seen, are so equivocal, that there is much room for mistake as to the actual existence of hydrothorax; and it is still more difficult to ascertain the seat of the disease, whether it be in one sac of the *pleura* or in both, or in the *pericardium* only, or in the cellular tissue of the lungs themselves. In the next place, a wound of the lungs, or pericardium, in a bad habit of body, cannot be deemed free from danger. And thirdly, the tapping of the chest, like that of the belly, does not remove the *cause* of the disease, and therefore can at best but afford a temporary relief.

Some practitioners have so far lost sight of the nature of the functions of the living body, as to propose the injection of

of ſtimulating liquids into the cavities of the thorax and abdomen, after the evacuation of the water by tapping; in order to excite an univerſal adheſive inflammation in the peritoneum and pleura, by which thoſe cavities might be obliterated, by the adheſion of the inteſtines and lungs to them reſpectively; and thus a recurrence of the effuſion prevented. This is done effectually in the caſe of dropſy of the ſcrotum, or HYDROCELE. But, not to mention the extreme danger of a general pleuritic or peritoneal inflammation, however excited, it muſt be obvious, that a general adheſion of thoſe organs to the *parietes* of their reſpective cavities, muſt be altogether inconſiſtent with the performance of their functions; and that neither reſpiration, nor the periſtaltic motion of the bowels, could afterwards go on. A proof that this is the conſequence of general adheſion of the lungs to the ribs may be found in a caſe related by Dr. Marcet, in the Edinburgh Med. and Surg. Journal, vol. i. p. 412.

Fatal experience has ſhewn, that the *paracenteſis* cannot be applied to the chronic *hydrocephalus*, with any chance of ſucceſs. The operation has proved ſpeedily mortal whenever performed. (Swieten ad Aph. 1218.)

II. The *ſecond* indication to be purſued in attempting the cure of dropſy, is to obviate or remove ſuch of the cauſes, which gave riſe to it, as ſtill continue to operate. The external cauſes, which may ſtill continue their influence, are the firſt to be combated; ſuch as expoſure to cold and moiſture, ſcanty food, intemperance, &c. It will avail but little to have removed the effuſed fluids, if theſe cauſes are permitted to keep up their morbid operation. It will be alſo neceſſary to inveſtigate accurately the internal cauſe or cauſes, immediately producing the loſs of balance between the exhalation and abſorption.

Where the internal cauſe appears to be a general debility, operating more eſpecially upon the exhalent veſſels, and conſtituting the hydropic diatheſis, tonic and corroborant medicines muſt be adminiſtered, particularly the ſimple bitters, variouſly combined with ſtimulants, chalybeates, alkalies, &c. as the circumſtances of the caſe may require. Theſe ſtrengthening medicines, indeed, may be often advantageouſly combined from the beginning with the diuretics, in dropſical caſes, connected chiefly with debility. Friction may be likewiſe employed in ſuch caſes, to aid the action of the blood-veſſels, and prevent the ſtagnation of fluids in their extremities. The uſe of the fleſh bruſh has often contributed to diſcuſs œdematous ſwellings; and in aſcites, a long continued gentle friction of the ſkin over the whole abdomen, by the fingers dipped in oil, has been ſometimes uſeful in exciting an increaſed flow of urine. Exerciſe, too, is uſeful, not only by contributing to obviate general debility, but by promoting the motion of the venous blood, to which the action of the muſcles, eſpecially in walking, greatly contributes. In ſome inſtances exerciſe has proved a cure to the diſeaſe, by exciting a copious flow of urine. This occurred in a lady, between 40 and 50 years old, after the operation of tapping had been performed ſixteen times. (See Lond. Med. Journ. vol. vii. p. 54.)

Where the internal cauſe is *obſtruction*, from congeſtion of blood, weak inflammatory action, torpor or morbid change of ſtructure, in any conſiderable viſcus, (as the lungs, liver, ſpleen, &c.) the uſe of bliſters is indicated; and mercury may be adminiſtered in combination with opiates, and antimonials, with *cicuta*, *hyoſcyamus*, and other medicines, which are believed to poſſeſs a deobſtruent power, by the ſtimulus which they impart to the extremities of the arterial ſyſtem.

III. When the effuſed fluids have been fortunately removed, and the cauſes obviated, by the means recommended above, the next object is to adopt ſuch means as are likely to reſtore the ſtrength of the patient, and to prevent a recurrence of the diſeaſe. A perſeverance in the uſe of exerciſe, of tonic medicines, and of a light, but nutritious diet, temperately taken, muſt be principally enjoined. Exerciſe is ſuited to promote the regular performance of every function of the animal economy, particularly to promote perſpiration, and thereby prevent the accumulation of watery fluids in the body, and to increaſe the digeſtive powers of the ſtomach. The latter function, digeſtion, is likewiſe greatly promoted by the uſe of chalybeate, bitter, and aromatic medicines, and the tone of the ſyſtem in general is thus alſo greatly reſtored. The cold bath is, on many occaſions, the moſt powerful ſtrengthener that we can employ; but at the beginning of dropſy, when the debility of the ſyſtem is conſiderable, it cannot be attempted with ſafety; neither, after the waters have been fully evacuated, can it be ſafely employed, as a means of preventing a relapſe, until the ſyſtem has otherwiſe recovered a good deal of its vigour. Then cold bathing may be very uſeful in confirming and completing it. But while the means of ſtrengthening the ſyſtem are thus adopted, it will be proper to keep in view for ſome time the ſupport of the watery excretions; not only of the perſpiration by a great deal of exerciſe, but alſo of the urinary excretion by the frequent uſe of diuretics.

It were impoſſible to point out every variety of treatment more particularly ſuited to each individual form or kind of dropſy. A few general principles, as we have endeavoured to ſtate above, include the whole of its modifications; and an attention to them will readily ſuggeſt the means adapted to the particular circumſtances of individual caſes.

DROPWORT, in *Botany*. See SPIRÆA.

DROPWORT, *Hemlock* and *Water*. See OENANTHE.

DROSACHA, or DROSICHA, in *Ancient Geography*, a town of Aſia, in the country of the Serres, according to Ptolemy.

DROSCHOLM, in *Geography*, a town of Denmark, in the iſland of Zealand; 40 miles W. of Copenhagen.

DROSENDORF, a ſmall town of Auſtria, with an ancient caſtle, ſituated in Lower Auſtria, in the circle above the Manhartsberge, on the river Teya, on the borders of Moravia; 24 miles S.W. of Znaim. It is ſometimes miſſpelt Droſſendorf.

DROSERA, in *Botany*, (Δροσερα, *dewy*, from Δροσος, *dew*, becauſe of the moiſture which always ſtands on the ſurface of its leaves, and exudes from the glandular hairs that cover them,) Sun Dew.—Linn. Gen. 154. Schreb. 207. Willd. Sp. Pl. v. i. 1543. Juſſ. 245. Gærtn. t. 61. Claſs and order, *Pentandria Hexagynia* (not *Pentagynia*). Nat. Ord. *Gruinales*, Linn. *Capparidibus affines*, Juſſ.

Gen. Ch. *Cal.* Perianth of one leaf, in five acute ſegments; erect, permanent. *Cor.* funnel ſhaped, of five obovate, obtuſe petals, rather larger than the calyx. *Stam.* Filaments five, rarely ten, awl-ſhaped, the length of the calyx; anthers ſmall. *Piſt.* Germen roundiſh; ſtyles ſix or eight, ſimple, the length of the ſtamens; ſtigmas ſimple. *Peric.* Capſule ſuperior, ſomewhat ovate, of one cell, with three or four valves. *Seeds* numerous, minute, nearly ovate, rough, fixed to a central ridge in each valve.

Eſſ. Ch. Calyx in five ſegments. Petals five. Capſule ſuperior, of one cell and three or four valves, with many ſeeds.

Linnæus mentions eight ſpecies, Willdenow 10, but ſome probably remain latent in the unexplored bogs of India and New Holland. The whole genus delights in a wet, turfy, or moſſy ſoil, and, as far as we know, is incapable of transplantation,

plantation, or of cultivation from feed. Its habit is characterized by the numerous, prominent, hair-like, glutinous glands, generally coloured, which clothe the upper furface of its leaves, and which feem to be irritable, clofing over and enfolding any fmall infect that fettles upon the leaf. At leaft fuch is the cafe with our three Britifh fpecies, *Drofera rotundifolia*, Engl. Bot. t. 867, *longifolia*, t. 868, and *anglica*, t. 869; which laft is diftinguifhed by having eight ftyles, and a capfule with four valves. The flowers of thefe are white, or flightly tinged with pink; the glandular parts of the herbage bright red. *D. capenfis* is faid to have a violet-coloured blofom. Befides the elegant *D peltata*, Sm. Exot. Bot. t. 41. Willd. Sp. Pl. v. 1. 1546, whofe ftem bears triangular peltate leaves fringed with numerous glands, and feveral rofe-coloured flowers, we have from the fame country, New South Wales, a larger and ftill more remarkable fpecies, named by fir Jofeph Banks and Dr. Solander *D. dichotoma*, hitherto not defcribed by any author. The *leaves* are all radical, ftalked, once or twice forked, linear, narrow, acute, their upper fide clothed with glandular hairs, the margins entire. *Stalk* folitary, naked, corymbofe, a foot or more in height, fmooth, bearing numerous, large, elegant, white flowers, much refembling thofe of *Dionæa mufcipula*, which fee. This herb turns entirely black in drying, except the petals, which become of a light brown.

Dodonæus mentions that fome phyficians of his time, obferving the permanent moifture of our European fun-dew, which is never dried up by the moft burning fun, conceived the plant muft be an admirable medicine to reftore the vital moifture of confumptive patients. He confeffes, however, that experience did not confirm this ingenious hypothefis; for the diftilled water being ufed, which, like the whole plant, is acrid and even caftic, the unfo tunate patients who took it died fooner than thofe who did not. An admirable illuftration of theoretical phyfic!

DROSING, in *Geography*, a town of Germany, in the archduchy of Auftria; fix miles E. of Zifterfdorf.

DROSSEN, a fmall town of Pruffia, in the New Mark of Brandenburg, on the river Lenzen; 12 miles off Cuftrin. It is neatly built, and has a flourifhing manufacture of woollen cloth.

DROSSENFELD, a town of Germany, in the circle of Franconia and principality of Culmbach on the Maine; fix miles S. of Culmbach.

DROST, in *Biography*, painter of hiftory and portrait, about the year 1636. He was a difciple of Rembrandt, whofe manner he imitated. He afterwards travelled to Italy, fettled at Rome, and adopted the ftyle of the Roman fchool. Defcamps. Vie des Peintres Flamands, &c.

DROT, in *Geography*, a river of France, which runs into the Garonne, at Gironde.

DROTNINGHOLM, a fmall town of Sweden, in Upland, about nine miles to the weft of Stockholm, remarkable for a royal palace built in an ifland called *Lofon*, which is indebted for its prefent magnificence to Eleonora, the confort of prince Charles Guftavus, to whom it devolved in 1652. The name of Drotningholm fignifies Queen's ifland.

DROTZDORF, a town of Silefia, in the principality of Neyfza; three miles S. of Grotkow.

DROVA-DRUE, or Drou, a town of Africa, on the Grain Coaft; 60 miles N. W. of cape Palmas.

DROUE', a fmall town of France, in the department of Loir and Cher, chief place of a canton in the diftrict of Vendôme, with a population of 896 individuals. Its canton comprizes 12 communes and 7336 inhabitants, upon a territorial extent of 265 kiliometres. 2

DROVERS, are perfons that buy cattle in one place, and drive them for fale to another. They are to be married men, and houfholders, and to be licenfed by ftatute 5 Eliz. cap. 12; and if they drive their cattle on the Lord's day, they fhall forfeit 20s by 1 Car. I cap. 1. 29 Car. II. c. 7.

DROUGHT, in the *Natural Hiftory of the Air*, is a long continuance of dry weather. Great droughts are very prejudicial to the farmer and his pafture; and fuch years afford but very little reward for the labour and expence of keeping it in order. The only remedies are high inclofures, and plenty of water at hand. The firft of thefe is always in the farmer's power, and fhould be carefully provided by planting hedges in a proper manner, in counties moft fubject to fuffer by this difadvantage. The other is not always fo eafy, but may be managed feveral ways, as by finking wells; but thefe, when deep, are very expenfive; or by bringing the water in pipes, gutters, or other conveyances; and this is eafily done where there is a fpring or brook in the neighbourhood higher than the lands. Pumps, wheels, and fuch other engines, are alfo ufed in fome places to bring on the water; and in others, ponds, cifterns, and receptacles, are made to take in the rains and winter floods, and retain the water till fummer, when it is wanted.

The farmers of England are very deficient in this laft method, which they might ufe to their great benefit in many places. In Spain they have no water in many parts but what they preferve in this manner; and at Amfterdam and Venice they have whole cellars made into cifterns, which receive the water that falls in rains, and preferve it all the year. Want of water for the cattle in fummer, in many places, might be eafily remedied by fome care of this kind, and many thoufand acres of land made ufeful, which are now left as wafte, by this means alone. The practicability of thus obtaining water is evinced by its being done in places where there falls much lefs rain annually than with us; and yet by this the inhabitants have always frefh water enough for the ufe of their houfes, cattle, and gardens, none of which ever fail. See Cistern.

DROUN, in *Geography*, a fmall town of France, in the department of the Upper Vienne; fix miles S. E. of Dorat.

DROWNED Lands. See Orange.

DROWNING, the act of fuffocating, or being fuffocated by water.

People not accuftomed to diving, Dr. Halley obferves, begin to drown in about half a minute's time.

Drowning was anciently a kind of punifhment. In the time of Louis XI. of France, the chronicles affure us, that they frequently drowned their criminals, inftead of hanging them. Chron. Scand. See Fossa and Furca. Natural hiftorians and phyficians furnifh us with divers well attefted inftances of furprifing recoveries of perfons drowned; which, if maturely confidered, might perhaps let a little light into the dark notions of life and death.

We fhall not particularly recite the improbable ftories mentioned by Pechlin, De Aer. & Alim. Def. cap. 10. of one who was under water fixteen hours, of another who was under water three whole days, and of a third, who was in this ftate feven weeks, and recovered. "Sit penes ipfum fides." But there are feveral unqueftionable facts, though they have rarely occurred, in every country, which fhew the poffibility of a recovery from fudden death, whether by apoplexy, convulfive fits, fuffocation by noxious vapours, ftrangulation by the cord, or drowning. However, inftances of this kind merely excited tranfient attention and furprize, and many perfons were loft for want of proper attempts for their recovery. This was particularly the cafe in Holland, where,

where, from the great abundance of canals and inland seas, the inhabitants are much exposed to accidents by water: and where many persons were drowned every year for want of assistance. In 1767. a society was formed at Amsterdam, which offered premiums to those who should save the life of a citizen in danger of perishing by water; and which proposed, from time to time, to publish the treatment, and method of recovery observed in such cases.

This institution was every where encouraged through the United Provinces, by the magistrates, and by the States General, and has been attended with very considerable success; and it appears that no less than two hundred persons have been recovered from death, by this institution, in the space of about six years. In several of these cases, the recovered patients had continued upwards of an hour, without any signs of life, after they had been taken out of the water. Instigated by this example, the magistrates of health at Milan and Venice issued orders, in 1768, for the treatment of drowned persons. The city of Hamburgh appointed a similar ordinance to be read in all their churches, extending their succour not only to the drowned, but to the strangled, to those suffocated by noxious vapours, and to the frozen. The first part of the Dutch Memoirs was also translated into the Russian language, by command of the empress. In 1769, an edict was published in Germany, extending its directions and encouragement to every accident, like death, that afforded a possibility of relief. In 1771, the magistrates of the city of Paris also founded an institution in favour of the drowned; and in France they have been instrumental in saving forty-five persons out of sixty-nine, in about sixteen months. In 1773, Dr. Cogan, and Dr. Hawes, of London, proposed a plan for the introduction of a similar institution into these kingdoms. The plan was so well received and encouraged, that they were soon, *viz.* in 1774, enabled to form a society, since called the Humane Society, for promoting its laudable designs.

The following abstract of the plan of this society, and method of treatment recommended by it, will not, we apprehend, be unacceptable to our readers. This society has undertaken to publish, in as extensive a manner as possible, the proper methods of treating persons in the unfortunate circumstances, to which they extend their relief; to distribute a premium of two guineas among the first persons, not exceeding four in number, who attempt to recover any person, taken out of the water for dead, within thirty miles of the cities of London and Westminster, provided they have not been longer than two hours under the water, and provided the assistants persevere in the use of the means recommended for the space of two hours, whether their attempts are successful or not. These rewards are also to include every other instance of sudden death, whether by suffocation from noxious vapours, hanging, syncopies, freezing, &c. They propose to distribute, in like manner, four guineas, wherever the patient has been restored to life; to give to any publican, or other person, who shall admit the body into his house, without delay, and furnish the necessary accommodations, the sum of one guinea, and to secure them from the charge of burial in unsuccessful cases; and to present an honorary medal to those medical gentlemen, or others, who give their assistance *gratis*, and who are provided with a fumigator, and other necessaries always in readiness, in all those cases in which they may prove instrumental of success. The device on one side of their medal is a boy, who is represented blowing an extinguished torch, with the hope, as the legend, "Lateat scintillula forsan," imports, that a little spark may still remain. The reverse exhibits a civic wreath, which was the Roman reward for saving the life of a citizen, with a blank for the name of a person to whom the medal may be given; the inscription round the wreath, "Hoc pretium cive servato tulit," expresses the merit which obtained it.

Before giving any directions concerning the treatment of the drowned patient, it will be necessary to describe the method of recovering the body; the implements for this purpose are termed *drags*. In navigable rivers, and where the person falls into the river clothed, the common boat-hook is likely to prove the most useful, from the circumstance of its being almost always at hand; and though not otherwise well adapted for the purpose, a body may often be recovered by it, before other drags, kept for the purpose, can be procured; another circumstance in their favour is, that in towns (where such accidents mostly occur) there are generally several boats near, each furnished with its hook or hitcher, and may be employed all at the same time, while on the other hand it cannot be expected, that more than one drag can be got to the place in any reasonable time; for these reasons it seems, that if any drag were contrived which would answer well, for both boat-hook and hitcher, it would be the best for rivers and canals, where the drowning subjects are mostly clothed.

Dr. Cogan has lately invented two drags, for which the Society of Arts presented him with their gold medal in 1806. The first, which is a simple one, is shewn in *fig.* 2. *Plate* XV. *Miscellany;* it is composed of two iron prongs *a, b*, attached to the end of a pole: at the ends of the prongs jointed hooks are fixed, which can be placed so as to project beyond the prongs, when the drag is used to get up a body that is clothed, but for a naked subject they must be withdrawn, by means of the screw *b, fig.* 3, which slides in the groove in the end of the iron prong, and fastens the hook at any place, so that it may project beyond the prong, as A, *fig.* 3, or be placed by the side of it, as B, *fig.* 3.

The other drag has three prongs *a, b, d, fig.* 1, each divided into two at their extremities, and is furnished with six moveable hooks like the last; this drag is fitted to a pole *f*, and a long cord is fastened to it at *e*, and passing through a hole in the top or other end of the pole. It is intended to be thrown into the water as far as it can, and then drawn along the bottom to find the body; a small line *g* is fastened to it at *b*, to draw it back in a contrary direction, to disengage it from weeds, roots, or other obstacles which it may meet with in being drawn along the bottom. This drag is particularly adapted to ponds and other places where a boat cannot be had; while it may also greatly expedite the recovery of the body, if boats are at hand, owing to the ease and certainty with which it can be thrown to a considerable distance.

Fig. 4. is a drag, or rather a pair of tongs, well adapted for the purpose when they can be used in a boat, or in small and deep waters, like the locks on canals, wells, not deeper than the pole's length: *a a* is a pole, on the lower end of which an iron socket is fixed, forming a centre for two crooked irons *b a d', b' a' d'*; *e* is a strong ring sliding on the pole, having two iron rods *f. f*, joined to it, and thereby connecting it with the ends *a, a'*, of the crooked irons; the ring has a double rope *g*, tied to it to move the tongs by; the weight of the ring *e* always causes the tongs to open, as in the figure, and in this state the body is searched for; when it is found the rope is pulled, and the tongs thereby shut up, (as shewn by the dotted lines,) enclosing the body in them. The ends *b* of the tongs should be forked, and may be furnished with sliding-hooks, the same as Dr. Cogan's above.

The following is the method of treatment recommended by the society.

1. In

1. In removing the body to a convenient place, great care muſt be taken that it be not bruiſed, nor ſhaken violently, nor roughly handled, nor carried over the ſhoulders with the head hanging downwards, nor rolled upon the ground, or over a barrel, nor lifted up the hills. For experience proves, that all theſe methods are injurious, and often deſtroy the ſmall remains of life. The unfortunate object ſhould be cautiouſly conveyed by two or more perſons, or in a carriage, upon ſtraw, lying as on a bed, with the head a little raiſed, and kept in as natural and eaſy a poſition as poſſible.

2. The body being well dried with a cloth, ſhould be placed in a moderate degree of heat, but not too near a large fire. The windows, or door of the room, ſhould be left open, and no more perſons be admitted into it than thoſe who are abſolutely neceſſary; as the life of the patient greatly depends upon having the benefit of a pure air. The warmth moſt promiſing of ſucceſs is that of a bed, or blanket, properly warmed. Bottles of hot water ſhould be laid at the bottom of the feet, in the joints of the knees, and under the arm-pits; and a warming-pan, moderately heated, or hot bricks, wrapped in cloths, ſhould be rubbed over the body, and particularly along the back. The natural and kindly warmth of a healthy perſon lying by the ſide of the body has been found in many caſes very efficacious. The ſhirt, or cloaths, of an attendant, or the ſkin of a ſheep freſh killed, may alſo be uſed with advantage. Should theſe accidents happen in the neighbourhood of a warm-bath, brew-houſe, baker, glaſs-houſe, ſaltern, ſoap-boiler, or any fabrick where warm lees, aſhes, embers, grains, ſand, water, &c. are eaſily procured, it would be of the utmoſt ſervice to place the body in any of theſe, moderated to a degree of heat, but very little exceeding that of a healthy perſon.

3. The ſubject being placed in one or other of theſe advantageous circumſtances as ſpeedily as poſſible, various ſtimulating methods ſhould next be employed. The moſt efficacious are, to blow with force into the lungs, by applying the mouth to that of the patient, cloſing his noſtrils with one hand, and gently expelling the air again by preſſing the cheſt with the other, imitating the ſtrong breathing of a healthy perſon. The medium of a handkerchief, or cloth, may be uſed to render the operation leſs indelicate. If the lungs cannot be inflated in this manner, it may be attempted by blowing through one of the noſtrils, and at the ſame time keeping the other cloſe. Dr. Monro, for this purpoſe, recommends a wooden pipe, fitted at one end for filling the noſtril, and at the other for being blown into by a perſon's mouth, or for receiving the pipe of a pair of bellows, to be employed for the ſame purpoſe, if neceſſary. Whilſt one aſſiſtant is conſtantly employed in this operation, another ſhould throw the ſmoke of tobacco up the fundament into the bowels, by means of a pipe, or fumigator, ſuch as are uſed in adminiſtering clyſters; or by a pair of bellows, till the other inſtrument can be procured. A third attendant ſhould, in the mean time, rub the belly, cheſt, back, and arms, with a coarſe cloth, or flannel, dipped in brandy, rum, or gin, or with dry ſalt, ſo as not to rub off the ſkin; ſpirits of hartſhorn, volatile ſalts, or any other ſtimulating ſubſtance, muſt alſo be applied to the noſtrils, and rubbed upon the temples very frequently. Electrical ſhocks, made to paſs in different directions through the body, and particularly through the heart and lungs, have been recommended as very powerful ſtimuli; and from the trials that have already been made, promiſe conſiderable ſucceſs. The body ſhould, at intervals, be ſhaken alſo, and varied in its poſition.

4. If there be any ſigns of returning life, ſuch as ſighing, gaſping, twitching, or any convulſive motions, beating of the heart, the return of the natural colour and warmth, opening a vein in the arm, or neck, may prove beneficial; but the quantity of blood taken away ſhould not be large; nor ſhould an artery ever be opened, as profuſe bleeding has appeared prejudicial, and even deſtructive to the ſmall remains of life. The throat ſhould be tickled with a feather, in order to excite a propenſity to vomit: and the noſtrils alſo with a feather, ſnuff, or any other ſtimulant, ſo as to provoke ſneezings. A tea-ſpoonful of warm water may be occaſionally adminiſtered, in order to learn whether the power of ſwallowing be returned; and if it be, a table-ſpoonful of warm wine, or brandy and water, may be given with advantage; but not before, as the liquor may get into the lungs, before the power of ſwallowing returns. The other methods ſhould be continued with vigour, until the patient be gradually reſtored.

When the patient has been but a ſhort time ſenſeleſs, blowing into the lungs, or bowels, has been, in ſome caſes, found ſufficient; yet a ſpeedy recovery is not to be expected in general. On the contrary, the above methods are to be continued with ſpirit for two hours, or upwards, although there ſhould not be the leaſt ſymptoms of returning life. The ſame means of reſtoration are applicable to the various other caſes of ſudden death, recited in the beginning of this article.

When theſe meaſures prove unſuccefsful, the ſurgeon's laſt reſource is *bronchotomy*, or opening the *arteria trachæa*; for perhaps the air entering freely into the lungs, through the aperture made in the canal, through which they received it in their natural ſtate, will reſtore the play of the lungs, and all the motions of the breaſt.

Mr. Hunter, F. R. S. has, at the requeſt of a member of the Humane Society, publiſhed propoſals for recovering perſons apparently drowned. In the caſe of apparent death by drowning, he conſiders that a ſuſpenſion of the actions of life has taken place, owing to the loſs of reſpiration, and the immediate effects which this has on the vital motions of the animal; at leaſt, he ſays, this privation of breathing appears to be the firſt cauſe of the heart's motion ceaſing; therefore, moſt probably, the reſtoration of breathing is all that is neceſſary to reſtore the heart's motion. The loſs of life in drowned people has been accounted for, by ſuppoſing that the blood, damaged by want of the action of the air in reſpiration, is ſent, in that vitiated ſtate, to the brain, and other vital parts; by which means the nerves loſe their effect upon the heart, and the heart, in conſequence, its motion. But Mr. Hunter concludes from experiments on a dog, in which a large column of bad blood, *viz.* all that was contained in the heart and pulmonary veins, was puſhed forward, without producing any ill effect, and alſo from the recovery of drowned perſons, and ſtill-born children, that the heart's motion muſt depend immediately on the application of air to the lungs, and not on the effects which air has on the blood, and which that blood has on the vital parts. Therefore, blowing air into the lungs, ſoon after the immerſion, may be ſufficient to effect a recovery; and the dephlogiſticated air of Dr. Prieſtley may prove more efficacious than common air. But if a conſiderable time, as an hour, has been loſt, it may be neceſſary to apply ſtimulating medicines, as the vapour of volatile alkali, mixed with the air; and theſe are beſt thrown in by the noſtrils, as applications of this kind to the olfactory nerves rouſe the living principle, and put the muſcles of reſpiration into action, while ſome applications to the mouth rather depreſs than rouſe, by producing ſickneſs. The larynx ſhould be at the ſame time preſſed againſt the œſophagus and ſpine, which will prevent the ſtomach and inteſtines from being too much diſtended by the air; however,

ever, the trachæa, and the aperture into the larynx, ſhould be both left perfectly free. Heat alſo is congenial with the living principle, which by increaſing the neceſſity of action, increaſes action; and to a due proportion of heat the living principle owes its vigour. Bed-cloaths, properly heated, ſhould, therefore, be gently laid over the patient, and the ſtream of volatile alkali, or of warm balſams, and eſſential oils, may be thrown in, ſo as to come in contact with many parts of his body. The ſame ſtream may alſo be conveyed into the ſtomach by means of a hollow bougie, and a ſyringe; together with ſpirits of hartſhorn, pepper-mint-water, juice of horſe-raddiſh, and alſo balſams and turpentines, in ſuch ſmall quantities, as not to produce ſickneſs. Theſe may alſo be thrown up by the anus. When the heart begins to move, Mr. Hunter adviſes to leſſen the application of air to the lungs; he abſolutely forbids bleeding, becauſe it weakens the animal principle, or that principle which preſerves the body from diſſolution, and is the cauſe of all its actions, and which Mr. Hunter ſuppoſes to be inherent in the blood, and conſequently leſſens both the power and diſpoſitions to action. Nothing ſhould be adminiſtered that ordinarily produce a nauſea or vomiting, or by the anus, that has a tendency to produce an evacuation that way; becauſe every ſuch evacuation tends to leſſen the animal powers. On this account he does not particularly recommend the fumes of tobacco, becauſe they always produce ſickneſs or purging, according to the mode of their application. He recommends the following apparatus, with a view to the purpoſes of this ſociety. Firſt, a pair of bellows; ſo contrived with two ſeparate cavities, that by opening them, when applied to the noſtrils or mouth of a patient, one cavity may be filled with the common air, and the other with air ſucked out from the lungs; and by ſhutting them again, the common air may be thrown into the lungs, and that ſucked out of the lungs diſcharged into the room. The pipe of theſe ſhould be flexible, in length a foot or a foot and a half, and at leaſt three eighths of an inch in width; by this the artificial breathing may be continued, while the other operations, the application of the ſtimuli to the ſtomach excepted, are going on, which could not conveniently be the caſe, if the muzzle of the bellows were introduced into the noſe. The end next the noſe ſhould be double, and applied to both noſtrils. Secondly, a ſyringe with a hollow bougie, or flexible catheter, of ſufficient length to go into the ſtomach, and to convey any ſtimulating matter into it, without affecting the lungs. Thirdly, a pair of ſmall bellows, ſuch as are commonly uſed in throwing fumes of tobacco up the anus. Phil. Tranſ. vol. lxvi. part ii. p. 412. 425.

Fig. 5, *Plate* XV, *Miſcellany*, repreſents a pair of reſpiration bellows, by which this artificial breathing may be performed: theſe bellows are compoſed of two diſtinct pair of bellows, ſeparated by a thick board *a b*; below this one pair of bellows, *a b c d*, is placed, and above it another, *a b e f*; in the top board, *e f*, is a valve *g*, opening upwards; and in the lower board, *c d*, the valve, *h*, is placed, opening upwards. The middle board of the bellows is made up of three boards, two thin ones and a thicker one between them, as is plainly ſeen in the figure; the middle board is cut through with a channel, repreſented in the figure by a dark ſpace; the lower board is glued to it, and the upper one ſcrewed down on it with leathered joints. This channel forms a pipe, which communicates with the long flexible pipe *i k*; in this paſſage are two valves, one repreſented opening into the paſſage from the lower bellows, and the other opening out of it into the upper bellows. The bellows act in this manner: the upper one is intended to draw the foul air from the lungs, and the lower one to ſupply them with freſh. In the figure it is repreſented, as though the lower one was in the act of ſhutting, and forcing its air through the valve in the dark paſſage and pipe, *i k*, into the lungs of the patient: when theſe lower bellows are completely cloſed, a ſtuffed cuſhion at *l* cloſes the valve through which the air before iſſued, and the operator keeps it ſo: he now opens the upper bellows, which draw the impure air out of the dark paſſage through the valve which is within them, from the lungs of the patient; the ſtuffed cuſhion preventing the air from coming through the valves of the lower bellows: the upper lid, *e f*, is then to be forced down again; this cloſes the valve on the dark paſſage, and opens the valve at *g* in the lid, the foul air ruſhing out thereat. The operator now holds down the upper lid, that it may preſs upon the valve within the upper bellows, and keep it ſhut, and he then opens the lower bellows; this raiſes the valve at *h*, and fills them with freſh air, or with gas from a bladder, previouſly prepared, as ſhewn in the figure (when the ſtop-cock and ſcrew-plate, deſcribed below, are removed); he then cloſes them, and expels the air they contain, through the valve in the dark paſſage and pipe *i k*, into the lungs. Theſe operations are to be repeated as often as neceſſary, and repreſent the action of reſpiration very naturally, if it be done by a careful operator.

To render the bellows very portable, they may be made ſmall. The drawing is one-fourth the real ſize, which may be 9 inches long, 4 broad, and opens 3 inches at the fartheſt. When both bellows are ſhut, they will be only $1\frac{1}{2}$ inch thick, which is but the uſual ſize of an octavo volume, and may be carried in the pocket. It will be remembered, that though this ſize may not contain quite air enough for a grown perſon, yet it will be rather more than neceſſary for a child, and may therefore be a proper average ſize; and they will be very convenient to uſe, as the operator may hold them in his hands without a ſupport. To render them more portable, the flexible pipe unſcrews at *i*, and the handles, *p* and *g*, turn round upon centres, ſo as to lay acroſs the boards, without projecting from them; the middle handle, *n*, turns half round into a receſs made in the middle board, ſo as to be out of the way. The pipe, *k*, at the end of the leather pipe, is of ivory, to be introduced into the noſe or mouth of the patient.

Some phyſicians have recommended various gaſſes to be thrown into the lungs: this may be eaſily done, by applying a bladder of ſuch gas, furniſhed with a ſtop-cock and ſcrew-plate, to the lower valve of the bellows, as ſhewn in the figure, and forcing its contents into the lungs, inſtead of pure air; but from the difficulty of procuring ſuch gaſſes in time, we fear that this plan (whatever may be its merits in other reſpects) cannot be generally applied.

The Humane Society, ſince its firſt eſtabliſhment, to the preſent time, has been inſtrumental in recovering a great number of perſons out of the multitude of caſes to which their attempts have been applied. See Reports of the Society for the Recovery of Perſons apparently drowned.

Societies of a ſimilar nature have been formed at Norwich, Briſtol, Liverpool, Colcheſter, Hull, &c. and likewiſe at Cork, in Ireland. The board of police in Scotland has alſo intereſted itſelf in favour of the ſame benevolent deſign.

DROYE, in *Geography*, a river of Pruſſia, which runs into the Pregel; 4 miles W. of Inſterburg.

DROYSZIG, a town of Germany, in the circle of Upper Saxony, in Thuringia; 6 miles S. E. of Stoſſen.

DRUCKEBACH, a river of Germany, in Upper Bavaria, which runs into the Inn, about 3 miles below Kuſſtein.

DRUENSIS, in *Ancient Geography*, an episcopal see of Africa.

DRUENT, in *Geography*, a town of the principality of Piedmont; 4 miles S. W. of Turin.

DRUG, in *Commerce*, a general name for all spices, and other commodities, brought from distant countries, and used in the business of medicine, and the mechanic arts. The drugs used in medicine are very numerous, and make the greatest part of the commerce of our druggists. Some of them grow in England, France, &c. but the greatest part are brought from the Levant, and the East Indies.

A list of all of them would be endless. Some of the principal are, aloes, ambergris, amber, assa-fœtida, antimony, bezoar, borax, benjoin, camphor, cantharides, cardamum, cassia, castoreum, coloquintida, civet, coral, cubebs, coffee, cocoa, gum anime, armoniac, adraganth, elemi, gamboge, labdanum, opopanax, sagapenum, sandarac, lacca, jalap, manna, mastic, myrrh, musk, opium, pearls, quinquina, helebore, galanga, zedoary, rhubarb, sarsaparilla, storax, galbanum, sanguis draconis, senna, spermaceti, spica nardi, scammony, sal ammoniac, tamarinds, tea, turpentine, turbith, tutia, &c.

The natural history, &c. whereof, see under their respective articles ALOES, AMBERGRIS, &c.

The drugs used by dyers are of two kinds: the *colouring*, which give a dye, or colour; and *non colouring*, which only dispose the stuffs to take the colours the better, or to render the colours more shining. Of the first kind are, pastels, woad, indigo, kermes, cochineal, madder, turmeric, &c. Of the second kind are, alum, tartar, arsenic, realgal, salt-petre, common salt, sal gemmæ, sal ammoniac, crystals of tartar, agaric, spirit of wine, urine, pewter, iron, bran, starch, lime, ashes, &c.

There is a third sort of drugs, which answer both intentions; as the root, bark, and leaf, of the walnut-tree, galls, copperas, &c.

DRUGGET, a sort of stuff, very thin, and narrow, sometimes all wool, and sometimes half wool, and half thread; having sometimes the whale, but more usually without.

Those without the whale in the plain druggets are woven on a loom with two treddles, after the same manner as linen, camblet, &c. Those with the whale, or the corded druggets, are wrought on a loom with four treddles. Those are called threaded druggets that have the woof of wool, and the warp of thread. M. Savary invented a kind of gold and silver druggets; the warp being partly gold and silver thread, and the woof of linen.

DRUIA, in *Geography*, a town of Lithuania, in the palatinate of Wilna; 16 miles N.E. of Breslaw.—Also, a town of Russia, in the government of Polotsk, seated on the Duna; 50 miles N.W. of Polotsk.

DRUIDS, DRUIDES, or *Druidæ*, the philosophers, as well as the priests, or ministers of religion, among the ancient Gauls, Britons, and other Celtic nations.

Etymology of the Name.—Some authors derive the word from the Hebrew דרושים, *deruffim*, or *druffim*, which they translate, *contemplatores*. Picard, Celtopæd. lib. ii. p. 58. believes the Druids to have been thus called from Druis, or Dryius, their leader, the fourth or fifth king of the Gauls, and father of Saron, or Naumes. Pliny, Salmasius, Vigenere, &c. derive the name from δρυς, *oak*; on account of their inhabiting, or at least frequenting, and teaching in forests; or perhaps, because, as Pliny says, they never sacrificed but under the oak. But it is hard to imagine, how the Druids should come to speak Greek. Menage derives the word from the old British *drus*, dæmon, magician. Gorop. Becanus, lib. i. takes *druis* to be an old Celtic, and German word, formed from *trowis*, or *truwis*, a doctor of the truth and the faith; in which etymology Vossius acquiesces: accordingly M'Pherson derives Druid from the Teutonic word *Druthin*, a servant of truth. Borel deduces it from the Saxon *dry*, magician; or rather from the old British *dru*, or *derw*, oak; whence he takes δρυς to be derived, which is the most probable supposition. This last derivation is much countenanced by a passage in Diodorus Siculus (l. 5.), who, speaking of the philosophers and priests of Gaul, the same with our Druids, says they were called *Saronidæ*, from Σαρων, the Greek name of an oak, and also from the above-mentioned etymology assigned by Pliny, &c. They were also called *Semnothei*, from their profession of conducting the worship of the gods, and also *Senani*.

History of their origin and settlement in Britain.—The Druids are said by some to have been a tribe of the ancient Celts or Celtæ, (see that article,) who migrated, as Herodotus informs us, from the Danube towards the more westerly parts of Europe; and to have settled in Gaul and in Britain at a very early period. Accordingly they have traced their origin, as well as that of the Celts, to the Gomerians, or the descendants of Gomer, the eldest son of Japhet. But little certain is known concerning them before the time of Cæsar, who says, that they were one of the two orders of persons, that subsisted in Gaul, the other being the *nobles*. The case was the same in Britain, where it is supposed the principles and rites of Druidism originated, and from whence they were transferred to Gaul. This seems to have been the custom according to the account of the historian; such of the Gauls as were desirous of being thoroughly instructed in the principles of their religion, which was the same with that of the Britons, usually took a journey into Britain for that purpose. It is universally acknowledged, that the British Druids were at this time very famous, both at home and abroad, for their wisdom and learning, as well as for their probity; and that they were held in high estimation as the teachers both of religion and philosophy. But it has been disputed whether they were the original inventors of the opinions and systems, which they taught, or received them from others; some have imagined, that the colony of Phocæans, which left Greece and built Marseilles in Gaul about the second year of the 60th Olympiad (B. C. 539); imported the first principles of learning and philosophy, and communicated them to the Gauls and other nations in the west of Europe. (See Gronov. in Ammian. Marcell. l. 15. c. 9.) We learn, indeed, from Strabo (l. 4.) as well as from Ammianus Marcellinus, that this famous colony contributed not a little to the improvement of that part of Gaul where it settled, and to the civilization of its inhabitants. (See also Justin, l. 43. c. 4.) But though it should be allowed, that the Druids of Gaul and Britain borrowed some hints and embellishments of their philosophy from this Greek colony, and perhaps from other quarters, there is reason to believe that the substance of it was their own. Others have suggested that the Druids derived their philosophy from Pythagoras, who published his doctrines at Crotona in Italy, and resided there in the highest reputation for virtue, wisdom, and learning, above 20 years. It is certain, that the philosophy of the Druids bore a much greater resemblance to that of Pythagoras, than to that of any other sage of antiquity: but this resemblance, as Borlase suggests, (Antiq. of Cornwall, p. 74.) may perhaps be accounted for, by supposing that Pythagoras learned and adopted some of the opinions of the Druids, whilst he imparted to them some of his discoveries. It is well known, that this eminent philosopher, animated by an ardent love of knowledge, travelled

travelled into many countries in purſuit of it, and procured admiſſion into every ſociety that was famous for its learning. (Clem. Alex. Strom. 1. p. 304. Burnet, Archeolog. Philoſ. p. 11.) It is, therefore, highly probable in itſelf, as well as directly aſſerted by ſeveral authors, that Pythagoras heard the Druids of Gaul, and was initiated into their philoſophy. Thoſe who trace the religious principles of the Druids, in their primary origin, to the grandſon of Noah, muſt allow, that, at the period to which we now refer, and among the people of whom we are now ſpeaking, religion had degenerated into an abſurd, wicked, and cruel ſuperſtition. It does not appear how widely the Druids were diſperſed through Britain and the adjacent iſles; but it is well known that their chief ſettlement was in the iſle of Angleſey, the ancient *Mona*, which they probably ſelected for this purpoſe, as it was well ſtored with ſpacious groves of their favourite oak. Many of them ſeemed to have lived a kind of collegiate or monaſtic life united together in fraternities, as Ammianus Marcellinus (l. 15. c. 9.) expreſſes it, as the authority of Pythagoras decreed among his followers. As one principal part of their office was to direct the worſhip and religious rites of the people, the ſervice of each temple required a conſiderable number of them, and all theſe lived together near the temple where they ſerved. The arch-druid of Britain is thought to have had his ſtated reſidence in the iſland of Angleſey, above mentioned, where he lived in great ſplendour and magnificence according to the faſhion of the times, ſurrounded by a great number of the moſt eminent perſons of his order. In this iſle, it is aſſerted, that the veſtiges of the arch-druid's palaces, and of the houſes of the other Druids, who attended him, are ſtill viſible. (Rowland's Mona Antiq. p. 83., &c.) But ſeveral of the Druids led a more ſecular and public way of life, in the courts of princes, and families of great men, to perform the various duties of their function; for no ſacred rite or act of religion could be performed without a Druid, either in temples or in private houſes. It is alſo probable, that ſome of theſe ancient prieſts retired from the world, and from the ſocieties of their brethren, and lived as hermits, in order to acquire a greater reputation of ſanctity. In the moſt unfrequented places of ſome of the weſtern iſlands of Scotland, there are ſtill remaining the foundations of ſmall circular houſes, capable of containing only one perſon, which are called by the people of the country Druids' houſes. (Martin's Deſcr. of the Weſtern Iſles, p. 154.) As none of theſe habitations were ſuitable to a married life, it is probable that the Druids generally lived in a ſtate of celibacy, and were waited upon by a ſet of female devotees. (See DRUIDESSES.) Although it is not eaſy to aſcertain the preciſe number of the Britiſh Druids, we have reaſon to believe that it was very conſiderable. Both the Gauls and the Britons of this period were much addicted to ſuperſtition, and of courſe among a ſuperſtitious people there will be many prieſts. Beſides, we are informed by Strabo (l. 4.) that they entertained an opinion highly favourable to the increaſe of the prieſtly order: for they were fully perſuaded, that the greater the number of Druids they had in their country, they would obtain the more plentiful harveſts, and the greater abundance of all things. We learn alſo from Cæſar, (De Bell. Gall. l. 6. c. 13.), that many perſons, allured by the honours and privileges which the Druids enjoyed, voluntarily embraced their diſcipline, and that many more were dedicated to it by their parents. Upon the whole it is not unreaſonable to conclude, that the Britiſh Druids bore as great a proportion in number to the reſt of the people, as the clergy in popiſh countries bear to the laity, in the preſent age.

Claſſes and Gradations of Druids.—Cæſar informs us (ubi ſupra) that the Druids were variouſly diſtinguiſhed by their ranks and dignity; ſome of them being more eminent than others; and the whole order being ſubject to one ſupreme head or arch-druid. This arch-druid was the high prieſt, or "pontifex maximus," in all matters of religion, and the ſupreme judge in all civil cauſes, to whom appeals might be made from the tribunals of inferior judges, and from whoſe tribunal there was no appeal. In ſhort, he had abſolute authority over the reſt, and commanded, decreed, puniſhed, &c. at pleaſure. The chief reſidence of the arch-druid of Gaul was at Dreux, in the Pais Chartrain; and in Britain, as we have already obſerved, in the iſle of Angleſey. He was elected from amongſt the moſt eminent Druids by a plurality of votes; and as this ſtation was attended with very conſiderable power and wealth, and with many privileges and honours of various kinds, the attainment of it was an object of great ambition, and the election of a perſon to occupy it ſometimes occaſioned a civil war. The Druids were alſo divided into ſeveral claſſes, or branches; *viz.* the vacerri, bardi, eubages, ſemnothii, or ſemnothei, and faronidæ. The vacerri are held to have been the prieſts; the bardi, the poets; the eubages, the augurs; and the faronidæ, the civil judges, and inſtructors of youth. As to the ſemnothei, who are ſaid to have been immediately devoted to the ſervice of religion, it is probable, they were the ſame with the vacerri.

Strabo, however, lib. iv. p. 197. and Picard after him, in his Celtopædia, do not comprehend all theſe different orders under the denomination of Druids, as ſpecies under their genus, or parts under the whole; but make them quite different conditions, or orders.

Strabo, in effect, only diſtinguiſhes three kinds; bardi, eubages, or vates, and Druids, though the laſt name was frequently given to the whole order. The bards were the heroic, hiſtorical, and genealogical poets of Gaul and Britain. They did not properly belong to the prieſtly order, nor had they any immediate concern with the offices of religion; on the contrary, they carefully abſtained from introducing any thing of a religious nature into their poems. (See BARD.) Thoſe of the ſecond claſs were called by the Greeks Ουατες, by the Romans *Vates*, and by the Gauls and Britons *Faids*. (See FAIDS.) The Druids were by far the moſt numerous claſs; and they performed all the offices of religion.

Learning of the Druids.—It is not eaſy to aſcertain the nature and extent of their learning, though we have no reaſon to doubt their having poſſeſſed various kinds of literature and philoſophy in an eminent degree, conſidering the period in which they lived. Diogenes Laertius aſſures us (in his Prologue), that the Druids were the ſame, among the ancient Britons, with the Sophi, or philoſophers, among the Greeks; the Magi, among the Perſians; the Gymnoſophiſts and Brachmans, among the Indians; and the Chaldæans, among the Aſſyrians. As the Druids ſtudiouſly concealed their principles and opinions from all the world but the members of their own ſociety, neither the Greeks nor Romans could obtain a perfect and certain knowledge of their ſyſtems either of religion or philoſophy; and, on this account, we find few remains of them in the works of the ancients. Beſides, they ſtrictly obſerved the ſubſiſting law, which forbade them to commit any of their doctrines to writing. (Cæſ. de Bell. Gall. l. 6. c. 13.) Accordingly, when the living repoſitories of theſe doctrines were deſtroyed, they were irrecoverably loſt, as they had not been preſerved in any written monuments. Some few ſcattered fragments, however, may be ſtill collected. It appears, that phyſiology,

or natural philosophy, was the favourite study of the Druids both in Gaul and in Britain. Cicero tells us (De Divinatione, l. 1.), that he was personally acquainted with one of the Gaulish Druids, Divitiacus the Æduan, a man of quality in his country, who professed to have a thorough knowledge of the laws of nature, or that science which the Greeks call physiology. (See on this subject, Diod. Sicul. l. 5. c. 31. Strabo, l. 4. Cæs. de Bell. Gall. l. 6. c. 13. Mela, l. 3. c. 12. Ammian. Marcell. l. 15. c. 9.) According to the authors here cited, they entered into many disquisitions and disputations in their schools, concerning the form and magnitude of the universe in general, and of the earth in particular, and even concerning the most sublime and hidden secrets of nature. On these and the like subjects they formed a variety of systems and hypotheses, which they delivered to their disciples in verse, that they might the more easily retain them in their memories, since they were not allowed to commit them to writing. Strabo has preserved one of the physiological opinions of the Druids concerning the universe, viz. that it was never to be entirely destroyed or annihilated, but was to undergo a succession of great changes and revolutions, which were to be produced sometimes by the power and predominancy of water, and sometimes by that of fire. In this respect the Druids agreed in opinion with the philosophers of many other nations; and they also coincided with them in their notions with regard to the origin of the universe from two distinct principles, the one intelligent and omnipotent, which was God, the other inactive and inanimate, which was matter. To this purpose Cæsar informs us, that they had many disquisitions about the power of God, and, without doubt, among other particulars, about his creating power. But it does not appear, whether they believed with some, that matter was eternal, or, with others, that it was created, and in what manner they endeavoured to account for the disposition of it into the present form of the universe. On these heads they expressed their sentiments, whatever they were, in a dark, figurative, and enigmatical manner. They also disputed about the magnitude and form of this world, and of the earth in particular; and though we are not informed what were their opinions concerning the dimensions of the universe or of the earth, yet we have reason to conclude, that they believed both to be of a spherical form; the circle being the favourite figure of the Druids, as appears from the form both of their houses and temples. The Druids likewise employed themselves in particular inquiries into the natures and properties of the different kinds of substances; but the result of these inquiries has not been transmitted to us. Astronomy seems to have been one of the chief studies of the Druids of Gaul and Britain; and accordingly Cæsar says, that they had many disquisitions concerning the heavenly bodies and their motions, in which they instructed their disciples; and Mela also observes, that they professed to have great knowledge of the motions of the heavens and of the stars. This last author suggests, that they were pretenders to the knowledge of astrology, or the art of discovering future events and the secrets of providence, from the motions and aspects of the heavenly bodies; for he expressly says, that they pretended to discover the counsels and designs of the gods. The Druids, besides these inducements which led them in common with others to the study of astronomy, in order to enable them to measure time, to mark the duration of the different seasons, and thus to regulate the operations of the husbandman, and to direct the course of the mariner, and to subserve many other purposes in civil life; had other motives peculiar to themselves, as they would thus be able to fix the times and regular returns of their religious solemnities, of which they had the sole direction; some of which were annual, and others monthly. This kind of knowledge was the more necessary, as these solemnities were attended by persons from very different and distant countries, who were all to meet at one place on the same day, so that they must have had some rule for discovering the annual return of that day. Besides, the circumstances of the Druids were favourable to the study of astronomy: the sun and moon, and perhaps the planets, were the great objects of their adoration, and therefore attracted their frequent attention; and the places of their worship, in which they spent much of their time, both by day and night, were all uncovered, and situated on eminences, from which they had a full view of the celestial bodies. That the British Druids actually devoted themselves to the study of astronomy may be inferred from the vestiges that remain in the isle of Anglesey, concerning which Mr. Rowland remarks, that as the ancients deciphered astronomy by the name of "Edris," a name attributed to Enoch, whom they took to be the founder of astronomy, so there is just by a summit of a hill, called "Caer Edris," or "Idris," and not far off, another place called "Cerrig-Brudyn," *i.e.* the astronomers' stones or circle; the former of these places may have been the residence, and the latter the observatory of these Druids in the isle of Anglesey. If we advert to the fact, it is well known that the Druids computed their time by nights and not by days, in conformity to a custom which they had received by tradition from their remote ancestors, and in which they were confirmed by their measuring time very much by the moon, the empress and queen of the night. By the age and aspect of the moon the Druids regulated all their great solemnities, both sacred and civil. Their most august ceremony of cutting the mistletoe from the oak by the arch-druid was always performed on the 6th day of the moon, as Pliny informs us. (l. 16. c. 44.) And Cæsar says (De Bell. Gall. l. 1. c. 50.). that their military operations were very much regulated by this luminary, and that they avoided, as much as possible, to engage in battle while the moon was on the wane. Whilst they directed their attention to this planet, they would soon find, that she passed through all her various aspects in 30 days; and by more accurate observations they would discover, that the regular period of her entire revolution was very nearly 29½ days. Hence they would be furnished with the division of their time into months, or revolutions of the moon, of which it is known they were possessed. In process of time, they would perceive that about 12 revolutions of the moon comprehended the whole variety of seasons, which recommenced and revolved again every 12 months. Thus was suggested to them the larger division of time, called a year, consisting of 12 lunations, or 354 days, which was the most ancient measure of the year in all nations. That this was, for some time at least, the form of the Druidical year, is both probable in itself, and from the following expression of Pliny (l. 16. c. 44.): "that they began both their months and years, not from the change, but from the 6th day of the moon;" which expression plainly proves, that their years consisted of a certain number of lunar revolutions, as they always commenced on the same day of the moon. Pliny also informs us, that the Druids had a cycle or period of 30 years, commencing on the 6th day of the moon, which they called an age. It is not positively ascertained what this cycle was, nor to what uses it was applied. It is not improbable that, while the Druids used the year of 12 lunar months, and had not invented a method of adjusting it to the real revolution of the sun, they observed that the beginning of this year had passed through all the seasons, and returned to the point from whence it set out, in a course of about 33 years, which they might, therefore, call an age. Others may perhaps

perhaps be of opinion, that this 30 years' cycle of the Druids is the fame with the great year of the Pythagoreans, or a revolution of Saturn. Some have imagined that the Druids were acquainted with the cycle of 19 years, commonly called the cycle of the moon; but this fuppofes that the Hyperborean ifland, mentioned by Diodorus Siculus, was Britain, or one of the Britifh ifles. The Druids, in their numerous obfervations on the moon, could not fail to difcover that fhe fhone by means of rays borrowed from the fun; and concurring with philofophers of other countries, they might conclude that fhe was inhabited. Such were the doctrines of Pythagoras, and we have, therefore, no reafon to doubt that they were entertained by the Druids of Gaul and Britain. It is poffible alfo, that they might have predicted eclipfes both of the fun and moon, in a vague and uncertain manner, as modern aftronomers predict the return of comets. We are further informed by Cæfar and Mela, that the Druids ftudied the ftars, as well as the fun and moon; and that they diftinguifhed thefe from the planets, with the motions and revolutions of which they were acquainted; but though they knew their number, and obferved their motions, it is doubtful whether they had afcertained the time in which they performed their feveral revolutions. If Plutarch's teftimony may be credited (De Defectu Oracul. et De Facie in Orbe Lunæ), we fhall have pofitive proof that the Druids of the Britifh ifles were acquainted with the conftellations, and the figns of the zodiac; and that they meafured the revolutions of the fun and planets, by obferving the length of time between their departure from, and return to, one of thefe figns. Some have fuppofed that the Druids had inftruments of fome kind or other, which anfwered the fame purpofes with our telefcopes, in making obfervations on the heavenly bodies. But this depends on an improbable conjecture of Diodorus Siculus (l. 2. § 47.), in his defcription of the famous Hyperborean ifland.

As the Druids applied themfelves to the ftudy of philofophy and aftronomy, we cannot doubt their having poffeffed fome degree of acquaintance with arithmetic and geometry. In this refpect the want of written rules could be no great difadvantage to them, as the precepts of this, as well as of the other fciences, were couched in verfe, which would be eafily committed to memory and retained. Unacquainted with the Arabic characters now in ufe, they probably made ufe, in their calculations, of the letters of the Greek alphabet. To this purpofe Cæfar expreffly fays, that the Druids of Gaul, in almoft all their tranfactions, and private accounts or computations, made ufe of the Greek letters. Their knowledge of geometry is confirmed by the beft hiftorical evidence; for Cæfar fays (l. 6. c. 13.), that when any difputes arofe about their inheritances, or any controverfies about the limits of their fields, they were entirely referred to the decifion of their Druids. Moreover, both Cæfar and Mela plainly intimate, that the Druids were converfant in the moft fublime fpeculations of geometry, "in meafuring the magnitude of the earth, and even of the world." It is certain that the Britifh Druids were well acquainted with the geography at leaft of their own ifland; and it is not improbable, that their knowledge in this refpect extended much farther. As feveral monuments were erected by the Druids for religious and other purpofes, to fay nothing here of *Stonehenge* (which fee), we cannot queftion their having made great progrefs in the fcience of mechanics, and in the mode of applying mechanical power, fo as to produce very aftonifhing effects. Medicine, or the art of healing, muft alfo have been the object of attention and ftudy among the Druids; for they were the phyficians, as well as the priefts, both of Gaul and Britain. To this purpofe Cæfar fays (De Bell. Gall. l. 6.), that, being much addicted to fuperftition, thofe who are afflicted with a dangerous difeafe facrifice a man, or promife that they will facrifice one for their recovery; and with this intention, they recur to the miniftry of the Druids, becaufe they declared, that the anger of the immortal gods (to which they imputed various difeafes) cannot be appeafed, fo as to fpare the life of one man, but by the life of another. Hence their medical practices were attended with a great number of magical rites and incantations. They are alfo faid to have applied to the ftudy of anatomy; but to what extent we are not able to fay. It is affirmed, however, that they diffected a prodigious number of human fubjects; and that they encouraged the fcience of anatomy to fuch an excefs, and fo much beyond all reafon and humanity, that one of their doctors, called Herophilus, is faid to have read lectures on the bodies of more than 700 living men, to fhew therein the fecrets and wonders of the human fabric. (Borlafe's Antiq. of Cornwall, p. 96.) That they had amongft them furgeons, as well as phyficians, we have no reafon to doubt: but they concealed their mode of practice from all but the initiated; and of courfe difguifed and blended all their applications with a multitude of infignificant charms. Their materia medica feems to have confifted only of a few herbs, which were believed to have certain falutary and healing virtues. Of the medical virtues of the mifletoe of the oak they entertained a very high opinion, and efteemed it a kind of panacea, or remedy for all difeafes. Pliny fays, (N. H. l. 16. c. 44. l. 24. c. 4.), that they called it by a name which in their language fignified "All-heal," becaufe they thought that it cured all difeafes; and that it was peculiarly efficacious in the epilepfy or falling ficknefs. The felago, a kind of hedge-hyffop, refembling favin, was alfo much admired by the Druids both of Gaul and Britain for its fuppofed medicinal virtues, particularly in all difeafes of the eyes; but its efficacy much depended, as they fuperftitiouffy conceived, on the peculiar mode of gathering it. They entertained a high opinion alfo of the herb famolus, or marfhwort, for its fanative qualities, and alfo of other plants, for an account of which we refer to Pliny, (N. H. l. 24. c. 12. l. 25. c. 9. l. 29. c. 3. l. 26. in proem.) From the imperfect hints pertaining to this fubject that have been collected, it has been inferred, that for the age in which they lived, the Druids were no contemptible botanifts. Their circumftances were peculiarly favourable for the acquifition of this kind of knowledge. For as they fpent moft of their time in the receffes of mountains, groves, and woods, the fpontaneous vegetable productions of the earth conftantly prefented themfelves to their view, and engaged their attention. For an account of the fuperftitious opinion they entertained of the ferpent's egg, or ANGUINUM *ovum*, we refer to that article. We learn from Pliny, (ubi fupra) that they had fome knowledge of pharmacy, without which their practice of phyfic, imperfect as it was, could not have fubfifted. Accordingly we are told, that they fometimes extracted the juices of herbs and plants, by bruifing and fteeping them in cold water, and fometimes by infufing them in wine; that they made potions and decoctions by boiling them in water, and other liquors; that they fometimes adminiftered them in the way of fumigation; that on fome occafions they dried the leaves, ftalks, and roots of plants, and afterwards infufed them; and that they were not ignorant of the art of making falves and ointments of vegetables.

The noble art of rhetoric, which enabled them to difplay their wifdom and learning, and which contributed to the fupport and advancement of their reputation, was diligently ftudied and taught by the Druids of Gaul and Britain. Mela fays expreffly (De Situ Orbis, l. 3. c. 2.), that they were great

maſters and teachers of eloquence. Among their deities was one named Ogmius, ſignifying in their language the power of eloquence, who was worſhipped by them, with great devotion, as the patron of orators and the god of eloquence. He was painted as an old man, ſurrounded by a great multitude of people, with ſlender chains reaching from his tongue to their ears. Lucian, expreſſing his ſurpriſe at this picture, received from a Druid the following explanation of it: "You will ceaſe to be ſurpriſed, when I tell you, that we make Hercules (whom we call Ogmius) the god of eloquence, contrary to the Greeks, who give that honour to Mercury, who is ſo far inferior to him in ſtrength. We repreſent him as an old man, becauſe eloquence never ſhews itſelf ſo lively and ſtrong as in the mouths of old people. The relation which the ear has to the tongue, juſtifies the picture of the old man who holds ſo many people faſt by the tongue. Neither do we think it any affront to Hercules to have his tongue bored: ſince, to tell you all in one word, it was that which made him ſucceed in every thing; and that it was by his eloquence he ſubdued the hearts of all men." (Lucian in Hercule Gallico.) The Druids had many opportunities of exerciſing their eloquence, whilſt they taught their diſciples in their ſchools; when they diſcourſed in public to the people on ſubjects of religion and morality; when they pleaded cauſes in the courts of juſtice; and when they argued in the great councils of the nation, and at the head of armies ready to engage in battle, ſometimes for inflaming their courage, and at other times for allaying their fury, and diſpoſing them to make peace. Such was the effect of their eloquence, that it engaged reſpect both from friends and enemies, and that when hoſtile armies were juſt commencing an engagement, with their ſwords drawn and ſpears extended, they ſtepped in between them and prevented, by the powers of their eloquence, the ſhedding of blood, and prevailed upon them to ſheath their ſwords. (Diod. Sicul. l. 5. c. 8.) Accordingly the Britiſh kings and chieftains, who were educated by the Druids, were famous for their eloquence.

It has been queſtioned, notwithſtanding the wiſdom and learning juſtly attributed to the Druids, whether they had the knowledge of letters, or whether they could read and write. In favour of their knowledge in this department it has been alleged, that though letters were neither generally known nor in common uſe at the period that ſucceeded the Roman invaſion, they muſt have been known to the Druids, and to ſome few of thoſe who had been educated by them. The law of the Druids, it has been ſaid, which is mentioned by Cæſar, againſt committing their doctrines to writing, affords ſufficient evidence, that they were not unacquainted with the uſe of letters; for if they had been ignorant of the art of writing, they could have had no neceſſity for ſuch a law, nor, indeed, any idea of it. Beſides, this hiſtorian ſays, that in all tranſactions, except thoſe of religion and learning, they made uſe of letters; and that the letters which they uſed were thoſe of the Greek alphabet. It has been ſuggeſted, that the Britons, and particularly their Druids, might have received the knowledge of the Greek letters, either directly from the Greek merchants of Marſeilles, which city is repreſented by Strabo (l. 4.) as a kind of univerſity to the Barbarians, for they frequented this iſland on account of trade, or from the Druids of Gaul, with whom they kept up a conſtant and friendly intercourſe. We may therefore conclude, that the letters of the Greek alphabet were known to the learned among the Britons, and uſed by them, on ſome occaſions, in writing contracts, treaties, and other important deeds, before they were invaded and conquered by the Romans. By that conqueſt the Roman letters were introduced, and from that era continued to be uſed, not only by thoſe Britons who learned to write and ſpeak the Latin language, but even by thoſe who ſtill retained the uſe of their native tongue.

Notwithſtanding the proficiency which the Britiſh Druids had made in ſeveral branches of real knowledge and uſeful learning, they were much addicted to magic and divination; and by theſe they pretended to work a kind of miracles, and exhibit aſtoniſhing appearances in nature; to penetrate into the counſels of heaven; to foretel future events, and to diſcover the ſucceſs or miſcarriage of public or private undertakings. Theſe powers were aſcribed to them, not only by their own countrymen, but by the philoſophers of Greece and Rome. "In Britain," ſays Pliny (N. H. l. 30. c. 1.), "the magic arts are cultivated with ſuch aſtoniſhing ſucceſs, and ſo many ceremonies at this day, that the Britons ſeem to be capable of inſtructing even the Perſians themſelves in theſe arts." "They pretend to diſcover the deſigns and purpoſes of the gods," ſays Mela (l. 3. c. 2.) They were ſo famous for the ſuppoſed veracity of their predictions, that they were not only conſulted on all important occaſions by their own princes and great men, but even ſometimes by the Roman emperors. Deriving reputation, and alſo wealth, from their magical and prophetical powers, they employed all their art and cunning, and all their knowledge in philoſophy and mechanics, to encourage and promote the deluſion. Their natural and acquired ſagacity, their long experience, and their great concern in the conduct of affairs, enabled them to form very probable conjectures about the events of enterpriſes. Theſe conjectures they pronounced as oracles, when they were conſulted, and they pretended to derive them from the inſpection of the entrails of victims; the obſervation of the flight and feeding of certain birds; and many other mummeries. By theſe and the like arts, they obtained and preſerved the reputation of prophetic foreſight among an ignorant and credulous people.

Before the invaſion of the Romans, the ancient Britons had among them various ſchools and ſeminaries of learning, which were wholly under the direction of the Druids, to whoſe care the education of youth was altogether committed. Theſe Druidical academies were very much crowded with ſtudents; as many of the youth of Gaul came over to finiſh their education in this iſland. The ſtudents, as well as the teachers, were exempted from military ſervices and from taxes; and enjoyed many other privileges, which much ſerved to increaſe their number. The academies of the Druids, as well as their temples, were ſituated in the deepeſt receſſes of woods and forests; partly becauſe ſuch ſituations were beſt adapted to ſtudy and contemplation, and principally becauſe they were moſt ſuitable to that profound ſecrecy with which they inſtructed their pupils, and kept their doctrines from the knowledge of others. Wherever the Druids had any temple of any great note, attended by a conſiderable number of prieſts, there they alſo had an academy, in which ſuch of theſe prieſts as were eſteemed moſt learned were appointed to teach. Of theſe Britiſh academies the moſt conſiderable was ſituated in the iſle of Angleſey, near the manſion of the arch-druid, who had the chief direction in matters of learning as well as of religion. Here is one place, which is ſtill called "Myfyrion," *i. e.* the place of meditation or ſtudy; another, as we have already mentioned, called "Caer-Edris," the city of aſtronomers; and another "Cerrig-Brudyn," the aſtronomers' circle. In theſe ſeminaries the profeſſors delivered all their lectures to their pupils in verſe; and a Druidical courſe of education, comprehending the whole circle of the ſciences that were then taught, is ſaid to have conſiſted of about 20,000 verſes, and to have laſted, in ſome caſes, 20 years. The ſcholars were not allowed

allowed to commit any of these verses to writing, but were obliged to get them all by heart. When the youth were first admitted into these academies, they were obliged to take an oath of secrecy, in which they solemnly swore, that they would never reveal the mysteries, which they should there learn. They constantly resided with their teachers and fellow-students, and were forbidden to converse with any other persons, till they were regularly dismissed. One lesson, which was sedulously inculcated upon all their pupils, was a supreme veneration for the persons and opinions of their teachers; nor was this lesson ever obliterated from their minds. This circumstance contributed to support the power and influence of the Druids; as all the principal persons in every state were educated in their academies, where they imbibed a high opinion of the wisdom and dignity of their instructors. From the charge and education of youth the Druids must have derived very considerable emoluments.

Hornius, in his History of Philosophy, lib. ii. cap. 12. believes all the learning and philosophy of the Druids to have been derived from the Assyrian magi, who are still called, in Germany, *trutten*, or *truttner*; and that as magus has lost its ancient signification, which was honourable, and now signifies a magician or sorcerer; so Druid, which had the same sense, has likewise degenerated, and now signifies no other than a person who has commerce with the devil, or is addicted to magic. And accordingly, in Friesland, where there anciently were Druids, witches are now called Druids. Gale, Dickenson, and some others, vainly contend, that the Druids borrowed all their philosophy, as well as religion, from the Jews.

Religion of the Druids.—The Druids, as well as the Gymnosophists of India, the magi of Persia, the Chaldæans of Assyria, and all the other priests of antiquity, had two sets of doctrines or opinions; one of which they communicated only to the initiated, who were admitted into their own order, and which they studiously concealed from the rest of mankind; teaching it in the caves or recesses of the forests, and forbidding its being committed to writing, lest it should be divulged; and another, which was made public, and adapted to the capacities and superstitious humours of the people, and calculated to promote the honour and opulence of the priesthood. The secret doctrines of our Druids were much the same with those of the other priests of antiquity, whom we have already mentioned, and are supposed to have flowed by different streams of tradition, from the instructions which the sons of Noah gave to their immediate descendants. Accordingly these secret Druidical doctrines were more agreeable to primitive tradition and right reason, than their public doctrines. It is not, therefore, improbable, that they still retained, in secret, the great doctrine of one God, the creator and governor of the universe; and Cæsar informs us, (l. 6. c. 13.) that they taught their disciples many things about the nature and perfections of God. Some writers have, with much research and labour, endeavoured to shew, that our Druids, as well as other orders of ancient priests, taught their disciples many things concerning the creation of the world, the formation of man, his primitive innocence and felicity, his fall into guilt and misery, the creation of angels, their expulsion from heaven, the universal deluge, and the final destruction of this world by fire; and that their doctrines on these subjects were not very different from those which are contained in the sacred writings. (Cluver. Germ. Antiq. l. 1. c. 32.) However this be, it is sufficiently manifest, that the Druids taught the doctrine of the immortality of the soul; and Mela says (l. 3. c. 11.) that this was one of their secret doctrines which, for political reasons, they were permitted to publish in order to render their disciples more brave and fearless.

Cæsar (lib. 6. c. 13.) and Diodorus (l. 5.) say, that the Druids taught the Pythagorean doctrine of the metempsychosis, or transmigration of souls into other bodies: and this, if they really taught it, was probably their public doctrine, adapted to the conceptions of the vulgar. Others, however, represent them as teaching, that the soul after death ascended to some higher orb, and enjoyed a more sublime felicity, which, perhaps, was their private doctrine, and expressed their real sentiments. But as the Druids conceived, in common with the other priests of antiquity, that the common people were incapable of comprehending rational principles of religion, or of being influenced by rational motives, and that superstitious fables were better adapted to their faculties and disposition; their public theology consisted of such mythological fables, concerning the genealogies, attributes, offices, and actions of their gods; the various superstitious methods of appeasing their anger, gaining their favour, and discovering their will. This farrago of fables was couched in verse, abounding with figures and metaphors, and was delivered by the Druids from little eminences, (of which many still remain) to the surrounding multitudes. With this fabulous divinity they intermixed moral precepts, for regulating the manners of their auditors; and they warmly exhorted them to abstain from doing injury to one another, and to fight valiantly in defence of their country. (Rowland, Mona Antiqua. Diogenes Laert. in Proem.) These pathetic declamations impressed their minds, and excited a supreme veneration for their gods, an ardent love to their country, an undaunted courage, and a sovereign contempt of death. (Lucan l. 1. v. 460, &c. Cæsar de Bell. Gall. l. 6. c. 13.) The secret and public theology of the Druids, together with their system of morals and philosophy, had swelled to such an enormous size, that their disciples employed no less than 20 years in acquainting themselves with it, and committing to memory the great multitude of verses in which it was contained. At what period a plurality of gods was introduced among them, it is not possible to ascertain; but this innovation was probably introduced by degrees, and the following causes might serve to promote it. The different names and attributes of the one true God were mistaken for, and adored as so many different divinities. The sun, moon, and stars, which were at first regarded with veneration as the most glorious works and lively emblems of the Deity, were gradually adored as gods. Illustrious princes, who had been the objects of universal admiration during their lives, and who had performed some signal exploits, became objects of adoration after their decease. The Britons had gods of all these different kinds. The supreme Being was worshipped by the Gauls and Britons under the name of Hesus, a word expressive of omnipotence, as *hizzuz* is in the Hebrew. (Ps. xiv. 8.) But when the plurality of gods was introduced, Hesus was adored only as a particular divinity, who, by his great power, presided over war and armies, and was the same with Mars. And as the Germans, Gauls, and Britons, were a warlike people, they were great worshippers of Hesus, whose favour and assistance they endeavoured to gain by such cruel and bloody rites as could be acceptable only to a being who delighted in the destruction of mankind. (Cæsar de Bell. Gall. l. 6. c. 17. Lucan, l. 1. v. 445.) Teutates was another name, or attribute, of the supreme Being, being compounded of the two British words, "Deu-Tatt," or God the Father, and was worshipped by the Gauls and Britons as a particular divinity. By the progress of idolatry, Teutates was

degraded into the ſovereign of the infernal world, and became the ſame with Dis, or Pluto, of the Greeks and Romans, or, as others think, with Mercury, and was worſhipped in ſuch a manner, as could be agreeable to none but an infernal power. (Baxter, Gloſſ. Brit. p. 277. Cæſar de Bell. Gall. l. 6. c. 18. Dionyſ. Halicarn. l. 1. p. 16.) When gods were multiplied, Taranis, ſo called from taran, thunder, and conſidered as the voice of the ſupreme Being, became a particular divinity, and was worſhipped by very inhuman rites. (Lucan, l. 1. v. 446. Job, xl. 9. Pſ. xxix. 3, 4, 5.) The ſun, the moſt ancient and univerſal object of idolatrous worſhip, received the homage of the ancient Britons, under the names of Bel, Belinus, Blatucardus, Apollo, &c. which names were expreſſive, in their language, of the nature and properties of that viſible fountain of light and heat. To this illuſtrous object of idolatrous worſhip, thoſe famous circles of ſtone, ſeveral of which ſtill remain, ſeem to have been chiefly dedicated; where the Druids kept the ſacred fire, the ſymbol of this divinity, and from whence, as they were ſituated on eminences, they had a full view of the heavenly bodies. The moon alſo obtained an early and large ſhare of the idolatrous veneration of mankind. The Gauls and Britons, ſeem to have paid the ſame kind of worſhip to the moon as to the ſun; and it has been obſerved, that the circular temples dedicated to theſe two luminaries were of the ſame conſtruction, and commonly contiguous. (Martin's Deſcr. of Weſt. Iſles, p. 365.) It farther appears, that thoſe deified mortals, who were adored by the Gauls and Britons, were generally the ſame perſons, who were worſhipped by the Greeks and Romans; and who had been victorious princes, wiſe legiſlators, inventors of uſeful arts, &c. (Cicero de Nat. Deor. l. 1. Diod. Sic. l. 3. Cæſar de Bell. Gall. l. 6. c. 17. Perron. Antiq. Celt. l. 1. c. 9. &c.) The Celtic gods are ſuppoſed by many writers to have been the originals, and thoſe of the Greeks and Romans copies; to which purpoſe, it has been alleged, that all the deified princes, ſuch as Saturn, Jupiter, Mercury, &c. belonged to the Celtæ by their birth, and were ſovereigns of the Celtic tribes, which peopled Gaul and Britain; that all their names were ſignificant in the Celtic language, and expreſſive of their ſeveral characters; and that the Gauls and Britons, and other nations denominated barbarians, were much more tenacious of the opinions and cuſtoms of their anceſtors, than the Greeks and Romans, who diſcovered a great propenſity to adopt the gods and religious ceremonies of other nations. (Dionyſ. Halicar. l. 7. (See Dæmon.) The worſhip of the ancient Britons was expreſſed in four different ways, and conſiſted of ſongs of praiſe and thankſgiving, prayers, and ſupplications, offerings, and ſacrifices, and the various rites of augury and divination. The Druids in Britain directed and ſuperintended theſe different modes of worſhip, and both inſtructed and aided their diſciples in the performance of them. As to their ſacrifices, it is much to be lamented that human victims conſtituted a part of them; for it was an article in the Druidical creed, "That nothing but the life of man could atone for the life of man." In conſequence of this maxim, their altars ſtreamed with human blood, and great numbers of wretched men fell a ſacrifice to their barbarous ſuperſtition. Criminals, who had been guilty of robbery and other crimes, were ſelected in the firſt inſtance; but when there was a ſcarcity of criminals, they did not ſcruple to ſupply their place with innocent perſons. Theſe dreadful ſacrifices were offered by the Druids, on behalf of the public, at the eve of a dangerous war, or in a time of any national calamity; and alſo for perſons of high rank, when they were afflicted with any dangerous diſeaſe. By ſuch acts of cruelty, the ancient Britons endeavoured to avert the diſpleaſure and gain the favour of their gods. Suetonius, in his Life of Claudius, aſſures us, they ſacrificed men; and Mercury is ſaid to be the god to whom they offered theſe victims. Diod. Siculus, lib. 6. obſerves, it was only upon extraordinary occaſions they made ſuch offerings: as, to conſult what meaſures to take, to learn what ſhould befal them, &c. by the fall of the victim, the tearing of his members, and the manner of his blood guſhing out. Auguſtus condemned the cuſtom; and Tiberius and Claudius puniſhed and aboliſhed it. (See Cæſar, lib. 6. cap. 13, and Mela, lib. 3. cap. 2.) We learn from Pliny, that the ancient Britons were greatly addicted to divination, and that they excelled ſo much in the practice of all its arts, as to be able to give a leſſon even to the Perſians. See Divination.

The ancient Britons were ſo much addicted to the ſuperſtitious rites of their religion, that they had daily ſacrifices and other acts of worſhip, at leaſt in their moſt famous places of devotion. The hours of theſe daily ſacrifices were perhaps at noon and midnight, when they imagined, according to Lucan (l. 3. v. 423. &c.), that the gods viſited their ſacred groves. At noon they probably paid their homage to the ſun and the celeſtial gods, and at midnight to the moon and the infernal powers. They were not ignorant of the ancient and univerſal diviſion of time into weeks, conſiſting of ſeven days each; but it is not certain, whether they conſecrated one of theſe ſeven days to acts of religion. They divided their time, as we have already obſerved, by lunar months, commencing with the ſixth day of one moon and terminating with the ſame day of another; and the firſt day of every lunar month, according to their mode of reckoning, or the ſixth according to our computation, was a religious feſtival. Pliny, ſpeaking of one of their religious ſolemnities, ſays, that this was always obſerved on the ſixth day of the moon: a day, he ſays, ſo much eſteemed among them, that they have made their months and years, and even ages, which conſiſt but of 30 years, to take their beginning from it. The reaſon of their chuſing that day is, becauſe the moon is by that time grown ſtrong enough, though not arrived at half its fulneſs. (N. H. l. 16. c. 44.) The Gauls and Britons had ſeveral annual feſtivals, which were obſerved with great devotion; of this kind was the auguſt ſolemnity of cutting the miſletoe from the oak, which was performed by the arch-druid; and it is thus deſcribed by Pliny: "The Druids held nothing ſo ſacred as the miſletoe of the oak; as this is very ſcarce and rarely to be found, when any of it is diſcovered, they go with great pomp and ceremony on a certain day to gather it. When they have got every thing in readineſs under the oak, both for the ſacrifice and the banquet which they make on this great feſtival, they begin by tying two white bulls to it by the horns, then one of the Druids, clothed in white, mounts the tree, and with a knife of gold, cuts the miſletoe, which is received in a white ſagum; this done, they proceed to their ſacrifices and feaſtings." (N. H. l. 14. c. 44.) This feſtival is ſaid to have been kept as near as the age of the moon permitted to the 10th of March, which was their New-year's day. The firſt day of May was a great annual feſtival, in honour of Belinus, or the ſun. (See Bel-tein.)

Midſummer day and the firſt of November were likewiſe annual feſtivals; the one to implore the friendly influences of heaven upon their fields, and the other to return thanks for the favourable ſeaſons and the fruits of the earth; as well as to pay their yearly contributions to the miniſters of their religion. It is alſo probable, that all their gods and god-

deſſes, their ſacred groves, their hallowed hills, lakes, and fountains, had their ſeveral annual feſtivals; ſo that the Druidiſh calendar was perhaps as much crowded with holydays as the popiſh one is at preſent. On theſe feſtivals, after the appointed ſacrifices and other acts of devotion were finiſhed, the reſt of the time was ſpent in feaſting, ſinging, dancing, and all kinds of diverſions.

In the Druidical creed it was an article, "that it was unlawful to build temples to the gods, or to worſhip them within walls, or under roofs." (Tacit. de Mor. Germ. c. 9.)

All their places of worſhip, were, therefore, in the open air, and generally on eminences, from whence they had a full view of the heavenly bodies, to whom much of their adoration was directed. But to prevent being incommoded by the winds and rains, or diſtracted by the view of external objects, or diſturbed by the intruſion of unhallowed feet, when they were either inſtructing their diſciples or performing their religious rites, they ſelected the deepeſt receſſes of groves and woods for their ſacred places; theſe groves were planted for that purpoſe, in the moſt proper ſituations, and thoſe trees in which they moſt delighted. The chief of theſe trees was the ſtrong and ſpreading oak, for which the Druids had a very high and ſuperſtitious veneration. "The Druids (ſays Pliny) have ſo high an eſteem for the oak, that they do not perform the leaſt religious ceremony, without being adorned with garlands of its leaves. Theſe philoſophers believe, that every thing which grows upon that tree comes from heaven; and that God hath choſen that tree above all others." (N. H. l. 16. c. 44.) In this reſpect they reſembled the prieſts of other ancient nations, and particularly the Hebrew patriarchs. (Gen. xxvi. 4. 8. Joſh. xxiv. 26.) Theſe ſacred groves were watered by ſome conſecrated fountain or river, and ſurrounded by a ditch or mound, to prevent the intruſion of improper perſons. In the centre of the grove was a circular area, incloſed with one or two rows of large ſtones ſet perpendicularly in the earth, which conſtituted the temple within which the altar ſtood, on which the ſacrifices were offered. In ſome of theſe moſt magnificent temples, they laid ſtones of prodigious weight on the tops of the ſtanding pillars, which formed a kind of circle aloft in the air, and added much to the grandeur of the whole; ſuch was STONE-HENGE, if it was a Druidical temple. Near to the temple, ſo called for want of a proper word, they erected their *carnedde*, or ſacred mounts; their *cromlechs*, or ſtone tables, on which they prepared their ſacrifices, and other things neceſſary for their worſhip. Of theſe temples, carnedde, and cromlechs, there are ſtill many veſtiges in the Britiſh iſles, and other parts of Europe. Lucan has poetically deſcribed one of the Druidical groves above-mentioned, in the following manner.

"Lucus erat longo nunquam violatus ab ævo, &c."
Pharſ. l. 3. v. 399.

"Not far away, for ages paſt had ſtood
An old unviolated ſacred wood:
Whoſe gloomy boughs thick interwoven made
A chilly cheerleſs everlaſting ſhade:
There, nor the ruſtic gods, nor ſatyrs ſport,
Nor fawns, and ſylvans with the Nymphs reſort;
But barb'rous prieſts ſome dreadful pow'r adore,
And luſtrate ev'ry tree with human gore, &c. &c."
Rowe's Lucan, b. 3. l. 594.

Although the ancient Britons had no images of their gods, at leaſt none in the ſhape of men or other animals, in their ſacred groves, yet they had certain viſible ſymbols or emblems of them. "All the Celtic nations," ſays Maximus Tyrius (Diſſ. 38), "worſhipped Jupiter, whoſe emblem or repreſentation among them was a lofty oak." The oaks which they uſed for this purpoſe were truncated, that they might be the better emblems of unſhaken firmneſs and ſtability. Such were thoſe in the Druidical grove deſcribed by Lucan, (l. 3. v. 412)

"—— Simulacraque mœſta deorum
Arte carent. Cæſiſque extant informia truncis."

"—— Strong knotted trunks of oak ſtood near,
And artleſs emblems of their gods appear."

Reputation, Authority, and Influence of the Druids.—The Druids were the firſt and moſt diſtinguiſhed order, in a variety of reſpects, among the Gauls and Britons. They were choſen out of the beſt families; and the honours of their birth, joined with thoſe of their function, procured for them the higheſt veneration among the people. They were verſed, as we have already ſtated, in aſtronomy, aſtrology, arithmetic, geometry, natural philoſophy, geography, and politics; they were well acquainted with the arts of divination and magic; and they had the adminiſtration of all ſacred things, being the interpreters of religion, and the judges of all affairs. Whoſoever refuſed obedience to them was declared impious and accurſed. As religion ſeems to have been the chief bond of union among the Britiſh tribes and nations, the Druids, as the miniſters of their religion, appear to have poſſeſſed the ſole authority of making, explaining, and executing the laws. Theſe laws were not conſidered, among the ancient Britons, as the decrees of their princes, but as the commands of their gods: and the Druids were ſuppoſed to be the only perſons to whom the gods communicated the knowledge of their commands, and conſequently they were the only perſons who could declare and explain them to the people. The violations of the laws were not conſidered as crimes againſt the prince or ſtate, but as ſins againſt Heaven; for which the Druids, as the miniſters of Heaven, had alone the right of taking vengeance. All theſe important prerogatives of declaring, explaining, and executing the laws, the Druids enjoyed and exerciſed in their full extent. "All controverſies (ſays Cæſar), both public and private, are determined by the Druids. If any crime is committed, or any murder perpetrated; if any diſputes ariſe about the diviſion of inheritances, or the boundaries of eſtates, they alone have the right to pronounce ſentence; and they are the only diſpenſers both of rewards and puniſhments." (De Bell. Gall. l. 6. c. 13.) "All the people (ſays Strabo) entertain the higheſt opinion of the juſtice of the Druids. To them all judgment, in public and private, in civil and criminal caſes, is committed." The Druids poſſeſſed ſo fully the power of judging in all caſes, that they were not under the neceſſity of calling in the aſſiſtance of the ſecular arm to execute their ſentences, but performed this alſo by their own authority, inflicting with their own hands ſtripes, and even death, on thoſe whom they had condemned. Their deciſions claimed at all times implicit ſubmiſſion, as it belonged to them to pronounce the ſentence of excommunication or interdict againſt all perſons, or whole tribes, when they refuſed to ſubmit to their decrees. This ſentence was ſo awful, that the perſons againſt whom it was fulminated were not only excluded from all ſacrifices and religious rites, but they were held in univerſal deteſtation, as impious and abominable; their company was avoided as dangerous and contaminating; they were declared incapable of any truſt or honour, put out of the protection of the laws, and expoſed to injuries of every kind. (Cæſ. De Bell. Gall. l. 6. c. 13.) Although it is not poſſible to obtain accurate information

formation concerning the times, places, forms, and circumſtances of the judicial proceedings of theſe awful judges; yet there can be no doubt of their attention to theſe particulars. That the ſeaſons or terms of their judicial proceedings might not interfere with thoſe devoted to religion, nor with thoſe appropriated by the people to their neceſſary occupations, ſuch as ſeed time and harveſt, which were vacations, they held only two law terms in very ancient times; one in ſummer, from the 9th day of May to the 9th of Auguſt, and the other in winter, from the 9th of November to the 9th of February. Whilſt the right of adminiſtering juſtice belonged to the order of Druids in general, there were, however, particular members of that order who were appointed to exerciſe this right, and to execute the office of judges. Their courts were probably held in the open air, for the convenience of all who had occaſion to attend them; and on an eminence, that all might ſee and hear their judges; and near their temples, to give the greater ſolemnity to their proceedings. There was at leaſt one of theſe places of judicature in the territories of every ſtate, perhaps in the lands of every clan or tribe. The arch-dreid, who was the ſupreme judge, held, for the purpoſe of hearing and determining all cauſes in the laſt reſort, a grand aſſize once in the year, at a fixed time and place; which was commonly at his ordinary or chief reſidence. The chief reſidence of the arch-druid of Gaul was at Dreux, and here the grand aſſize for Gaul was held; and that of Britain was in the iſle of Angleſey. Of this latter Mr. Rowland deſcribes the veſtiges: "In the other end of this townſhip of Fe'r Dryw, there firſt appears a large cirque or theatre, raiſed up of earth or ſtones to a great height, reſembling a horſe-ſhoe, opening directly to the weſt, upon an even fair ſpot of ground. This cirque or theatre is made of earth and ſtones, carried and heaped there to form the bank. It is, within the circumvallation, about 20 paces over; and the banks, where they are whole and unbroken, above 5 yards perpendicular height. It is called "Bryn-gwyn," or "Brein-gwyn," that is, the ſupreme or royal tribunal: and ſuch the place muſt have been, wherever it was, in which a ſupreme judge gave laws to a whole nation." (Mona Antiq. p. 89, 90.) The laws, enacted and enforced among the ancient Britons, were compoſed in verſe, and they were never committed to writing. Whilſt theſe laws were unwritten, they were more entirely at the diſpoſal of the Druids, who alone could make themſelves complete maſters of them: and, therefore, when they were deſtroyed, their laws in a great degree periſhed with them. Thoſe which related to their religion, the worſhip of the gods, and the privileges of their miniſters, obtained, of courſe, the firſt place in their ſyſtem of juriſprudence; and the obligation of theſe was declared to be moſt ſacred and inviolable. That the gods are to be worſhipped was, probably, the very firſt law in the Druidical ſyſtem. To this all the other preſcriptions relating to the rites, times, places, and other circumſtances of that worſhip would naturally follow, accompanied with proper ſanctions to ſecure obedience. The laws aſcertaining the honours, rights, and privileges of the Druids; thoſe declaring their perſons inviolable, and providing for their immunity from taxes and military ſervices, were not forgotten. (Cæſ. De Bell. Gall l. 6. c. 14.) The Druids exerciſed a degree of authority, which was paramount to that of the Britiſh ſovereigns. They conſtantly attended their armies; and to them it belonged, independently of the kings, to impriſon or puniſh any of their ſoldiers. Nor could the princes give battle until the prieſts had performed their auguries, and declared that they were favourable.

Revenues of the Druids.—Theſe cannot, at this diſtance of time, be accurately aſcertained: but conſidering their influence and ſervices, and the ſuperſtitious veneration with which they were regarded by the people, we may naturally imagine, that they were as great as the people could afford. Thoſe who have obtained the entire direction of men's conſciences may ſecure to themſelves, without much difficulty, a conſiderable portion of their poſſeſſions. The Druids ſeem to have had the ſuperiority, if not the entire property, of certain iſlands on the coaſts both of England and Scotland, as Angleſey, Man, Harris, &c.; and it is highly probable, that they had alſo territories in different parts of the continent, near their ſeveral temples. Beſides, a great part of the offerings, which were brought to their ſacred places, and preſented to their gods, and theſe were frequent, and ſometimes very great, fell to their ſhare. Among the nations of Gaul and Britain, it was a common practice to dedicate all the cattle, and other ſpoils taken in war, to that deity by whoſe aſſiſtance they imagined they had gained the victory. Of theſe devoted ſpoils the prieſts were at leaſt the adminiſtrators, if not the proprietors. They were frequently conſulted, both by ſtates and private perſons, about the ſucceſs of intended enterpriſes, and other future events; and were well rewarded for the good fortune which they promiſed, and the ſecrets of futurity which they pretended to reveal. (Æl. Var. Hiſt. l. 2. c. 31.) They derived alſo conſiderable profits from the adminiſtration of juſtice, the practice of phyſic, and teaching the ſciences, all which were in their hands; and alſo from the inſtruction they gave to their diſciples in the principles and myſteries of their theology. We are alſo traditionally informed, that there were certain annual dues exacted from every family, by the prieſts of that temple within whoſe diſtrict the family dwelt; and theſe artful prieſts had invented a moſt effectual method to ſecure the punctual payment of theſe dues. All theſe families were obliged, under the dreadful penalties of excommunication, to extinguiſh their fires on the laſt evening of October, and to attend at the temple with their annual payment; and the firſt day of November to receive ſome of the ſacred fire from the altar, to rekindle thoſe in their houſes. By this device, they were obliged to pay, or to be deprived of the uſe of fire, at the approach of winter, when the want of it would be moſt felt. If any neighbours out of compaſſion ſupplied them with fire, or even converſed with them in their ſtate of delinquency, they were laid under the ſame terrible ſentence of excommunication, which excluded them not only from all the ſacred ſolemnities, but from all the ſweets of ſociety, and all the benefits of law and juſtice. (Toland's Hiſt. of the Druids, p. 71, 72. Cæſ. De Bell. Gall. l. 6. c. 13.) When we advert to theſe ſeveral ſources of wealth, we may reaſonably conclude, that the Britiſh Druids were the moſt opulent, as well as the moſt reſpected body of men in the country, in the times in which they flouriſhed.

Decline and Extinction of the Druids.—At the period of the firſt invaſion of Britain by the Romans under Julius Cæſar, B. C. 55, the Britiſh Druids were in the zenith of their power and glory; but as the Romans gained ground in the iſland, their power generally declined, until it was almoſt quite deſtroyed. Theſe victorious people, contrary to their uſual policy, diſcovered every where a great animoſity againſt the perſons and religion of the Druids. This animoſity was partly owing to their abhorrence of the cruel rites, of which the Druids were guilty, and partly to conſiderations of a political nature. The Druids, dreading the prevalence of the Romans, as threatening deſtruction to the authority and influence, which belonged to them under the character of miniſters of religion, and alſo under the rank of civil judges, legiſlators, and even ſovereigns in their ſeveral countries, animated their countrymen to reſiſt theſe invaders, and

and excited frequent revolts among them, after they had submitted. The Romans, at the same time, knew that they could not establish their own authority, and secure the obedience of Gaul and Britain, without destroying the authority and influence of the Druids in these countries. With this view, they obliged their subjects in these provinces to build temples, to erect statues, and to offer sacrifices after the Roman manner; and enacted severe laws against the use of human victims. They deprived the Druids of all authority in civil matters, and shewed them no mercy when found transgressing the laws, or concerned in any revolt. By these means, the authority of the Druids was brought so low in Gaul, in the reign of the emperor Claudius, about A. D. 45, that he is said by Suetonius (in Vit. Claud. c. 25.) to have destroyed them in that country. About the same time they began to be persecuted in the Roman province, newly erected by that emperor, in the south-east parts of Britain; from whence many of them retired into the isle of Anglesey, which was a kind of little world of their own. But they did not long remain undisturbed in this retirement. For Suetonius Paulinus, who was governor of Britain under Nero, A. D. 61, observing that the isle of Anglesey was the great seat of disaffection to the Roman government, and the asylum of all who were forming plots against it, determined to subdue it. Having conducted his army to the island, and defeated the Britons, who attempted to defend it, though they were animated by the presence, the prayers, and the exhortations of a great multitude of Druids and Druidesses, he made a very cruel use of his victory. Not contented with cutting down their sacred groves, demolishing their temples, and overturning their altars, he burnt many of them in the fires, which they had kindled for sacrificing the Roman prisoners, if the Britons had gained the victory. (Tacit. Annal. l. 14. c. 3.) So many of the Druids perished on this occasion, and in the unfortunate revolt of the Britons under Boadicea, queen of the Iceni, which happened soon after, that they were never able to make any considerable figure after this period in South Britain. Those, however, who did not think fit to submit to the Roman government, and comply with the Roman rites, fled into Caledonia, Ireland, and the lesser British isles, where they maintained their authority and superstition for some time longer. But though the dominion of the Druids in South Britain was destroyed at this time, their pernicious principles and superstitious practices continued much longer. Nay, so deeply rooted were these principles in the minds of the people both of Gaul and Britain, that they not only baffled all the power of the Romans, but even resisted the superior power and divine light of the gospel for a long time after they had embraced the Christian religion. Hence we meet with many edicts of emperors and canons of councils, in the 6th, 7th, and 8th centuries, against the worship of the sun, moon, mountains, rivers, lakes, and trees. This wretched superstition was afterwards revived, first by the Saxons, and next by the Danes; and even at so late a period as the reign of Canute, in the 11th century, it was necessary to enact a law against these heathenish superstitions in the following terms: "We strictly forbid all our subjects to worship the gods of the Gentiles; that is to say, the sun, moon, fires, rivers, fountains, hills, or trees, and woods of any kind."

Druidesses.—These were females, who assisted in the offices, and shared in the honours and emoluments of the Druidical priesthood. When Suetonius invaded the isle of Anglesey, his soldiers were somewhat daunted by the appearance of a great number of these consecrated females, who ran to and fro among the ranks of the British army, like enraged furies, with their hair dishevelled, and flaming torches in their hands, imprecating the wrath of heaven on the invaders of their country. The Druidesses of Gaul and Britain are said to have been divided into three ranks or classes. Those of the first class had vowed perpetual virginity, and lived together in sisterhoods, very much sequestered from the world. They were great pretenders to divination, prophecy, and miracles; and they were held in high estimation by the people, who consulted them on all important occasions as infallible oracles, and gave them the honourable appellation of "Senæ," that is, venerable women. Mela, who has described one of these Druidical nunneries, says, that it was situated on an island in the British sea, and contained nine of these venerable vestals, who pretended to raise storms and tempests by their incantations, to cure the most inveterate diseases, to transform themselves into all kinds of animals, and to predict future events. However, they disclosed the things which they discovered to none but those who came into their island for the avowed purpose of consulting their oracle; none of whom, we may well imagine, would come empty-handed. The second class consisted of certain female devotees, who were, indeed, married, but spent the greatest part of their time in the company of the Druids, and in the offices of religion, and conversed only occasionally with their husbands. The third class was the lowest of all, and was composed of such as performed the most servile offices about the temples, the sacrifices, and the persons of the Druids. Henry's Hist. of England, vol. i. ii.

DRUIVENSTEIN, Aart, or Arnold, Janze, in *Biography*, painter of landscape and animals, born at Haerlem in 1564, died 1607. He was a burgomaster of Haerlem, of easy fortune, and practised his art without a view to pecuniary advantage. Descamps. Vie des Peintres, &c.

DRULINGEN, in *Geography*, a small town of France, in the department of the Lower Rhine in the district of Saverne. It is the chief place of a canton, but contains only 272 inhabitants. The whole canton, however, has an extent of 175 kiliometres, and a population of 10,368 individuals, dispersed in 30 communes.

DRUM *of the Ear*, in *Anatomy*, is a small cavity in the petrous part of the temporal bones, situated within the membrana tympani, and called in Latin the tympanum. See Ear, and Cranium.

Drum, in *Architecture*, the bell-formed part of the Corinthian or Composite capitals, concave in the upper part under the abacus, and as it descends towards the astragal approaches to a cylindric surface: from this the leaves and volutes project.

Drum end of the step of a stair, is when the first ascending step has the end of its riser made with a convexity instead of a curtail step.

Drum, in *Geography*, a town of Bohemia, in the circle of Leitzmeritz; 3 miles S. of Leypa.

Drum, or *Drom*, which signifies in the Irish language a high narrow ridge of hills, is applied to a range of mountains in the county of Waterford, near Durgarvan, which divide two baronies, called *Decies within Drum*, and *Decies without Drum*. It forms part of the name of many villages and parishes in Ireland.

Drum, in *Ichthyology*, is used to signify a kind of fish in Virginia. The oil of this fish is said to cure pains in the limbs, frequent in that country See Phil. Trans. N° 451. § 1.

Drum, in *Mechanics*. See Capstan.

Drum, is a term applied to any short cylinder (which in shape resembles a musical drum): it is, however, mostly restricted to those which revolve on an axis, as the drum of a thrashing-mill, coal-gin, &c. A drum is frequently

frequently uſed to turn ſeveral ſmall wheels, by means of ſtraps paſſing round its periphery; of this ſpecies is the expanding rigger invented by Mr. Andrew Flint, and rewarded by the Society of Arts in 1805. See EXPANDING RIGGER, and MINE-WINDING-ENGINE. In ſmaller machines, the parts anſwering the purpoſes of a drum are frequently called *Barrels*, as of a *Clock*, a *Jack*, &c. which ſee.

DRUM, in the *Military Art*, an inſtrument uſed particularly in martial muſic; and in ſome inſtances to be found in modern orcheſtras. It is ſaid by Le Clerc to be an oriental invention, and brought by the Arabians, or perhaps the Moors, into Spain. The ordinary military or ſide-drum is made either of braſs or of very thin board, turned round into a cylinder; in which form it is well ſecured by glue and rivets; and further, to ſtrengthen it, is lined throughout with a ſtrong kind of hempen cloth, or coarſe Holland, cemented to its interior; ſo as to prevent the wood from ſplitting. The drum thus made, will not, however, ſtand great heats or intenſe cold; nor will it in damp weather yield ſo full a tone as one with a braſs barrel. Within each end of the barrel there is a flat wooden hoop firmly fixed, and projecting about the third of an inch beyond the braſs or wood: theſe, which are called the batten-hoops, ſerve to prevent the head from being cut by the edges. The head is made of parchment cut to a circular form, about two inches each way larger than the ends of the drum-barrel: it is faſtened, while moiſt, to a ſmall ring of copper, or of very firm, tough wood, called the fleſh hoop, ſo as juſt to exceed the ſize of the band. The *head* properly means the parchment covering of that end which is beat upon: the other end, which is covered with a coarſer parchment, is called the *reverſe*. The head and the reverſe, being applied to their reſpective ends of the barrel; over each a hoop, of about an inch and a half broad, and about the third of an inch in thickneſs, is drawn, to preſs the parchments cloſe over the ends of the barrel, but not to paſs over the fleſh-hoops. The bracing-hoops, having holes made for paſſing a cord alternately from one to the other, backwards and forwards, are pulled down as near as poſſible towards each other, thereby to ſtrain the head and reverſe parchments very tight; but as the cord is ſubject to relax, it is neceſſary to have ſliders of very ſtrong buff leather, called *braces*, which being preſſed downwards from the head hoop, towards the reverſe hoop, cauſe them to approach ſtill nearer, and to tighten the two parchments to an extreme.

When in this ſtate the drum is ſaid to be "braced;" when otherwiſe, "unbraced." To give greater effect, and to cauſe that vibration which occaſions a rough intonation, three pieces of thick cat-gut are ſtretched acroſs the reverſe, flat upon it, and parallel. When theſe, which are called "ſnares," are ſlackened, ſo as not to vibrate when the head is beat upon, the drum is ſaid to be "damped," or "unſnared;" ſome, inſtead of ſlackening the ſnares, put a cloth between them and the reverſe; whereby the ſound is conſiderably deadened: this properly is termed "muffling;" though moſt perſons conſider that term to be appropriate only when the head is covered with crape, &c. as at funerals.

After all the foregoing preparation, the drum would have little or no ſound, were it not that a round hole, about the ſize of a large pea, is left in the centre of that ſide which is neareſt the body when the inſtrument is ſuſpended by means of a "ſling" paſſing over the right ſhoulder and under the left arm.

However ſimple the beats of the drum may appear, it is, nevertheleſs, by long practice only, that perfection can be attained; and then requiring both a correct ear, and a very nimble wriſt. Every beat is perfectly regular in the number and diviſion of the ſtrokes from the two ſticks; of which that held by the right hand is ſlightly graſped, while that in the left hand is retained in an oblique poſition; paſſing between the middle and third fingers, and being held by the two firſt fingers and the thumb; the two lower fingers croſſing under it, and the palm being turned upwards. Such is the eſtabliſhed preciſion in which the drum-majors take great pride, that if all the drummers of the Britiſh ſervice were aſſembled together, they would be found to beat perfectly alike throughout what is called "the duty;" that is to ſay, all the beats in uſe; of which the following may be conſidered the principal.

The Roll, which is a continued rolling ſound, without the leaſt inequality or intermiſſion; this is produced by giving two taps with the ſame ſtick, uſing the different ſticks alternately, each beating twice. The ordinary mode of teaching the roll is by the beat of "daddy mammy;" ſo called from the double taps, in which each hand, after its two taps, is raiſed as high as the ſhoulder; thus forcing the pupil to ſtrike diſtinctly and leiſurely. By degrees he is able to beat quicker, and, ultimately, "to roll," in the manner above deſcribed, with ſuch incredible celerity and evenneſs, as to produce a cloſe and ſmooth ſound.

The Swell is nothing more than the roll occaſionally beat ſo ſoftly as ſcarce to be heard; then increaſing to the utmoſt of the performer's ſtrength; and again lowering ſo as almoſt to die away upon the ear: the great difficulty is to raiſe and to lower the ſound very gradually. This beat is merely ornamental; it is uſually performed in the reveillez, &c., while the fifes are ſilent: it is quite arbitrary, being an *ad libitum* performance.

The Flam is a beat made by the two ſticks ſtriking almoſt at the ſame inſtant on the head, but ſo as to be heard ſeparately: it is uſed as a ſignal for various motions and manœuvres.

The Preparative cannot be deſcribed in letter-preſs; it is the ordinary ſignal for the firings to commence.

The General is an air, which, when performed at full length, is the ſignal for marching to ſome new ground, or to ſome other ſtation: the firſt bar of its meaſure is beat as a ſignal for the firings to ceaſe.

The Aſſembly, or *Aſſemblez*, is a ſignal for the line to fall in; and, when beat after the *general*, is followed by the *march*, which is beat by each corps as it moves from its ground.

The March is almoſt indefinite, but is ordinarily beat in compliment to a reviewing, or a paſſing, field marſhal, general, prince of the blood, &c.; as alſo during ſalutes, when the battalion preſent their arms. "The Dead March" is beat with muffled drums, as already deſcribed. "The Grenadiers' March," and "The Lilies of France," are complimentary marches, and, in ſtrictneſs, ought not to be beat but to a corps of grenadiers, or when a grenadier officer commands, or when the colours of the regiment are flying. "Slow March" is in ſlow, ſolemn time; and "Quick March" is in quick time: what are commonly called *marches*, and which have no particular diſtinguiſhing character, are uſually performed in ordinary time. "The Rogue's March" is played when men, and "The Whore's March" when women, are drummed out of a town.

The Ruffle is a ſhort roll; perhaps of five or ſix ſeconds duration, beat very cloſe and firm, decreaſing a little in force juſt before it concludes, which it does in an abrupt and ſmart manner, and with a ſtrong flam.

The Reveillez is beat early in the morning, uſually at day-break, to waken the garriſon: it is a medley of various airs and beats.

The

The Tattoo is always beat at night, at ſuch hour as the garriſon ſhould retire to reſt; it is the ſignal for extinguiſhing fires and light, except in public guard-rooms. All ſoldiers found abroad after the "Tattoo" is beat, are conſidered as treſpaſſers againſt martial law. This beat is a medley of airs and beats; the drums accompanying only at certain intervals.

Beat for Orders; a peculiar mixture of rolls, flams, and ſingle taps, beat at the adjutant-general's quarters, or office, for aſſembling all perſons whoſe duty it is to receive the orders of the day. Each regiment alſo beats *for orders*, to aſſemble the ſerjeants, &c., who keep the order books of the ſeveral companies.

The Retreat is beat every evening at ſun-ſet, or after a corps has been diſmiſſed to their quarters; it is often beat in rather a quick time along the front of a corps, when paraded for inſpection or roll-call. This beat likewiſe warns corps engaged in action, or performing evolutions, to retreat.

The Troop is beat before the new guards, &c., about to march off from their place of aſſembly, to relieve others then on duty. This, as well as the "Retreat," is ordinarily in triple time of three crotchets or quavers; not unlike the "Waltz," when performed rather ſlowly.

To Arms is a beat reſorted to on all emergencies, whether owing to diſturbances, fire, invaſion, &c.

There is a kind of accompaniment performed on the drum, when beating to marches, and to other airs played by a fife. This is called the *Drag*, and is either double or ſingle, according as the muſic may admit. The *Single Drag* is little more than a tap of the drum for each note in the air; the taps being given in exact time with the diviſions of the muſic. This is what we commonly beat as an accompaniment to quick ſteps, "Rule Britannia," &c. The *Double Drag* is a much fuller accompaniment, in which, for the moſt part, two or three taps are given for every note in each bar; or, eventually, the whole is performed in a kind of articulate roll, not to be eaſily deſcribed, in which the accented parts are reinforced with much ſtrength. But to ſay the moſt of the ſide-drum, its monotony ſoon tires the ear; its rattling ſound becomes oppreſſive, and the little variety of its beats, in general not over well executed, adds to the fatigue of liſtening, and produces ſomething worſe than indifference towards its ſounds. This, however, is a doctrine by no means tolerated among drum-majors, who affect to produce infinite variations from what the vulgar call the "parchment fiddle." They have a long train of "ſingle reveilleze," &c., which are intended to be performed without the fife, and are conſidered as concertantes among the ſages in this branch of muſic: many pride themſelves on the number of thoſe ſolos, which, poſſibly, may have charms for their ears, though failing to faſcinate ours. When we ſpeak of the drum as a muſical inſtrument, we muſt, at all events, exempt the *ſide*, or military drum; which was moſt quaintly and ludicrouſly deſcribed by an American, the author of "Yankee Doodle;" who, in detailing the gay appearance of the firſt regiments which were ſent to ſuppreſs the inſurrection, ſtates:

"They have got little barrels,
The heads be kiver'd wi' leather;
They beats upon 'em wi' little clubs,
To call their folk together."

Baſs Drum, or *Turkiſh Drum*, is an inſtrument of the ſame conſtruction as the ſide drum above deſcribed; only it is on a very large ſcale, has no ſnares, is ſlung by the middle acroſs the performer's body, and is beat upon at both ends; the right hand being furniſhed with a large ſtick, having a knob at its end; the left being provided either with a whiſk or a ſtick, whoſe knob is covered with buff leather, to ſoften the tone. The right-hand beats the accented parts of the meaſure, the left filling up the time according to the performer's judgment. This inſtrument is of great ſervice in military bands, giving a marked emphaſis and a fine effect to the muſic, and proving an admirable guide to the corps while marching, ſo as to make them preſerve a correct and regular pace.

The *Kettle Drum*, ſo called becauſe the bottoms, which are made generally of copper, ſtanding upon three or four ſhort legs, like thoſe at the bottom of a caſt iron pot, ſo much reſemble large boilers or kettles. Theſe drums are uſed in pairs, the one being pitched to the key-note, the other to the dominant, or fourth below the key. In ſome inſtances three kettle-drums have been uſed, the third being tuned to the fifth below the key; but this is very rare. It were to be wiſhed that practice were more common; becauſe not only could the kettle drums then accompany in the key, and its two adjuncts, but when performing in the key, the perfect cadence could be completely ſupported by this powerful inſtrument. For example: ſuppoſe a piece to be compoſed in C major; then the centre drum, ſtanding before the performer, would be tuned to C; that to the performer's left would be G; and that to his right would be F. Now the perfect cadence in the key of C compriſes F G C; all which notes are thus attainable. When the modulation paſſes into the key of G, the left hand drum will become the key; and when it paſſes into F, the right hand drum will be the key, with the important advantage of having its dominant, C, ſtanding at its ſide. It is to be obſerved, that the three drums muſt ſtand in a triangular poſition; the two adjuncts rather near to the key, but not quite touching, and the performer ſtanding between the two adjuncts, which would rarely be required in the ſame bar, except in the perfect cadence.

The *Double Drums* and *Tromboni*, which were introduced in the band at the commemoration of Handel, for a *blow* and a *blaſt*, now-and-then, produced an admirable effect; but by a conſtant roll and ſcream they reverſe the effect by ſhortening the concords, and making them as tranſient as the diſcords in *Acciaccatura*, which ſee.

The kettle-drum is furniſhed with ſcrews, whereby the head can be tightened at pleaſure; and that head is faſtened to a large hoop, which being moveable upwards or downwards for ſeveral inches, ſo as to increaſe or to diminiſh the internal area of the inſtrument, it follows that the kettle-drum can be tuned in exact accord with the inſtruments of the band; the ſize of the bottom, or kettle, being duly proportioned to the note it is to yield.

Formerly, kettle drums, of a ſmall ſize, were in uſe in our ſeveral regiments of horſe, but being found extremely unwieldy, they have been for many years laid aſide. It is difficult to account for our adoption of the Turkiſh cuſtom in a branch ſo peculiarly ill adapted to its reception. Throughout Aſia kettle-drums, of an immenſe ſize, are carried acroſs camels in the train of all crowned heads: the inſtrument is adorned with ſuperb trappings, and beat by a man, who has a kind of ſeat made for him on the ſaddle.

The *Naugaurah*, as it is there termed, is one of the types of royalty, though it is ſometimes uſurped by, and tacitly tolerated with, perſons of diſtinction, when in authority at a diſtance from the court. Theſe alſo imitate their ſovereigns, by having *nobuts*, or bands of muſic, ſtationed in a gallery over the entrance into the palace-yard. The bands, in which the *Naugaurah* is extremely audible, perform at ſtated hours during the day and night, to the great delight of their retainers, but in a ſtrain highly offenſive to a well-tuned ear.

The muſicians of Hindooſtan perform with incredible dexterity on a pair of very ſmall kettle-drums, cauled *Taublahs*, which they faſten before them, by means of a cloth wrapped ſeveral times round their waiſts; they uſe no ſticks, but beat with their fingers in a peculiar ſtyle, ſo as to vary the intonation in a manner far from diſpleaſing, according as the fingers ſtrike more or leſs near to the rims of the *Taublahs*. The note is not pitched to any particular concordance, but, as in the ſide-drum, is perfectly adventitious. Single drums, of the ſame deſcription, and faſtened in front of the performer, by means of leather ſtraps paſſing round the waiſt, are alſo uſed on many occaſions; eſpecially to accompany the poſt, for the purpoſe of intimidating tigers, which are in ſome places very numerous, and not to be deterred either by the ſound of theſe drums, called *Doogdoogies*, which are beat with two ſticks of hard wood, keeping up a continual *roll*, nor by the flambeaus, which likewiſe attend the letter carriers during the night. Many of the poſt-office people are annually carried off by tigers.

The drum uſed by the Hindoos in their religious proceſſions, and in their recreations, is cylindrical, and about 20 inches in length, the diameter about a foot; they are beat with one hand at each end, and are uſually made of wood. The ſame people likewiſe uſe very large drums, perhaps a yard in length, and reſembling a fruſtrated parabolical ſpindle; or, in other words, like a long narrow caſk, whoſe centre may be about double, or even treble, the diameter of either end. Theſe drums, which, as well as the wooden cylindrical kind juſt deſcribed, are called *Doles*, are commonly made of baked earth, and, like the former, have their heads made of parchment.

Drum, or *Drummer*, alſo denotes a ſoldier appointed to beat the drum. When a battalion is drawn up, the drums are on the flank; and when it marches by diviſions, they march between them.

Drum-*major*, is that perſon in a regiment who beats the beſt drum, commands the others, and teaches them their duty. Every regiment has a drum-major.

Drum *Point*, in *Geography*, a cape of America, on the north ſide of the Patuxin, at the mouth oppoſite to Cedar point.

DRUMLANRIG, a town of Scotland, in the county of Dumfries, ſituated on the Nith; 13 miles N. of Dumfries.

DRUMMOND, William, in *Biography*, an elegant Scottiſh poet, was born in 1585. He was inſtructed in grammar-learning at the high ſchool of Edinburgh, and completed his ſtudies at the univerſity there. He then ſpent four years in foreign travel, and in the ſtudy of civil law at Bourges. But, on his return to Scotland, his father being dead, he devoted himſelf to the purſuits of polite literature. A dangerous illneſs gave his thoughts a ſerious turn, and his firſt literary production was a work in proſe, intitled "The Cypreſs Grove," containing reflections on death; and his next was called "Flowers of Sion, or Spiritual Poems." The loſs of a young lady, to whom he was ſhortly to have been united in marriage, threw him into a deep melancholy, which rendered his own home inſupportable. He reſolved, therefore, to ſeek relief by foreign travel, and again to viſit the principal cities on the continent. He remained abroad eight years, cultivating an acquaintance with men of letters, and forming a collection of valuable books in various languages. On his return, he employed himſelf at the ſeat of his brother-in-law, ſir John Scott, in compoſing the hiſtory of the five Jameſes, kings of Scotland, a work which did not ſee the light till after the death of the author. In his 45th year, he married a lady of the family of Logan, by whom he had ſeveral children. He was a zealous friend to high monarchical principles, and was deeply afflicted when the civil war broke out: it is thought to have been the means of ſhortening his life. He died in his 64th year, in December, 1649. It is as a poet that Mr. Drummond is now remembered, and in that claſs he claims as high a rank as any of his contemporaries. His diction is Engliſh of the moſt cultivated kind then in uſe, and muſt have been derived from the ſtudy of the beſt models. He excels chiefly in the tender and delicate, particularly in thoſe ſonnets which celebrate the virtues of the ladies to whom he was attached. He poſſeſſed that gentle and unambitious diſpoſition which fits a man for the retired walks of life, and which becomes a votary of the muſes. Beſides the occupations of reading and writing, which he conſidered as the buſineſs of his life, he amuſed himſelf with chefs, and playing on the lute. He maintained a correſpondence and intimacy with many literary characters, particularly with Drayton and Ben Jonſon, the latter of whom regarded him with ſo much enthuſiaſtic veneration, that he walked from London to Drummond's ſeat in Scotland on purpoſe to viſit him. Biog. Brit.

Drummond, or *Accomac Court-houſe*, in *Geography*, is ſituated in Virginia, America, on the poſt road from Philadelphia to Norfolk; 20 miles from Belhaven, and 194 from Philadelphia.

DRUMSLADE, the performer on the kettle-drum in the time of Edward VI., perhaps from *trommel ſchlager*, drum-beater.

DRUMSNAW, in *Geography*, a neat village in the county of Leitrim, Ireland, charmingly ſituated on the wooded banks of the Shannon. Near it is a chalybeate ſpring, which has been much eſteemed for its medicinal virtues. It is 73 miles N.W. from Dublin, and within four miles of Carrick, the county-town. Beauſort's Memoir.

DRUNA, in *Ancient Geography*, a river of Gaul, which, according to M. D'Anville, is the *Drome*; which ſee.

DRUNGUS, Δρουγγος, a body, or company of forces; thus called in the latter times of the Roman empire.

The name drungus, as appears from Vegetius, lib. iii. cap. 16., was at firſt only applied to foreign, and even enemies' troops; but under the Eaſtern empire, it came in uſe for the troops of the empire itſelf; where it amounted, pretty nearly, to what we call a regiment, or brigade.

The ſame author notes, that Δρουγγος, among the modern Greeks, ſignifies a ſtaff, or rod, the badge of a dignity, or office, as *agla* among the Turks; and he thinks, that the name may be formed from the Latin *truncus*. But it appears from Vegetius, that drungus is a barbarous, not a Latin word. Spelman takes it for Saxon; becauſe, at this day, *throng*, in Engliſh, ſignifies a multitude. Salmaſius derives it from ῥυγχος, *beak*; on account of the drunguſes being diſpoſed beak-wiſe, or terminating in a point.

Leunclavius obſerves, that the drungus was not leſs than one thouſand men, nor more than four thouſand.

DRUNKENNESS, Ebrietas, conſidered in a *Phyſical* point of view, ſignifies that derangement of the functions of the animal economy, which is produced by drinking ſpirituous, or fermented liquors.

Theſe liquors have been principally uſed in all ages and countries, for the purpoſes of exhilaration and inebriation: but, in the eaſtern parts of the globe, in which the religion of Mahomet has interdicted the uſe of wines, other ſubſtances have been adopted, by which that agreeable derangement of the animal functions, which amounts to intoxication, is readily produced. In Turkey the inſpiſſated juice of the poppy is eaten in large quantities for that purpoſe, and

gives rise to very similar feelings, and, when confirmed into a habit, brings on many diseases of the constitution, like those consequent on the potation of vinous liquors. (See the Memoirs of Baron de Tott. See also OPIUM.) In Persia the leaves of the hemp plant, *cannabis*, are prepared in various ways, and swallowed as a means of intoxication, under the name of *Bangue*. This substance is said to produce a pleasing sort of delirium, during which the person under its influence talks incoherently, laughs, and sings in a merry mood; "yet is he not giddy, or drunk, but walks and dances, and sheweth many odd tricks." The fit is terminated by sleep, from which he awakes refreshed, without any untoward symptom, as giddiness, pain in the head, or stomach, &c. (See Dr. Hook's Philos. Exper. and Observat. p. 211.) A pleasing temporary intoxication, of a similar description, was lately discovered by Mr. Davy, to result from breathing an artificial *gas*, the nitrous oxyd, or gaseous oxyd of azot. The effects of this *gas* are generally a brief and slight delirium, accompanied with a considerable propensity to motion, which, when it ceases, leaves the individual in a state of agreeable exhilaration for some hours. (See Davy's Chemical Researches.) The use of this inebriating gas has as yet, however, been confined to a few of the curious in chemical experiments.

Our sole object, then, at present, is to inquire into the nature and effects of intoxication, produced by the spirit of fermented liquors, which, whether under the title of wine, malt-liquors, cyder, perry, mead, *koumiss*, &c. yield the same essence on distillation; namely, *alcohol*, or spirit of wine, which is itself variously modified, by intermixture with colouring, sapid, and odorous substances, in the form of gin, brandy, rum, whisky, noyau, and other *liqueurs*. In some of the varieties of fermented liquor, in addition to the spirit, there is present a considerable portion of *carbonic acid*, or *fixed air*, (also one of the products of the vinous fermentation.) which is disengaged by uncorking the vessel, and gives a sparkling and pungency to the liquors, such as champaign, cyder, bottled beer, &c. while it adds to their inebriating quality. But this kind of ebriety appears to be of short duration, arising only from the temporary action of the *gas* on the nerves of the stomach.

The effects of fermented liquor on the animal economy, arise principally from its *stimulating* power, or the power which it possesses of exciting the muscular parts to an increased rapidity and strength of action, as well as the nervous and mental qualities, to an unusual degree of acuteness. When the animal functions are carried on with langour and feebleness, from whatever cause, the general sensations of the body are uneasy, sometimes to a degree of pain. Thus, after long fasting, want of sleep, fatigue, or disease, this condition of the frame exists, and prompts us instinctively to the employment of some stimulus, as food, tepid, or fermented drink, the warm bath, &c. The immediate effect of such stimuli, especially of fermented liquors, is the diffusion of a grateful sensation throughout the body; the languor and listlessness of the previous state are superseded by a general pleasureable feeling of warmth, energy, and self-command, accompanied with an indescribable tranquillity and complacency of mind; the countenance is enlivened with a glow of animation, in consequence of the free circulation through the cutaneous blood-vessels, and the renewed energy of the muscular parts, which were before languid and relaxed. From the same moderate excitement of the circulation and nervous system, the flow of animal spirits becomes more free and spontaneous, giving birth to lively conversation, to the flow of eloquence, and the sallies of wit: anxieties and corroding cares respecting the business of life are laid aside for the time; and good humour and cheerfulness prevail. With those who are habitually temperate, this degree of excitement, both mental and corporeal, is the result of a very moderate stimulus; taking food alone is adequate to produce it, with little aid from fermented liquors. This is the excitement of nature, is consistent with, and conducive to, the healthy operations of the constitution, and contributes to cherish the flame of life to its latest spark. But

——————" Know, whate'er
Beyond its natural fervour hurries on
The sanguine tide; whether the frequent bowl,
High season'd fare, or exercise to toil
Protracted, spurs to its last stage tir'd life,
And sows the temples with untimely snow."

Armstrong.

If the heating draught is continued beyond this moderate excitement, the increasing effects of the stimulation become obvious. The circulation is farther quickened and strengthened, so that the whole surface glows with redness and warmth, the face is flushed, the eyes, which were at first bright, become suffused with a degree of redness, from the blood being carried into the smaller vessels, which are ordinarily transparent with lymph only. The muscles acquire a greater power of action, and a greater propensity to exertion ensues, whether to dancing, wrestling, or to whimsical gesticulations: and the mental faculties are in a similar manner roused. Cheerfulness arises to boisterous mirth; noise and ribaldry, passing with rapidity from subject to subject, succeed to the eloquence of rational conversation and chaste wit; the song becomes louder, and excessive laughter marks the high excitement of the mind. The passions and dispositions are also elevated beyond their natural pitch. "In the bottle," as Dr. Johnson observes, "discontent seeks for comfort, cowardice for courage, and bashfulness for confidence." In a word, the whole man, mind and body, is elevated by the use of vinous liquors, in all his qualities and functions, far above the accustomed powers naturally inherent in his constitution.

This state of inordinate excitement manifests itself in various ways, in different individuals, and also under the influence of different species of liquor. Thus, intoxication from drinking porter, or other malt liquors which contain the narcotic substance of the hop, or other vegetables, together with much mucilaginous matter, and require to be drank in large quantities, is generally accompanied with more of stupor, than the inebriation occasioned by wines, or distilled spirits; and the same may be said of the heavier wines, as compared with the lighter, or those which contain carbonic acid gas. But the variety of the symptoms of drunkenness depends much more on the natural disposition, and on the corporeal temperament of the individual, than on the species of the intoxicating liquor. We thus see some, in their cups, mild, good-natured, and gentle; while others are fierce, irascible, and implacable: this one is complaisant to his enemy, and forgetful of injury; that is insulting to his friend, and thoughtful of revenge. This person is gay, musical, and loquacious; that one is dull, sullen, and silent; and a third is turbulent and loud, making the dome echo with oaths and imprecations. As in other species of insanity, so under the influence of intoxication, the inebriate feels not the blush of ingenuous shame, and commits many indecencies.

The doctrine of temperaments is not well understood; and it would be difficult to explain the peculiar actions of persons under the excitement of wine, upon the principles of such doctrine. "The sanguineous and choleric temperaments, I conceive," says Dr. Trotter, in his "Essay on Drunkenness,"

Drunkenness," "to be most prone to resentment and ferocity; as may be observed in those whose countenance becomes very much flushed or bloated, with their eyes as if starting from their sockets: the former of the two is the most lascivious and amorous. The nervous temperament exhibits most signs of idiotism, and is childish and foolish in its drunken pranks. The phlegmatic temperament is difficult to be roused; is passive and silent, and may fall from the chair before many external signs of ebriety appear. The melancholic temperament, as when sober, is tenacious of whatever it undertakes, and shews least of the inebriate in its manner. But all constitutions have something peculiar to them, and the shades of distinction blend so insensibly with one another, that distinction becomes difficult." P. 27. 2d edit.

On the whole, however, the sort of delirium, which the fever of intoxication will produce in any individual, cannot be known *à priori*, either from the nature of the liquor employed, or of the disposition and temperament of the drinker. It will necessarily vary, like delirium under other circumstances, according to the particular sensations which prevail, and therefore according to the facility of derangement, in different organs of the body, as well as to the general idiosyncrasis. (See DELIRIUM.) So that the disposition of many persons, in a state of inebriation, is often observed to be the reverse of their sober disposition; the placid man will become irascible, and the surly man kind and complaisant; in consequence, no doubt, of the new state of feeling induced by the stimulus of the liquor. In this view of the subject, the adage *in vino veritas*, is altogether untrue; for the natural disposition is changed, or represented in an unnatural light. And even when unaltered in kind, it is exaggerated in degree: so that it has been justly remarked by the Spectator, that the person you converse with, after the third bottle, is not the same man who at first sat down at table with you. "Wine heightens indifference into love, love into jealousy, and jealousy into madness. It often turns the good natured man into an idiot, and the choleric into an assassin; it gives bitterness to resentment, and makes vanity insupportable," &c. In a word, it exhibits the individual in a new and foreign character, and infuses qualities into the mind, to which it is a stranger in its sober moments. Hence the justice, as well as neatness, of the saying of Publius Syrius; "He who jests upon a man that is drunk, injures *the absent*." Spectator, vol. viii. No. 569.

We shall not stop here, to amuse our readers with a narration of the follies and vices, which men have been induced to commit, under the influence of that degree of delirious excitement, which we have above described; when the rapidity of the conceptions, the vigour of the passions, and the strength and propensity to muscular motions, all stimulated to a morbid pitch, constitute what may be considered the first stage of intoxication. For such narrations, we refer to Dr. Trotter's essay before quoted, and to the works of satyrical writers. See also Burton's Anat. of Melancholy, part 1. § 2. mem. 5. Brydone's Tour through Sicily, let. xx.

If the stimulus of the inebriating liquor continues to be applied, a considerable change, both in the mental and corporeal faculties, soon ensues. This change is partly to be attributed to the debility, which results from every excess of stimulation in the animal economy (see DEBILITY); and partly to the narcotic effects of the liquors on the *sensorium*, through the medium of the nerves of the stomach; but it is, perhaps, chiefly owing to the increasing pressure on the brain, occasioned by the increasing fulness of the blood-vessels in that organ, from the continued stimulus to the action of the heart and arteries. This conclusion is deducible, both from the phenomena, which resemble the symptoms of oppressed brain, from other causes; and from the consequences, in the last stage of drunkenness, as we shall presently shew.

The vivacity and active powers and propensities, before described, are now gradually succeeded by an imbecility of all the faculties. The corporeal strength is diminished; giddiness comes on; the voluntary power over the muscles fails; so that the attempt to walk is marked by a tottering and staggering, and the hands cannot be directed steadily to any object: the muscles of the countenance at length relax, the lip falls, the eyelids are half closed, and the head nods, depicting the enervated condition of the frame. The muscular organs of the mouth, throat, and chest, become also enfeebled, and the powers of voice and articulation are by degrees diminished. The eyes are no longer directed to the same focus by the muscles of the orbits, and vision becomes double, or indistinct, as if a mist were floating in the atmosphere. The first of these conditions constitutes the *aphonia temulentorum*, the latter the *diplopia à temulentia*, in the arrangement of diseases by Sauvages. Thomson has accurately described them:

——————"Their feeble tongues,
Unable to take up the cumbrous word,
Lie quite dissolved. Before their maudlin eyes,
Seen dim and blue, the double tapers dance,
Like the sun wading through the misty sky."

Sometimes this loss of muscular contraction extends even to the sphincters of the bladder and *rectum*, et ebrius improviso minget, et alvum exonerat.

The debility of the mental powers keeps pace with the corporeal relaxation. The flow of ideas becomes more tardy, and less various, till at length the conceptions are incoherent and indistinct, and the person is altogether incapable of conversation, and is silent, or mutters an unintelligible soliloquy. The sensations become extremely obtuse, so that external impressions produce no effect on any of the senses, and pass altogether unregarded. The passions partake of the general enervation of the frame, and cease to excite any emotion, or to prompt any action or effort.

In this state of intoxication there is a considerable resemblance to the condition of the maniac, in respect to the power with which the body resists the action of cold, and of contagion, as well as to its insensibility to pain.

No stronger proofs of the power of the constitution, under such a state of inebriation, in resisting the operation of cold, need be adduced, it is observed by Dr. Trotter, than what are daily witnessed among our seamen in the great sea-ports. "These men are permitted to come on shore to recreate themselves; but, from a thoughtlessness of disposition, and the cunning address of their landlords, they drink till the last shilling is spent; they are then thrust out of the door, and left to pass the night on the pavement. It is surprising how they should escape death on such occasions; for I have known many of them who have slept on the street the greatest part of the night in the severest weather." *Loc. cit.* The following fact also affords a striking illustration of the resistance of cold under similar circumstances. A miller, very much intoxicated, returning from market late at night, while it snowed and froze very hard, missed his way, and fell down a steep bank into the mill dam. By the fright and sudden immersion he became so far sensible as to recollect where he was. He then thought the surest way home would be to follow the stream, which would take him within pistol-shot of his own door. Instead, however, of taking that course,

courſe, he waded againſt the current, without knowing it, till his paſſage was oppoſed by a wooden bridge. This bridge he knew; and though he felt ſome diſappointment, he ſtill thought his beſt way was to follow the ſtream, for the banks were ſteep and difficult to climb. He now found himſelf in a comfortable glow, turned about, and arrived at his own houſe at midnight, perfectly ſober, after having been nearly two hours in the water, and often up to the breech. He went immediately to bed, and roſe in perfect health. Trotter.

With reſpect to contagion, the ſame author ſtates, that men in a ſtate of inebriation have certainly, on many occaſions, been expoſed to typhous contagion, and eſcaped, while others have ſuffered. And inſenſibility to pain, in the ſame condition, is daily exemplified among ſeamen, whoſe heedleſs revels expoſe them to more diſaſters than other deſcriptions of mankind. The moſt dreadful wounds and bruiſes are thus often inflicted without the ſmalleſt ſigns of feeling, and often without the ſlightelt recollection how they were effected. Dr. Trotter mentions the circumſtance of a ſailor belonging to a king's ſhip, in which he then ſerved, having quarrelled, while drunk, with his wife; in the fury of paſſion, he ſeized a butcher's cleaver, and cut off two of his fingers by the root. The wounds were dreſſed, and the man put to bed. When he waked in the morning, he had no remembrance of what had happened, ſhewed the utmoſt contrition, and wept like a child for his misfortunes, when he was told that he had done it himſelf.

This ſecond ſtage of inebriation, characteriſed by relaxation and enervation of the animal powers, as the former was diſtinguiſhed by inordinate excitement, generally terminates in ſleep, which continues for the ſpace of ſeveral hours. After this period, the offending liquors being neutralized or decompoſed by the action of the digeſtive organs, and evacuated through the perſpiratory and urinary paſſages, or more directly by vomiting, the drunkard awakes, feeling head-ach, languor, and low ſpirits, with naufea, and loathing of food,—the proofs of a debilitated frame, conſequent on exceſſive ſtimulation.

In this way the fit of drunkenneſs uſually goes off. But ſometimes a third ſtage ſucceeds, in which the ſenſes and voluntary powers are altogether ſuſpended, and the inebriate lies in a ſtate of *ſopor*, or profound ſleep, from which nothing can rouſe him. In this condition, (as in a paroxyſm of apoplexy,) the only ſigns of life are a ſlow and ſtertorous breathing, with a full and ſlow pulſe, and the remaining warmth of the body;—ſymptoms, which are often only to be diſtinguiſhed from thoſe of true APOPLEXY, by a knowledge of their cauſe, (fermented liquors;) or, where this cannot be learnt, by a conjecture, from the ſmell of liquor in the breath, or the ejection of it from the ſtomach. The inebriate is ſaid, in the vulgar phraſe, to be "dead drunk;" and occaſionally the obſervation proves to be literally true; for actual and fatal APOPLEXY (the *apoplexia temulenta* of Sauvages) ſometimes cloſes the ſcene; or the oppreſſed ſtate of the brain is evinced by the occurrence of PALSY and CONVULSIONS, ſcarcely leſs fatal.

In ſuch caſes, the condition of the brain has been aſcertained, by diſſection after death, to be the ſame as it is commonly obſerved to be, when apoplexy and convulſions prove mortal, under other circumſtances. Morgagni has related ſome examples of this ſort, in his great work, *De ſedibus et cauſis Morborum*. In one of theſe caſes, a man was brought home drunk, and apopleſtic, and died in the courſe of the night. On examination, the veſſels of the inveſting membrane (*pia mater*) of the brain, as well as thoſe of the *plexus choroides*, and other internal parts of that viſcus, were found filled and diſtended with blood, in an extraordinary degree; and there was ſome water effuſed into the lateral ventricles. (See Epiſt. lx. art. 12.) In another caſe, in which convulſions and palſy were induced by the ſame cauſe, and which terminated fatally in ſix or ſeven days, nearly the ſame appearances preſented themſelves on diſſecting the brain: the veſſels of the *pia mater* ſeemed as if they had been filled by injection, even to the ſmalleſt branches; and thoſe of the ventricles (in which a conſiderable quantity of limpid water was found) as well as of the medullary ſubſtance itſelf, were alſo much diſtended. (Epiſt. lxii. art. 5.)

Such are the phenomena and conſequences of a fit of intoxication. It is rarely, indeed, carried to a fatal extent at once; and in the leſſer degrees, or when ſeldom repeated, it may not materially injure a hardy conſtitution: nay, ſome men have ſufficient ſtrength of frame, to bear the habitual repetition of it, during many years. But theſe are, in truth, rare exceptions, and more rare than the world at large is aware of. As the ſtimulus of fermented liquors is more frequently reſorted to, it becomes gradually leſs efficient; and, therefore, a greater quantity, or a ſtronger ſpecies of it, becomes neceſſary to produce the uſual degree of excitement. For it is a general law, in the animal economy, that as the conſtitution becomes habituated to any ſtimulus, the effect of that ſtimulus decreaſes, whether it be of a mental, or corporeal nature. Hence, the charm of novelty and variety in all our gratifications; and hence the pampered voluptuary, who has exhauſted every ſource of pleaſure, exclaims in diſguſt, that "all is vanity." But great as the *ennui* of the voluptuary may be, in the intervals of pleaſure, there is a degree of horror and painful depreſſion conſequent on the over-excitement by ſpirituous liquors, (when habit has rendered the extreme of ſtimulation requiſite to produce the ordinary effect,) which is, perhaps, the moſt intolerable of all ſenſations, that follow exceſſive excitement from any cauſe, if we except that from ſwallowing opium.

> ——"An anxious ſtomach well
> May be endured; ſo may the throbbing head:
> But ſuch a dim delirium, ſuch a dream
> Involves you, ſuch a daſtardly deſpair
> Unmans your ſoul, as maddening Pentheus felt,
> When, baited round Cithæron's cruel ſides,
> He ſaw two ſuns, and double Thebes aſcend."
>
> Armſtrong.

Hence, then, the danger of frequent indulgence in the agreeable ſtimulation of fermented liquors. However innocently begun, or moderately taken at firſt, the continuance of the practice may gradually induce a diſpoſition to increaſe the quantity and ſtrength of the liquor, and to ſhorten the intervals of drinking, until the caſual gratification becomes converted into an *appetite; i. e.* until the call for the ſtimulus of ſpirituous liquors become as much a part of the conſtitution, as the demand for food; with this difference, that the ſenſations of languor and pain, and the ſinking and daſtardly deſpair that accompany them, are infinitely more urgent and more inſupportable than the keeneſt pain of hunger. The condition of the ſpirit drinker, then, while it is a ſubject of juſt reproach, is likewiſe truly pitiable. He may be conſidered as labouring under a conſtitutional diſeaſe, the removal, or palliation of which muſt be difficult, in proportion to its inveteracy.

But this is not the whole of the evil. The habit of intemperance in the uſe of ſpirituous liquors, (we ſay *ſpirituous*, becauſe, when the habit is confirmed, the weaker and more dilute ſorts of fermented drink are ſeldom adequate to the proper ſtimulating effect,) is, ſooner or later, productive of a ſeries

a ſeries of painful and fatal diſeaſes, of a chronic nature, and conduces to render fevers, internal inflammations, and many pulmonic diſorders, inveterate, and even mortal. This fact, it is true, ſome will pretend to queſtion, and cite the longevity of individual drunkards as a perfect refutation of the poſition; forgetting that individual ſtrength of conſtitution, in thoſe inſulated examples, had withſtood the deleterious effects of the practice, but as exceptions to a general rule; and that both theory and experience concur in diſproving their hypotheſis. Mark, ſays Darwin, what happens to a man, who drinks a quart of wine, if he has not been habituated to it. "He loſes the uſe both of his limbs and of his underſtanding! He becomes a temporary ideot, and has a temporary ſtroke of the palſy! and though he ſlowly recovers after ſome hours, is it not reaſonable to conclude, that a perpetual repetition of ſo powerful a poiſon muſt at length permanently affect him?" (See Zoonomia, vol. i. ſect. xxi. 10.) To this queſtion the following obſervation may be ſtated, as the anſwer of experience. "On comparing my own obſervations with the bills of mortality, I am convinced, that conſiderably *more than one-eighth of all the deaths which take place in perſons above twenty years old happen prematurely, through exceſs in drinking ſpirits.*" (See Dr. Willan's Report on the Diſeaſes in London, p. 152.) Among the diſeaſes thus brought on, and prematurely terminating life, are enumerated many caſes of what are called *bilious* and *nervous* diſorders, pain in the ſtomach, pain in the bowels, inteſtinal hæmorrhage, palſy, apoplexy, gravel, or dyſury, ſchirrous liver, jaundice, and dropſy. And beſides the aggravation of the febrile, inflammatory, and pulmonic complaints above-mentioned, the habitual drinking of ſpirits manifeſtly augments every ſymptom of ſea-ſcurvy in our fleets, and retards the healing of wounds, converting them into ulcers. (See Dr. Trotter *loc. cit.*) We have already had occaſion to remark, that in all the examples of Europeans wintering within the arctic circle, thoſe who drank ſpirits died from ſcurvy, while thoſe who poſſeſſed no ſuch liquors, and drank water only, ſurvived. See COLD.

Although theſe various diſeaſes and injuries are occaſioned by drinking ſpirituous and vinous liquors, in various conſtitutions, yet there is a certain gradual progreſs of decay and diſorder, which may be obſerved to go on in general, as the pernicious practice is continued. It is generally ſuppoſed that theſe deleterious liquors have an immediate and ſpecific effect on the liver: which viſcus has been often found after death, in drinkers of ſpirits, hardened or altered as to its texture, diſcoloured, enlarged, or diminiſhed. It appears, however, that the ſtomach and bowels ſuffer firſt from the uſe of ſpirits; and that their baneful influence is afterwards extended gradually to every part of the body, producing a variety of morbid ſymptoms, nearly in the following order of ſucceſſion.

The firſt appearances of diſeaſe are the uſual ſymptoms of indigeſtion, or *dyſpepſia*, attended with a diſreliſh of plain food, with a frequent nauſea, heat, and oppreſſive pain at the ſtomach, particularly ſoon after taking victuals; with ſudden, ſlightly convulſive diſcharges of a clear, acid, or ſweetiſh fluid from the ſtomach into the mouth. This ſymptom (the *Pyroſis* and *Cardialgia*, or *Gaſtrodynia ſputatoria* of authors) is termed the *water brash* in Scotland, where it is an uſual effect of the deleterious ſpirit, whiſkey. Along with theſe ſymptoms, there is frequently an inexpreſſible ſenſation of ſinking, faintneſs, and horror, eſpecially at thoſe times when the influence of the ſtimulating liquor has gone off. Racking pains and violent contractions of the bowels and of the abdominal muſcles ſucceed: often returning periodically, about four in the morning, being attended with extreme depreſſion, or langour, a ſhortneſs of breath, and the moſt dreadful apprehenſions.

The unhappy patient ſometimes drags on a miſerable life, rendered now and then more ſupportable by renewed potations, for ſeveral years. But other ſymptoms ſooner or later enſue. The ſtomach will take and retain food, but after receiving it, it is oppreſſed, and feels tightened or contracted in its dimenſions; the patient expreſſes it as if it were tied by a ſtraight bandage, and the muſcles being drawn into irregular contractions the ſurface of the belly is diverſified with protuberances and cavities. The pain continues increaſing to ſuch exceſs, that the miſerable patient is obliged to preſs againſt a table or ſome hard body, to mitigate his diſtreſs, till vomiting brings a reſpite; or he haſtens this operation, by thruſting his finger into his throat, and thus relieves himſelf, till the next reception of nouriſhment, when the ſame ſuffering is repeated. In perſons of the ſanguine temperament, inflammations of the peritoneal membrane enſue, which continue long, producing intenſe pain, ſo that the ſlighteſt preſſure on the abdomen cannot be endured.

The lower extremities now become emaciated, and are attacked with frequent cramps and pains in the joints, which finally ſettle in the ſoles of the feet; theſe, as well as the legs, become ſmooth and ſhining, and at the ſame time ſo tender, that the weight of the finger excites exclamations of pain, yet in a moment's time heavy preſſure ſometimes gives no uneaſineſs. To theſe ſucceed a degree of *paralyſis* in all the limbs, or at leaſt an incapacity of moving them with any conſiderable effect, ſo that, wherever they are placed, there they generally remain till removed again by the attendant. The whole of the ſkin becomes dry and ſcaly, and the complexion ſallow. As the powers of the circulation are more and more impaired, the red veſſels diſappear from the white of the eye, the ſecretion of bile is imperfectly performed, and the ſmall hairs of the ſkin fall off, leaving the ſurface ſmooth, eſpecially on the legs, as we have already mentioned. After ſome time jaundice begins to appear, the belly fills with water, and dropſical ſwellings ariſe in the legs, with general redneſs or inflammation of the ſkin, terminating in black ſpots and gangrenous ulcers. Sometimes *petechiæ*, or purple ſpots, appear and diſappear for many months, and if the ſurface of the extremities be ſcratched, blood exudes. The *melæna*, or *morbus niger*, conſiſting of a diſcharge of grumous blood from the bowels, or vomitings of a ſimilar fluid, like coffee-grounds from the ſtomach, ſucceed: often, indeed, profuſe diſcharges of blood take place from the noſtrils, ſtomach, bowels, kidnies, or bladder; and from the lungs in perſons of a conſumptive habit. Women of a ſanguine temperament, who indulge to exceſs, frequently have the catamenia very profuſely, long after the uſual period; even, ſometimes, beyond the ſixtieth year of age. A frequent recurrence of aphthous ulcerations in the mouth and throat takes place, and the ſmell of the breath is offenſive, being ſimilar to that of rotten apples.

In the courſe of theſe bodily complaints, the mental powers ſuffer a change no leſs remarkable. At firſt, low ſpirits, ſtrange ſenſations, and groundleſs fears occur to the patient,—"ſuch horrors take place," it is remarked by Dr. Lettſom, "as are dreadful even to a by-ſtander; the poor victim is ſo depreſſed, as to fancy a thouſand imaginary evils; he expects momentarily to expire, and ſtarts up ſuddenly from his ſeat, walks wildly about the room, breathes ſhort, and ſeems to ſtruggle for breath: if theſe horrors ſeize him in bed, when waking from ſlumber, he ſprings up like an elaſtic body, with a ſenſe of ſuffocation, and the horrors of frightful objects around him." Yet theſe painful depreſſions ſometimes alternate with unſeaſonable, and

even

even boiſterous mirth. But at length a degree of ſtupidity, or confuſion of ideas, ſucceeds. "The memory," to uſe the words of Dr. Willan, "and the faculties depending on it, being impaired, there takes place an indifference towards uſual occupations, and accuſtomed ſociety or amuſements: no intereſt is taken in the concerns of others; no love, no ſympathy remain. Even natural affection to neareſt relatives is gradually extinguiſhed, and the moral ſenſe ſeems obliterated. The wretched victims of a fatal poiſon fall, at length, into a ſtate of fatuity, and die with the powers both of body and mind wholly exhauſted. Some, after repeated fits of derangement, expire in a ſudden and violent phrenzy: ſome are hurried out of the world by apoplexies: others periſh by the ſlower proceſs of jaundice, dropſy, aphthous ulcerations of the alimentary canal, and gangrenous ulcers of the extremities." (See Dr. Willan, Reports, &c. p. 132, *et ſeq.* Dr. Lettſom on Hard Drinking, and alſo in the Memoirs of the Med. Soc. of London, vol. i. p. 152. Dr. A. Fothergill on the Abuſe of Spirituous Liquors.)

This is the moſt uſual courſe of the deleterious operation of ſpirituous liquors on the human conſtitution. It is not to be inferred, however, that this ſeries of ſymptoms is obſerved in every drunkard, without variety; or that other complaints do not often occur, as a conſequence of habitual inebriation: nor, on the other hand, is it to be concluded, that any, or all of theſe morbid changes, are not frequently produced by that degree of *tippling*, which many people practice without getting drunk, and without acquiring the character of intemperate drinkers. Fatal caſes of jaundice, dropſy, ſchirrous liver, apoplexy, &c. from the latter degree of habitual potation, are but too numerous in the experience of every phyſician. Theſe ſober drunkards, if the expreſſion may be allowed, deceive themſelves, as well as others; they advance more ſlowly, but not leſs certainly, in the road to the ruin of their health. And even this is not invariably true; for intemperance is a relative term: what is an active poiſon to one individual, the conſtitution of another will enable him to bear with a trivial detriment. We have no accurate accounts of the quantity of liquor which ſome inebriates are capable of conſuming. Even now, when barbarous exploits in drinking are no longer the ſubject of rival boaſting, as in the time of the Spectator, ſome men may be found to equal "honeſt *Will Funnel*," in the hogſheads of October, and tons of Port, that have paſſed through them. (See vol. viii. N° 569.) But this, as well as the effects on the conſtitution, will depend on the ſtrength and kind of the liquor, and its combinations with other ſubſtances. Dr. Trotter mentions a marine, in a king's ſhip, who drank four gallons of beer in the day; he ſoon grew bloated and ſtupid, and died of apoplexy. A ſimilar caſe fell under the obſervation of the writer of this article, in a ſedentary man, employed in writing; he took little ſolid food, but drank 12 or 13 quarts of porter daily, and ſoon grew corpulent, with a paſſid or leucophlegmatic complexion, and exceſſively dull and incapable of exerciſe, and at length was ſeized with a fit of apoplexy, of which he died in a few hours. Wine of courſe may be taken in much larger quantities than the pure ſpirit, but it produces nearly the ſame effects; a purple redneſs of the complexion, with eruptions called *gutta roſacea*, eſpecially about the noſe; of which Shakeſpeare has given a humourous caricature in Falſtaff's deſcription of Bardolph's noſe. (Henry IV. Part i. act 3.) An officer of the hoſpital ſhip of the fleet in which Dr. Trotter ſerved, beſides his allowance of wine at the meſs table, uſually drank a bottle and a half of gin in twenty-four hours: his face at times was equal to Bardolph's, with bloodſhot eyes, fœtid breath, &c.; he died of apoplexy and diſeaſed liver.

Spirits, like other poiſons, if taken in a ſufficient *doſe*, prove immediately fatal. The newſpapers frequently furniſh us with examples of almoſt inſtantaneous death, occaſioned by wantonly ſwallowing a pint or other large quantity of ſpirit for the ſake of a wager, or in boaſt. The author laſt quoted obſerves, that "among the numerous deaths from intoxication, which have come under his own obſervation, or been reported to him by ſurgeons, no ſeaman ever exceeded *the bottle* of ſpirit," (p. 163.) But ſmaller quantities, if repeated at ſhort intervals, will induce diſeaſes, that ſpeedily terminate life, without running the courſe which we above deſcribed; of which two inſtances are related by Dr. Rollo, in the ſeventh vol. of the London Medical Journal (of Dr. Simmons) for 1786, p. 33.

Prevention and Cure.—When it is conſidered that the deſire for ſtimulating liquors, with which the habitual tippler or drunkard is actuated, is in fact a conſtitutional feeling, an appetite, an inclination of nature for the time (a morbid one, it is true) as much as the thirſt of the parched and panting traveller for a draught of cold water, or of the feveriſh man for the ſame refreſhment; it muſt be obvious, that, as in other chronic diſeaſed conditions of the body, it may be moſt effectually checked in its commencement, and that much more is to be hoped from a ſyſtem of prevention, than from any attempts to cure. *Venienti occurrite morbo*, ſhou'd be the maxim of every individual in this matter, for in ſuch a caſe, "the patient muſt miniſter to himſelf." "I would guard every perſon," ſays Dr. Lettſom, "from beginning with even a little drop of this faſcinating poiſon, which, once admitted, is ſeldom, if ever, afterwards overcome." *Loc. cit.*

The moſt important preventive caution that can be given, eſpecially to the female ſex, is to avoid the firſt encroachments of the enemy *in diſguiſe*. Many of the unhappy victims to drinking, have to date their firſt propenſity to that practice from the frequent uſe of ſpirituous tinctures, uſed as *medicines*, raſhly preſcribed for languors, ſtomachic pains, and other *nervous* and hyſterical complaints; or from the time when, by the unguarded advice of ſome medical practitioner, or good lady-doctor, a little brandy and water was ſubſtituted for wine, under an idea that the latter turned ſour on the ſtomach. But if much miſchief has accrued from theſe ſources, what a catalogue of moral and phyſical evils is to be attributed to the circulation of thoſe diſguiſed and medicated *drams*, which the avarice and *charlatanerie* of the quack impoſtors of this country palm upon the public, under the titles of *nervous cordials*, *cordial balms*, &c. &c. Theſe potions of coloured whiſkey not only become the origin of the pernicious habit of dram-drinking, but afford the means of continuing and increaſing the practice of it, without any of the moral compunction or reproach, with which the potation of vulgar rum and brandy is uſually ſtigmatized. The laſt remark, indeed, applies alſo to the uſe of cordials and *liqueurs*, which is common in many families. The names of *noyau*, &c. ſerve to deceive the unwary; for, doubtleſs, there are many who drink of thoſe *liqueurs*, that would bluſh to taſte brandy: yet they are nothing more than brandy diſguiſed.

There are many well-meaning people, who take frequent drams, under one ſhape or another, to relieve uneaſineſs at the ſtomach, or lowneſs of ſpirits, without at all ſuſpecting that they are doing any harm. They mention theſe ſymptoms ſlightly, as nervous, or gouty, and attempt to avert preſent ſuffering, by indulging more freely in the very cauſe of the miſchief, until the habit, with all its lamentable conſequences, is eſtabliſhed. And it is painful to hear the deluſive arguments, with which they juſtify the choice of their liquor. Some, who avoid brandy, have been induced to take

take rum, from a vulgar opinion, that it is more oily and balſamic!—others, who condemn both brandy and rum, make no objection to gin, becauſe they think it diuretic; whereas half the dropſies, among the lower claſſes of the people, originate, or are confirmed by the uſe of this ſpirit. They are all nearly alike deleterious.

There is another caution, which the temperate will ever attend to: never to drink wine or ſpirituous liquors on an empty ſtomach, or after long faſting. In this condition the ſtomach is much more eaſily affected, and a ſmall quantity will produce a powerful impreſſion. In the theoretical language of Brown and Darwin, the excitability or ſenſorial power is accumulated in conſequence of the abſence of ſtimulus. A ſtriking illuſtration of this fact is afforded in captain Bligh's narrative. The allowance of water and proviſion was ſo exceedingly ſmall, that it was little better than faſting. The rum was meaſured out to each man in a teaſpoon; yet the body was in that ſtate ſo ſuſceptible of ſtimulus, that this quantity produced a degree of intoxication. When a morning glaſs becomes neceſſary to baniſh the languor, ſinking, and tremors of the tippler, the caſe may be conſidered as a diſeaſe rooted in the habit, and therefore nearly hopeleſs.

For theſe beginnings of the practice of drunkenneſs, each individual is reſponſible chiefly to himſelf; but the foundation of this pernicious vice is, in many caſes, laid by others, even by thoſe who are the natural guardians of the health, which they contribute to undermine, and at a period when the ſufferer is totally unable to reſiſt the miſchief. The ſeeds of the diſeaſe are unqueſtionably often ſown in *infancy*, by the miſtaken indulgence of parents and friends. The mild bland nutriment, which nature has prepared for the young of animals of our own claſs, as ſuited to the delicate excitability of thoſe tender beings, ought ſurely to be the model of the preparations, which we ſubſtitute for it. Natural appetite requires no ſtimulants; and it cannot be doubted, that ſpirits, wine, and fermented liquors of all kinds, ought to be excluded from the diet of infancy, childhood, and youth; except, in the latter period, ill health demand its occaſional uſe medicinally.

> "Nothing like the ſimple element dilutes
> The food, or gives the chyle ſo ſoon to flow;"

is a truth, which, in infancy and childhood, at leaſt, is incontrovertible.

As to the *cure* of drunkenneſs, when the habit is eſtabliſhed, experience teaches us, that it is ſcarcely to be expected, that ſucceſs will attend any ſuch attempt. In the earlier periods of the practice, when the effects of the liquor on the conſtitution, have not greatly contaminated it, beyond the frequent recurrence of indigeſtion, and pains and oppreſſion of the ſtomach, ſpirits ſhould be at once interdicted altogether; and ſome leſs pernicious ſtimulant for a time ſhould be ſubſtituted, as the bitter drugs, *Columbo*, *Quaſſia*, Peruvian bark, or ſteel in ſmall quantities between the meals. The food ſhould be light, and taken often, at regular intervals. But where the ſtomach is ſtill more affected, and rendered incapable of retaining nutriment in any quantity, a ſmall portion of ſome one light ſubſtance ſhould be taken, until that organ acquire tone enough to digeſt a ſtronger, or more mixed diet. Dr. Lettſom mentions the caſe of a lady, who could not retain any food on her ſtomach above an hour or two. He requeſted her to fix upon ſome light nouriſhment, that ſhe could fancy palatable, and ſhe mentioned milk: he then reſtrained her to four table ſpoonfuls of it every ſix hours, and afterwards increaſed the quantity as the ſtomach could bear it. From this ſhe went to broth, and thus gradually acquired ſuch a ſtate of the ſtomach, as to bear the uſual food of the family: and for two years paſt ſhe had enjoyed good health with the moderate uſe of a glaſs of wine, or of beer, but not one drop of ſpirit. (Memoirs of the Med. Soc. vol. i. p. 164.)

But where the habit of ſpirit drinking has been long continued, and the debility and derangement of the functions brought on by it are very conſiderable, the total and ſudden omiſſion of the uſual ſtimulus, has ſunk the perſon into irretrievable weakneſs. Health can only be recovered in this caſe by a gradual abandonment of the pernicious draughts. Dr Darwin mentions what he calls a golden rule, by which he has ſucceſsfully directed the diminution of the quantity of ſpirit in ſuch caſes. He has preſcribed to ſeveral of his patients to omit one-fourth part of the quantity, they had lately been accuſtomed to, and if in a fortnight their appetite increaſed, they were adviſed to omit another fourth part. But ſo little was his hope of ſucceſs, if the digeſtion appeared to be impaired from the want of that quantity of ſpirituous potation, that he then adviſed them rather to continue as they were, and bear the ills they had, than riſk the encounter of greater. He recommended at the ſame time fleſh-meat, with or without ſpice, with bark and ſteel, and half a grain or a grain of opium, with 6 or 8 grains of rhubarb, at night.

Perhaps, however, this fear of the ſudden omiſſion of the ſtimulus of ſpirits is carried farther, in conſequence of hypothetical opinion, than actual experience would juſtify. Dr. Trotter remarks that, we daily ſee, in all parts of the world, men who by profligacy and hard drinking have brought themſelves to a gaol; yet, if we conſult the regiſter of the priſon, it does not appear that any of theſe habitual drunkards die by being forced to lead ſober lives. And he contends, that whatever debility of the conſtitution exiſts, it is to be cured by the uſual medicinal means, which are employed to reſtore the weakened organs. But the great difficulty in theſe attempts to cure inebriety is in ſatisfying the mind, and in whetting the blunted reſolutions of the patient. And this is, doubtleſs, more eaſily accompliſhed by a gradual abſtraction of his favourite potation. The recommendation of a celebrated phyſician to a Highland chieftain, to put as much ſealing wax daily into his cup, as would receive the impreſſion of his ſeal, is ſaid to have been attended with the happy effect, of curing his habit of inebriation. Dr. Lettſom mentions a perſon who uſually drank twelve *drams* a day, but being convinced of his approaching miſery, took the reſolution to wean himſelf from this poiſon. He always drank out of one glaſs; into this he daily dropped a drop of ſealing wax: by this means he had twelve drops leſs of ſpirit every day, till, at length, his glaſs being filled with wax, his habit was cured.

The waters of Bath are in conſiderable repute for their efficacy in recruiting the worn down conſtitutions of inebriates. To the wealthy, who can afford to procure this remedy by a journey to Bath, the uſe of it is certainly to be recommended. In addition to the warmth, theſe waters contain iron in a very diffuſed ſtate. The change of place and of general habits may contribute to introduce new modes of thinking, to divert the attention from too much brooding over the corporeal feelings, and therefore to change the habit in reſpect to liquors. The uſe of warm, weak, diluent liquors, in any ſituation, with a plain diet, and regular temperance, will effect a great deal, even under the otherwiſe unaided efforts of nature, in removing thoſe violent ſtomachic and hepatic affections, which have been brought on by the free uſe of vinous and ſpirituous potation. Nay, thoſe diſeaſes, when pronounced incurable, have ſometimes yielded, in

in a few months, to ſuch a ſyſtem of regularity, plain diet, and water-beverage:—an encouraging fact to thoſe perſons, who reſolve firmly to change their pernicious mode of life.

In aiding ſuch a reſolution, the phyſician has unfortunately many prejudices of the mind, as well as diſtreſſing feelings in the nervous ſyſtem of the patient, to encounter. The Spectator juſtly obſerves, that "no vices are ſo incurable as thoſe which men are apt to glory in;" but, he adds, "one would wonder how drunkenneſs ſhould have the good luck to be of this number." (See N° 569.) But the wonder ceaſes, when we reflect, that from our earlieſt education we are accuſtomed to read of the pleaſures of Bacchus, and the praiſes of wine, in the moſt elegant languages of antiquity;—that our own poets and dramatiſts have employed their various talents in extolling the ſame ſubjects;—that not only Horace, and Anacreon, and Shakeſpeare, but even our grave Milton wrote, in a beautiful Latin ode, the praiſes of the ſpirit of the grape. And Haller and Hoffmann, both phyſicians of great learning, have expreſſed an opinion that wine inſpires a genius favourable to the effuſions of the poet. (See Haller Phyſiol. lib. 17. Hoffm. de Temperan.) The opinion, moreover, has extended among the people generally, that a generoſity of ſpirit, a cheerfulneſs, courage, and manlineſs, belong to thoſe only who do not ſhrinch from the cheerful cup; and the high and low, therefore, applaud the ſentiments of Falſtaff: "Good faith, this ſame young ſober-blooded boy doth not love me, nor a man *cannot make him laugh*:—but that's no marvel, he drinks no wine. There's never any of *theſe demure boys come to any proof*: for thin drink doth ſo over-cool their blood, and making many fiſh meals, they fall into a kind of male green-ſickneſs; and then when they marry, they get wenches: they are generally *fools and cowards*, which ſome of us ſhould be too, but for inflammation." (Henry IV. p. ii. act 4.)

Now, it may be an encouragement to the drunkard to know, that theſe are arrant prejudices; and it is happy for the preſent age, that they are much leſs prevalent than in the preceding one, and that drunkenneſs, among the better educated claſſes of the community, is no longer a vice that "men are apt to glory in." The following ſentiments of Dr. Trotter are the reſult of ſtrict obſervation: "My whole experience aſſures me, that wine is no friend to vigour or activity of mind: it whirls the fancy beyond the judgment, and leaves body and ſoul in a ſtate of liſtleſs indolence and ſloth. The man that, on arduous occaſions, is to truſt to his own judgment, muſt preſerve an equilibrium of mind, alike proof againſt contingencies as internal paſſions. He muſt be prompt in his deciſions; bold in enterprize; fruitful in reſources; patient under expectation; not elated with ſucceſs or depreſſed with diſappointment. But if his ſpirits are of that ſtandard as to need a *fillip* from wine, he will never conceive or execute any thing magnanimous or grand. In a ſurvey of my whole acquaintance and friends, I find that *water-drinkers* poſſeſs the moſt equal temper and cheerful diſpoſitions." (Loc. cit. p. 170.) This, we believe, will be confirmed by the experience of every perſon. This denomination, however, does not exclude the idea of an occaſional temperate uſe of wine; for, let us not be miſunderſtood:

> "We curſe not wine: the vile exceſs we blame;
> More fruitful than th' accumulated board
> Of pain and miſery," &c.

In regard to the *cure* of the fit of intoxication, the principal objects are, to evacuate the inebriating fluid from the ſtomach by vomiting, or to dilute it by means of warm water poured down the throat. This laſt expedient will often produce vomiting. If the perſon is in the laſt ſtage of drunkenneſs, having ſo far loſt the power of ſenſe and motion as to be unable to help himſelf, he ſhould be treated as if under the danger of an impending apoplexy. He ought to be placed either in an arm chair, where he cannot fall, or laid on a bed, with the head and ſhoulders raiſed nearly erect; the neckcloth ſhould be removed, and the collar of the ſhirt unbuttoned; a free ventilation ſhould be admitted, and all uſeleſs viſitors excluded. If his face is much ſwollen, and unuſually flushed or bloated, his breathing ſtertorous, the eyes fixed, with their veſſels turgid, there is danger of an inſtant fit of apoplexy. In this caſe, bleeding, or cupping the temples, may be adviſable, to relieve the preſſure on the brain; and it will then be deſirable to unload the ſtomach as ſpeedily as poſſible: and this is often readily accomplished, by introducing a feather, or any ſuitable ſubſtance into the throat. Throughout the whole paroxyſm, the application of cold water, rectified ſpirit, or æther, to the head and temples, is proper: the actual cold of the firſt, and the cold occaſioned by the evaporaion of the latter, tend to repreſs the inordinate action of the arteries of the head, and therefore to diminiſh the quantity of blood ſent to the brain. Immerſion in the cold bath has often brought a drunkard to his ſenſes, as occurred in the miller before mentioned; and as is often obſerved among ſeamen, who fall over-board in a ſtate of ſtupid intoxication, they are generally ſober when picked up. There was a cuſtom of *ducking* a drunken huſband prevalent in ſome parts of this iſland, of uncertain origin; but it is to be lamented that our fair country-women ſhould not exerciſe ſo wholeſome a privilege more generally.

It might perhaps be conſidered by ſome as too great a compliment to inſtruct the drunkard, how to correct morning headach and ſick ſtomach. A wet cloth over the forehead is effectually employed by ſome perſons for the relief of the former: for the latter, a little ſalted fiſh, ham, &c. is often ſerved up; and kitchen ſalt, in any way, is doubtleſs a very grateful ſtimulus to a ſtomach weakened by exceſs. Dr. Cullen uſed to ſay, in his lectures on Indigeſtion, that he found it repreſs ſickneſs, when every thing elſe failed. Vitriolic acid, riding on horſeback, and even continuance in bed, contribute to the ſame effect, according to Dr. Home. Where acidity prevails, the abſorbent earths, as magneſia and chalk, or alkaline medicines, are uſeful.

We have now to mention one of the moſt formidable effects of habitual intoxication, of which many inſtances are recorded in the Philoſophical Tranſactions, and other works of authority, namely, the *combuſtion* of the individuals ſo habituated. As we do not aſk our readers for that faith in theſe ſtories, which we do not give them ourſelves, we ſhall content ourſelves with relating one example of ſuch burnings; and refer to the authorities before-mentioned for a farther account of them. "Madame de Boiſeon, 80 years of age, exceedingly meagre, who had drunk nothing but ſpirits for ſeveral years, was ſitting in her elbow chair before the fire, while her waiting maid went out of the room a few moments. On her return, ſeeing her miſtreſs on fire, ſhe immediately gave an alarm, and ſome people having come to her aſſiſtance, one of them endeavoured to extinguiſh the flames with his hands, but they adhered to it as if it had been dipped in brandy or oil on fire. Water was brought, and thrown on the body in abundance; yet the fire appeared more violent, and was not extinguiſhed till the whole fleſh had been conſumed. Her ſkeleton, exceedingly black, remained entire in the chair, which was only a little ſcorched; one leg only, and the two hands, detached themſelves from the reſt of the bones." Trotter, p. 76. See Phil. Tranſ.

Act. Med. Hafn. Encyclopedie Methodiq., &c. quoted by Dr. Trotter.

The ancient Lacedæmonians used to make their slaves frequently drunk, to give their children an aversion and horror for this vice. The Indians hold drunkenness a species of madness; and, in their languages, the same term *ramjam*, that signifies drunkard, signifies also a phrenetic.

Drunkenness is punishable by the laws of England. The penalty is five shillings fine, or the sitting six hours in the stocks in case of non-payment. For a second offence, the guilty person may be bound with two sureties in 10*l.* each to his good behaviour. And an alehouse-keeper, convicted of the same offence, shall be disabled to keep any such alehouse for three years. Tippling is a species of drunkenness. If any inn-keeper, victualler, or alehouse-keeper, shall suffer any person (except travellers, and labouring people at their dinner hour) to continue drinking or tippling in an alehouse, &c. he shall forfeit ten shillings to the poor, to be recovered by distress; or the party offending to be committed till payment, and disabled to keep an alehouse for three years. The persons tippling shall forfeit 3*s.* 4*d.*, or be set in the stocks for four hours. All flag officers and persons belonging to his majesty's ships of war, being guilty of drunkenness, are liable to such punishment as a court-martial shall think fit to impose. See stat. 1 Jac. I. c. 9. 4 Jac. I. c. 5. 7 Jac. I. c. 10. 21 Jac. I. c. 7. 1 Car. I. c. 4. 22 Geo. II. c. 33.

Hobbes makes voluntary drunkenness a breach of the law of nature, which directs us to preserve the use of our reason. The law of England also does not allow it to be an excuse in any case whatsoever, but rather an aggravation of an offence. To this purpose sir Edward Coke observes (1 Inst. 247.), that a drunkard, who is "voluntarius dæmon," hath no privilege thereby; but whatsoever hurt or ill he doth, his drunkenness doth aggravate it: "nam omne crimen ebrietas, et incendit, et detegit." It hath been observed, that the real use of strong liquors, and the abuse of them by drinking to excess, depend much upon the temperature in which we live. The same indulgence, which may be necessary to make the blood move in Norway, would make an Italian mad. A German, therefore, says Montesquieu (Sp. Laws, l. 14. c. 10.), drinks through custom, founded upon constitutional necessity; a Spaniard drinks through choice, or out of the mere wantonness of luxury: and drunkenness, he adds, ought to be more severely punished, where it makes men mischievous and mad, as in Spain and Italy, than where it only renders them stupid and heavy, as in Germany and more northern countries. Accordingly, in the warm climate of Greece, a law of Pittacus enacted, "that he who committed a crime, when drunk, should receive a double punishment:" one for the crime itself, and the other for the ebriety which prompted him to commit it. (Puffend. L. of N. l. 8. c. 5.) The Roman law, indeed, made great allowances for this vice: "per vinum delapsis capitalis pœna remittitur." But the law of England, considering how easy it is to counterfeit this excuse, and how weak an excuse it is (though real), will not suffer any man thus to privilege one crime by another. (Plowd. 19.) It has been held that drunkenness is a sufficient cause to remove a magistrate; and the prosecution for this offence by stat. 4 Jac. I. c. 5. was to be, and still may be, before justices of peace in their sessions, by way of indictment, &c. Equity will not relieve against a bond, &c. given by a man when drunk, unless drunkenness is occasioned through the management or contrivance of him to whom it is given. (3 P. Wm. 130, in n. 1 Inst. 247.)

DRUPA, in *Botany*, (*drupæ* of the Latin writers are unripe olives, or any other similar fruit.) A stone fruit. This consists of a fleshy coat, not separating into valves, usually of a juicy substance, though sometimes, as in the Cocoa-nut, dry and spongy, enclosing a single hard and bony nut, to which it is closely attached, as in the Peach, Plum, Cherry, &c. Sometimes the nut, though not separating into distinct valves, contains more than one cell, and consequently several seeds, as in the Cornel-tree, *Cornus*, and the Olive, *Olea*, though only one cell of the latter usually comes to perfection, the other being entirely obliterated as the fruit advances in growth. Linnæus reckons some fruits *drupæ*, in which there are several separate seeds or nuts, on account of the hardness of those seeds, as in the Medlar, *Mespilus*; but Gærtner more commodiously reckons them berries, *baccæ*, it being found best to restrain the term *drupa* to a fruit with a single nut, of one or more cells, even though its nut be sometimes furnished with a very tender shell, as in *Daphne*. Sm. Intr. to Botany.

DRUPATRIS, (a name contrived by Loureiro, from *Drupa*, a stone fruit, and *tres*, three, to express its ternate or three-celled nut.) Loureir. Cochinch. 314. Class and order, *Icosandria Monogynia*. Nat. Ord. *Hesperideæ*, Linn. *Myrti*, Juss.

Gen. Ch. *Cal.* Perianth bell-shaped, superior, its limb in five acute segments. *Cor.* Petals four, roundish, concave, spreading, rather longer than the calyx. *Stam.* Filaments more than twenty, thick, shorter than the corolla, inserted into the calyx; anthers two-lobed, roundish, fixed. *Pist.* Germen roundish; style thick, equal to the stamens; stigma thickish. *Peric.* Drupa oval, smooth, dry. *Seed.* Nut of three cells.

Ess. Ch. Calyx five-cleft, superior. Petals four. Drupa with a nut of three cells.

D. *cochinchinensis*, native of the deep woods of Cochinchina, where it is called *Cây Deung*. A large tree, with a few ascending branches. *Leaves* alternate, large, ovate-oblong, pointed, serrated, smooth. *Spikes* numerous, oblong, nearly terminal. *Flowers* white, small. *Drupa* of a middling size, not eatable.

Such is Loureiro's account, which is all we know of the plant or its genus. It appears very nearly related to *Eugenia racemosa* of Linnæus, *Stravadium* of Jussieu, Rumph. Amboin. v. 3. t. 116, but if the above description be correct it can scarcely be the same. The name of Loureiro is at least as good as that of Jussieu, and might remain, if by a comparison of the two *drupæ* in an early state, each should be found to have three cells. Still there will be some difficulty on account of the shortness of the filaments in Loureiro's plant.

DRURYD, in *Geography*, a river of Wales, in the county of Merioneth, which runs into the Irish sea, about 2 miles N.N.W. of Harlech.

DRUSA, in *Natural History*, a name given by some of the Saxon miners to the common pyrites, and by others to some peculiar kind of it. But in general it is understood to signify both the pyrites and the marcasite.

DRUSENHEIM, in *Geography*, a small town of France, in the department of the Lower Rhine, situated at the confluence of the Motte and Rhine, in the district of Wissembourg; 18 miles N.E. of Strasbourg.

DRUSES, Druzes, or *Derouz*, a people of Syria, bordering upon the Maronites to the south, and extending from the river Nahr-el-Kell, or the river of the Dog, which discharges itself into the Mediterranean, in N. lat. 33° 48′, to the neighbourhood of Sour (Tyre), between the valley of Bekaa and the Mediterranean sea. The whole country contains 100 square leagues, including a population of 120,000, and of which 40,000 are able to bear arms; so that each

league

league contains 1090 perſons: a population equal to that of the richeſt provinces in France. This is the more remarkable, as their ſoil is not fertile, and many eminences remain uncultivated; inſomuch, that they do not produce corn enough to ſupport themſelves three months in the year. Beſides, they have no manufactures, and all their exportations are confined to ſilks and cottons, the balance of which exceeds very little the importation of corn from the Hauran, the oils of Paleſtine, and the rice and coffee they procure from Bairout. Volney attributes this extraordinary number of inhabitants, occupying ſo ſmall a ſpace, to that ray of liberty which glimmers in this country. Unlike the Turks, every man lives in a ſtate of perfect ſecurity with regard to his life and property. The peaſant is not richer than in other countries, but he is free, and not ſubject to pillage and oppreſſion, which are unknown among theſe mountains. Security, therefore, has been the original cauſe of population, from that inherent deſire which all men have to multiply themſelves, wherever they find an eaſy ſubſiſtence. The frugality of the nation, which is content with little, has been a ſecondary cauſe; and a third is the emigration of a number of Chriſtian families, who daily deſert the Turkiſh provinces to ſettle in Mount Lebanon, where they are cordially received by the Maronites from ſimilarity of religion, and by the Druzes from principles of toleration, and a conviction how much it is the intereſt of every country to multiply the number of its cultivators, conſumers, and allies. The Druzes, who engaged the attention of Europe about the cloſe of the 16th century, bear a ſtriking reſemblance to the Maronites in their mode of life, form of government, language, and cuſtoms; the principal difference between them conſiſting in their religion. Volney traces their origin to a diſſenſion that took place about the commencement of the 11th century between the followers of Mahomet; and particularly to the contempt manifeſted by the third caliph of Egypt, called Hakem-bamr-ellah, to the Mahometan religion. This caliph cauſed the firſt caliphs, the companions of Mahomet, to be curſed in the moſques, and afterwards revoked the anathema; he compelled the Jews and Chriſtians to abjure their religion, and then permitted them to reſume it; he burnt one-half of the city of Cairo for his diverſion, while his ſoldiers pillaged the other; and not content with theſe extravagant acts, he forbade the pilgrimage to Mecca, faſting, and the five prayers; and at length carried his madneſs ſo far as to deſire to paſs for God himſelf. This impious pretenſion was ſupported by a falſe prophet, who came from Perſia into Egypt, and was called Mohammed-ben-Iſmael. This Mohammed taught that it was not neceſſary to faſt or pray, to practiſe circumciſion, to make the pilgrimage to Mecca, or obſerve feſtivals; that the prohibition of pork and wine was abſurd; and that marriage between brothers and ſiſters, fathers and children, was lawful. To ingratiate himſelf with Hakem, he maintained that this caliph was God himſelf incarnate. Both the impoſtor and the caliph were ſoon brought to an untimely death by the hands of violence. However, the death of theſe two chiefs did not prevent the progreſs of their opinions. A diſciple of Mohammed-ben-Iſmael, named Hamza-ben-Ahmud, propagated them with indefatigable zeal in Egypt, Paleſtine, and along the coaſt of Syria, as far as Sidon and Berytus. His proſelytes underwent the ſame fate with that of the *Maronites* (which ſee); for, being perſecuted by the ſect in power, they took refuge in the mountains of Lebanon, and here, being better able to defend themſelves, they formed an independent ſociety. Notwithſtanding difference of opinions, they find it their intereſt to allow mutual toleration, and they have united in their oppoſition, at different times, to the cruſaders, the ſultans of Aleppo, the Mamlouks, and the Ottomans. The conqueſt of Syria by the latter made no change in their ſituation. The Druzes, thus ſecure, and unmoleſted by Selim I. and his ſucceſſor, Soliman II., but not ſatisfied with their independence, frequently deſcended from their mountains to pillage the Turks. At length, in the year 1588, Amurath III. reſolved to reduce them; and his general, Ibrahim Pacha, marched from Cairo, and attacked the Druzes and Maronites with ſuch vigour, as to force them into their ſtrong holds, the mountains. Diſſenſion took place among their chiefs, of which he availed himſelf, for exacting a contribution of upwards of one million of piaſtres, and for impoſing a tribute which has continued to the preſent time. Until this expedition, the Druzes had lived in a ſort of anarchy, under the command of different ſcheiks, or lords. The nation was alſo divided into two factions, diſtinguiſhed by the appellations of "Kaiſi," and "Yumani," and by the red and white colours of their flags. Ibrahim allowed them only one chief, who ſhould be reſponſible for the tribute, and execute the office of chief magiſtrate; and this governor became king of the republic. As he was always choſen from among the Druzes, he had at his diſpoſal the whole ſtrength of the nation, and being able to give it direction, as well as unanimity and force, he turned it againſt the Turks, engaging in ſecret hoſtilities whenever favourable opportunities occurred, and avoiding open war. About this time, that is, in the beginning of the 17th century, the power of the Druzes attained its greateſt height; which it owed to the talents and ambition of the celebrated Emir Fakr-el-din, commonly called Fakardin. This chief firſt gained the confidence of the Porte, by every demonſtration of loyalty and fidelity; repulſed the Arabs, who infeſted the plain of Balbec, and the countries of Sour and Acre; took poſſeſſion of the city of Bairout, and proceeded in the ſame manner at Saide, Balbec, and Sour; till at length, in the year 1613, he ſaw himſelf maſter of all the country, as far as Adjaloun and Safad. Whilſt he was making this progreſs, the pachas of Tripoli and Damaſcus oppoſed him, ſometimes with open force, and at other times by complaints at the Porte; but the Emir, who there maintained his ſpies and defenders, defeated every attempt. The divan, at length, began to be alarmed by the progreſs of the Druzes, and made preparations for effectually cruſhing them. In the mean while, Fakr-el-din embarked at Bairout for Italy to ſolicit ſuccours, and having reſigned the adminiſtration to his ſon Ali, repaired to the court of the Medici, at Florence. His arrival excited attention and curioſity; and as the hiſtory and religion of the Druzes were little known, it was doubted whether they ſhould be claſſed with the Mahometans, or Chriſtians. In this ſtate of uncertainty, it was ſuggeſted, that a people who had taken refuge in the mountains, and were enemies to the natives, could be no other than the offſpring of the cruſaders. Of this groundleſs conceit, Fakr-el-din availed himſelf, and pretended that he was related to the houſe of Lorraine. The miſſionaries and merchants, who promiſed themſelves a new opening for converſions and commerce, encouraged his pretenſions. The learned in etymology, ſtruck with the reſemblance of the names, inſiſted that "Druzes" and "Dreux" muſt be the ſame word, and thus formed the ſyſtem of a pretended colony of French cruſaders, who, under the conduct of a comte "de Dreux," had formed a ſettlement in Lebanon. The hypotheſis, however, has been totally overthrown, by the diſcovery, that the name of the Druzes is to be found in the Itinerary of Benjamin of Tudela, who travelled before the time of the cruſades. Not to mention other circumſtances, which evince the

the futility of this hypothesis, we may remark, that the term "Druzes" is pure Arabic; and that it originates from the founder of the sect of Mohammed-ben-Ismael, who was surnamed "El-Dorzi." After a stay of nine years in Italy, Fakr-el-din returned to resume the government of his country, which had been preserved secure, and in good order, by his son Ali. Upon his arrival, he set about perfecting the internal administration, and promoting the welfare of his country; but in doing this, he pursued the frivolous and extravagant plan, the idea of which he had acquired in Italy. He built numerous villas, constructed baths, and planted gardens; and, without respect to the prejudices of his country, he employed the ornaments of painting and sculpture, though they are prohibited by the Koran. The Druzes, who paid the same tribute as in time of war, became dissatisfied; the people murmured at the expence of the prince; and the luxury he displayed renewed the jealousy of the pachas. Hostilities commenced; and Fakr-el-din, having lost his son, whilst he was bravely resisting the progress of the Turkish army, and enfeebled by age and a voluptuous life, lost both courage and presence of mind. Having fled from the field of contest, and retired to the steep eminence of Nitra, he was at length betrayed by the companions of his adversity, and delivered up to the Turks. Upon his arrival at Constantinople, Amurath yielded to the instigations of his courtiers, and ordered him to be strangled, about the year 1631. After his death, his posterity continued in possession of the government, at the pleasure, and as vassals, of the Turks. This family, failing in the male line, the authority devolved, by the election of the scheiks, on the house of Shehab, in which it still continues.

The religion of the Druzes is formed upon the opinions of Mohammed-ben-Ismael, already mentioned; nevertheless, the religious customs of one class of them are very peculiar. Those who compose it are, with respect to the rest of the nation, the same as the *initiated* were to the *profane*: they assume the name of "Okkals," denoting spiritualists, and bestow on the vulgar the epithet of "Djahel," or ignorant; and they have various degrees of initiation, the highest orders of which require celibacy. These are distinguishable by the white turban, as a symbol of their purity; which they conceive to be sullied by even touching a profane person. If one eat out of their plate, or drink out of their cup, they break them; and hence has originated the custom, so general in this country, of using vases, with a sort of cock, which may be drank out of without touching them with the lips. All these practices are enveloped in mysteries. Their oratories are solitary, and situated on eminences, and in these they hold their secret assemblies, to which women are admitted. They have one or two books, which they carefully conceal; but chance has discovered that one of these contains only a mystic jargon, valuable only to adepts. It represents God, meaning Hakem bamr ellah, as incarnated in the person of the caliph: it likewise treats of another life, of a place of punishment, and a place of happiness, where the Okkals shall, of course, be most distinguished. The rest of the Druzes are wholly indifferent with regard to religion. The Christians, who live in this country, pretend that several of them believe in the metempsychosis, or transmigration; and that others worship the sun, moon, and stars. When among the Turks, they affect the exterior of Mahometans, frequent the mosques, and perform their oblations and prayers. Among the Maronites, they accompany them to church, and, like them, make use of holy water. Many of them, importuned by the missionaries, suffer themselves to be baptized; and, if solicited by the Turks, receive circumcision, and conclude by dying, neither Christians nor Mahometans; but in matters of civil policy they are not so indifferent.

The Druzes, as well as the Maronites, may be divided into two classes, the common people, and the people of eminence and property, called scheiks, and emirs, or descendants of princes. Most of them are cultivators, either as farmers or proprietors; every man lives on his own inheritance, improving his mulberry trees and vineyards, and in some districts they grow tobacco, cotton, and grain, in inconsiderable quantities. At first the lands were in the hands of a small number of families; but in order to render them productive, the great proprietors sold part, and let leases of other parts. The scheiks of the principal families, who possess large property, amounting to one-tenth part of the whole country, have great influence among their inferiors and dependents, and involve all the Druzes in their dissensions. However, in consequence, probably, of the conflict between contending parties, the nation has never been enslaved by its chief. This chief, called "Hakem," or governor, and also "Emir," or prince, is a sort of king, or general, who unites in his own person the civil and military powers. His authority is hereditary; but the succession is determined rather by force than by any certain laws. Females are excluded. But whoever be the successor, and this is generally determined by the greatest number of suffrages and resources, when the male line of any family is become extinct, it is necessary for him to obtain the approbation of the Turks, of whom he becomes the vassal and tributary. The office of the governor is to watch over the good order of the state, and to prevent the emirs, scheiks, and villagers, from making war on each other. He is also at the head of the civil power, and names the Cadis, always reserving to himself the power of life and death. He collects the tribute, from which he always allows an annual sum to the pacha. This tribute, which varies from 100 purses (833*l.*) to sixty, is called "Mni," and is imposed on the mulberry tree, vineyards, cotton, and grain. The surplus of this tribute is for the prince, so that it is his interest to reduce the demands of the Turks, and to augment the imposts: but this measure requires the sanction of the scheiks, and their consent is necessary for peace or war. In these cases the emir must convoke general assemblies, and lay before them the state of his affairs. There every scheik and every peasant, in reputation for courage or understanding attend; so that this government may be considered as a well-proportioned mixture of monarchy, aristocracy, and democracy. Neither the chief, nor the individual emirs, maintain troops; they have only persons attached to the domestic service of their houses, and a few black slaves. When the nation makes war, every man, whether scheik or peasant, able to bear arms, is called upon to march. He takes with him a little bag of flour, a musquet, some bullets, a small quantity of powder, made in his village, and repairs to the rendezvous appointed by the governor. The ceremonies, previous to war, very much resemble the customs of ancient times. When the emir and the scheiks determined on war, at Dair-el-Kamar, cryers, in the evening, ascended the summits of the mountain, and there began to cry with a loud voice; "To war, to war; take your guns, take your pistols; noble scheiks, mount your horses; arm yourselves with the lance and sabre; rendezvous to-morrow at Dair-el-Kamar. Zeal of God! Zeal of combats!" This summons, heard in the neighbouring villages, was repeated there; and, as the whole country is nothing but a chain of lofty mountains and deep vallies, the proclamation passed in a few hours to the frontiers. These voices, from the stillness of the night, the long-resounding echoes, and the nature of the subject, had something

thing awful and terrifying in their effect. Three days after, 15,000 armed men rendezvoued at Dair-el-Kamar, and operations might have been immediately commenced. The troops of the Druzes have neither uniforms, nor discipline, nor order; they are mere peasants with short coats, naked legs, and musquets in their hands, differing from the Turks and Mamlouks, in being all foot; the scheiks and emirs only having horses, which are of little use from the ruggedness of the country. The war of the Druzes is merely a war of posts; for they never risk themselves in the plain, as they would not be able to stand the shock of cavalry, having no bayonets to their musquets. They are excellent marksmen, and accustomed to sudden surprises; though they are daring even to temerity, and sometimes ferocious; they possess two qualities essential to the excellence of any troops; they strictly obey their leaders, and are endowed with a temperance and vigour of health, unknown to most civilized nations. They can pass three months in the open air, without tents, or any other covering than a sheep skin, and their provisions consist of small loaves baked on the ashes or on a brick, raw onions, cheese, olives, fruits, and a little wine. They have no knowledge of fortification, the management of artillery, or the mode of encampments; in a word, they are ignorant of war, considered as an art.

The Druzes, comparing their own situation with that of the subjects of the Turkish government, acquire an idea of their own superiority, which has an influence on their personal character. Hence they are in their disposition elevated, energetic, and active; and they are considered, through the Levant, as restless, enterprizing, hardy, and brave even to temerity. No people have a higher sense of honour than the Druzes, and this has produced a politeness which is visible even among the peasants. They are also distinguished for their hospitality; for any one who presents himself at their door as a suppliant or passenger, is sure of being entertained with lodging and food, in the most generous manner. The poorest peasants have given the last morsel of bread to the hungry traveller; alleging that "God is liberal and great, and all men are brethren." They have, therefore, no inns in this country; and when they have once contracted with their guest the sacred engagement of bread and salt, no subsequent event can induce them to violate it. The Druzes, like the Bedoueens, pay great respect to the antiquity of families; but nobility exempts no scheik or emir from paying tribute, in proportion to their respective revenues; and it confers upon them no prerogatives. Every thing among the Druzes is held in freehold; after paying his miri and his rent, every man is master of his property. Fathers have here, as in the Roman law, the power of preferring such of their children as they think proper. Such are their prejudices, that they do not chuse to make alliances out of their own families. They invariably prefer a poor relation to a rich stranger; it is usual with them for a brother to espouse a brother's widow; and, in various respects, they retain the customs of the Hebrews, in common with other inhabitants of Syria, and all the Arab tribes.

The proper and distinguishing character of the Druzes is a sort of republican spirit, which gives them a greater degree of energy than other subjects of the Turkish government, and an indifference for religion, which forms a striking contrast with the zeal of the Mahometans and Christians. In other respects their private life, their customs and prejudices are the same with other orientals. They may marry several wives and repudiate them when they choose; but this is seldom practised, except by the emir, and a few men of eminence. Occupied with their rural labours, they experience neither artificial wants, nor those inordinate passions which are produced by the idleness of the inhabitants of cities and towns. The veil, worn by their women, is their protection; insomuch that no one knows the face of any other woman besides his wife, his mother, his sister, and sister-in-law. The women are perfectly domestic; those even of the scheiks make the bread, roast the coffee, wash the linen, cook the victuals, and perform all the offices of the family. The men cultivate their lands and vineyards, and dig canals for watering them. In the evening they assemble in the area, or court, or house of the chief of the village or family; where, seated in a circle, with legs crossed, pipes in their mouths, and poniards at their belts, they discourse of their various labours, the scarcity or plenty of their harvests, peace or war, the conduct of the emir, or the amount of the taxes; they relate past transactions, discuss present interests, and form conjectures on the future. Their children listen, and at 10 or 12 years of age they talk with a serious air of war and taxes. This is their only education. They are not taught to read either the Psalms, as among the Maronites, nor the Koran, like the Mahometans: and even the scheiks scarcely know how to write a letter. Among the Druzes there is little appearance of the gradation of ranks; all, both scheiks and peasants, treat one another with a familiarity, which is equally remote from rudeness and servility. In a word their manners are those of ancient times, and that rustic life, which marks the origin of every nation; and which proves that the people, among whom they are found, are hitherto only in the infancy of the social state. Volney's Travels in Egypt and Syria. Tott's Memoirs. Pococke's Description of the East, vol. ii.

DRUSIAS, in *Ancient Geography*, a town of Palestine, placed by Ptolemy W. of the Jordan.

DRUSILLIANIA, an episcopal town of the proconsular Africa.

DRUSIUS, John, in *Biography*, a very learned theologian of the Protestant faith, was born at Oudenard, in Flanders, about the year 1550. The first rudiments of his education he had at Ghent, and from thence he was sent to Louvain to go through a course of philosophy. His father, in 1567, was one of the victims of the savage tribunal established by the duke of Alva in the Netherlands, which stripped him of his estate, and obliged him to seek refuge in England. Young Drusius, notwithstanding the vigilance of his mother, who, being herself a zealous Catholic, took every method of detaining the youth in Flanders, found means to escape and join his father in London. He almost immediately entered himself at Cambridge, and studied with much ardour the classics and philosophy, and was at the same time employed as private tutor to some young men at the same college with himself. In 1571 he returned to the metropolis, and was preparing for a journey to France, with a view of farther improvement, when the news arrived of the dreadful massacre in Paris on St. Bartholomew's day. In the following year he was admitted a member of Merton college, Oxford, took his degree of B. A., and had an establishment appointed him for reading a lecture in the oriental languages. He continued the duties of this office four years, and then feeling a strong desire to visit his native country, he quitted Oxford and went to Louvain, where he applied himself to the study of the civil law. Here his continuance was very short, on account of the troubles excited by bigots in religion, and he returned to his father in London. A sudden turn in the affairs of his country, by the pacification of Ghent, enabled both father and son to return home in security. The latter began now to look for a settlement in some Protestant country on the continent, and was accordingly appointed professor of the oriental languages in

in the univerſity of Leyden. In the duties of this office he laboured with indefatigable induſtry, and, during the eight years which bore witneſs to his aſſiduity as a lecturer, he publiſhed works that eſtabliſhed his fame for ſolid erudition in various departments of literature. In the year 1580 he married, and openly expreſſed a wiſh for a more lucrative ſettlement, in order that his means might correſpond to the additional expences in which a family might involve him. The prince of Orange knew his value in the univerſity, and, with his own hand, wrote to the magiſtrates of Leyden, exhorting them to furniſh Druſius with ſuch ample proviſion as ſhould prevent him from leaving their city. Inattentive, however, to his great merits, they ſuffered him to accept of the ſituation of Hebrew profeſſor in the univerſity of Francker. He entered upon the duties of his new office in the year 1585, and retained it with the higheſt reputation to himſelf till his death, in 1616. He left behind him, in his numerous works, monuments to his fame, as one of the ableſt ſcripture critics, having written upwards of thirty ſeparate works on the ſubject. The greateſt part of theſe has been incorporated in the well-known and highly eſteemed "Critici Sacri in Vet. et Nov. Teſt," firſt publiſhed in this country, and of which we have an abridgment in Pool's "Synopſis Criticorum," a work that is become almoſt as ſcarce as it is valuable. Beſides this we have many other writings of Druſius, which indiſputably prove his deep ſkill in the Hebrew language, and his extenſive acquaintance with the Jewiſh antiquities, and with whatever is connected with biblical literature. The private character of this excellent ſcholar was as amiable and unaſſuming as his learning was profound. He had a ſon, of the ſame name with himſelf, who exhibited an aſtoniſhing inſtance of genius at a very early age: he underſtood accurately the Hebrew language when he was only eight or nine years old; and, before he was 17, he was preſented to James I. of England; before whom, in the midſt of his courtiers, he delivered a Latin oration, which obtained the applauſe and admiration of all who heard it. He died of the ſtone, before he was 21 years of age, at the houſe of the dean of Chicheſter, leaving behind him many memorials of his learning and unaffected piety.

DRUSOMAGUS, in *Ancient Geography*, a town of Vindelicia, now *Memmingen*.

DRUSUS, Marcus Livius, in *Biography*, a perſon of conſiderable diſtinction at Rome, was deſcended from an ancient family, and became tribune of the people about the year 91, B. C. At this period there were great diſſenſions in the ſtate; Druſus hoped to reconcile the contending parties, but his plan was oppoſed by all thoſe whom he aimed to benefit by it. Conſcious, perhaps, of his own good intentions, he did not readily abandon the ſcheme, and in ſome inſtances he made uſe of means which were by no means juſtifiable to promote its ſucceſs. Finding himſelf growing unpopular, he propoſed, as a bait to the multitude, a gratuitous diſtribution of corn among them: this meaſure he followed by a ſtill more alarming motion, of giving to the Latins the privileges of Roman citizens. Hence violent conſpiracies were formed, which required all his addreſs to ward off for a time, and which, in the end, proved fatal to him. Returning from the forum, where he had been haranguing in favour of the allies, he was attended to his houſe by a great crowd of people, in the midſt of which an aſſaſſin, ſaid to be C. Varus, plunged a knife into his body, and made his eſcape. Druſus fell, and expired a few hours after, exclaiming, with his laſt breath, "When will the republic again poſſeſs a citizen like myſelf!" By the party whoſe cauſe he eſpouſed his death was ſincerely deplored, while thoſe on the oppoſite ſide regarded it as a timely deliverance of the ſtate from one who was only ambitious of being diſtinguiſhed as a popular leader. Univer. Hiſt.

Drusus. Nero Claudius, ſecond ſon of Tiberius Nero, by Livia, afterwards the wife of Auguſtus, was diſtinguiſhed on many occaſions for his courage and talents in public employments. His conduct againſt the Rhetians, a fierce people, inhabiting the country of the modern Griſons, over whom he obtained a complete victory, is celebrated by Horace in the fourth ode of the fourth book. This was about the year 15, B.C.; and in two years afterwards, Auguſtus, who was his patron, committed to him the charge of ſtopping the incurſions of the Germans into Gaul. In this, and in various other inſtances, he evinced the characteriſtics of courage and of the higheſt military prudence and ſkill; till, at length, his ſucceſſes were ſo brilliant and important, that his army, on the field of battle, ſaluted him Imperator. On his return to Rome he obtained the honour of a triumph, and in the following year, 9, B.C., he was raiſed to the conſulate. Foreign war called him again to Germany: he croſſed the Rhine and the Weſer, and made ſome ineffectual attempts to paſs the Elbe. Here he erected trophies to atteſt his conqueſts, and then began to march homewards: a fall from his horſe, however, impeded his progreſs; and a fever, the conſequence of the accident, put an end to his life, in the 30th year of his age. Though cut off in the prime of life, and even in the ardour of youth, he had lived ſufficiently long to eſtabliſh a high reputation as a ſoldier and magiſtrate. His public and private character exhibited the ſtrongeſt marks of honour and integrity. He was lamented by the army and the people, and all claſſes of the citizens rendered him every token of homage and reſpect. He left three children; *viz.*, the celebrated Germanicus; Claudius, who was afterwards emperor; and Livilla. Rom. and Univer. Hiſt.

Drusus, Cæsar, ſon of the emperor Tiberius, was born B. C. 13. He was introduced by Auguſtus to offices in the ſtate at a very early age, and at the time of the death of that emperor, he was nominated to the conſulſhip. In the firſt year of his father's reign, ; *viz.* A. D. 14, he was ſent out to appeaſe a ſedition, which had broken out in the legions in Pannonia, in which he, happily, ſucceeded. In the year 17, he was ſent to command in Illyricum, in order to keep that province free from the war, which was then raging in Germany. For his prudent and ſucceſsful ſervices he had the honour of an ovation on his return. He was elected conſul, a ſecond time, in the year 21, and during the abſence of the emperor in Campania, he fulfilled, alone, the functions of the office to the entire ſatisfaction of the public. In the following year the tribunitial authority was conferred upon him, for which he returned thanks by letter, inſtead of preſenting himſelf in due form before the ſenate, which was regarded in the light of an inſult. Druſus, however, felt his importance in the ſtate, and could not brook a rival, which led him to dread the growing influence of Sejanus, and to take every opportunity of treating him with indignity. Sejanus was too aſpiring and ambitious to ſubmit even to the prince, and determined to deſtroy him. For this purpoſe, he inſinuated himſelf into the favour of Livilla, the wife of Druſus, and, at length, ſeduced her affections, and contrived, by her means, to adminiſter poiſon to her own huſband, the foe of her infamous gallant. In early life Druſus was ſuppoſed to betray a cruel diſpoſition, by ſome feats at the gladiatorian games: he was alſo, in ſome degree, addicted to wine, and in other inſtances he gave tokens of a haughty and violent character. It muſt, however, be mentioned to his credit, that, while the court was divided between him and his couſin Germanicus, the two princes remained in perfect union, and almoſt

almoſt indifferent as to the final deciſion. Rom. and Univer. Hiſt.

Drusus, the *tower of Straton*, or *Cæſarea*, in *Ancient Geography*, a port of Judea on the ſea, formerly in the half-tribe of Manaſſeh, on this ſide of Jordan, and called Druſus in honour of the ſon of Cæſar's wife. See Cæsarea.

DRUSWER, in *Geography*, a town of Lithuania, in the palatinate of Wilna; 14 miles W. of Braſlaw.

DRUTHMARUS, Christian, in *Biography*, a learned French monk in the ninth century, was a native of Aquitaine, but he was ordained prieſt in the diocese of Amiens. His various works prove that he was an excellent ſcholar; and very converſant in the ſacred writings. He left behind him commentaries on the goſpels of St. Matthew, Luke, and John; of the laſt, two fragments only have reached us. His object, as a critic and illuſtrator of the ſacred writings, was to give the natural and plain ſenſe of the original language, and he is thought by able judges to have obtained his wiſh. His commentary on St. Matthew, and the fragments of the others, were published at Straſburgh in 1514, which were ſoon after ſuppreſſed on account of their tendency, which was decidedly in favour of proteſtantiſm. The catholics maintained, that theſe paſſages are inſidious interpolations, and of no authority whatever.

DRUTISCHKEN, in *Geography*, a town of Pruſſian Lithuania, on the Rominte; four miles S. S. E. of Gumbinnen.

DRUTZ, a river of Ruſſia, which runs into the Dnieper at Rogatchev, in the government of Mogilev.

DRUYE, a town of France, in the department of the Yonne, and diſtrict of St. Fargeau; 16 miles S. of Auxerre.

DRUYN, or Drevin Petri, or *Grand Drewin*, a town of Africa, on the Ivory coaſt, at the mouth of the river St. Andre. N. lat. 5°. W. long. 4° 5′.

DRUYSKIDWAR, a town of Lithuania, in the palatinate of Wilna; 8 miles N. E of Braſlaw.

DRUZIPARA, in *Ancient Geography*, a town of Thrace, near the river Agrianes, towards the north-weſt, and at ſome diſtance from Perinthus.

DRY. A dry air, *ceteris paribus*, leſſens the weight of the human body, and the contrary quality increaſes it. See Moisture *of the air*.

Dry *Aqueduct*, is an arch made under a canal for a road to paſs through.

Dry *Baths*, *Confects*, *Dock*. See the ſubſtantives.

Dry *Exchange*, *Cambium ſiccum*, a ſoft appellation, anciently uſed to diſguiſe uſury, intimating ſomething to paſs on both ſides; whereas, in truth, nothing paſſed but on one: in which reſpect it might be called dry. See Interest, and Usury,

"Cambium ſiccum," ſays Lud. Lopes, de Contract. & Negot. "eſt cambium non habens exiſtentiam cambii, ſed apparentiam, ad inſtar arboris exſiccatæ, &c."

Dry *Harbour*, in *Geography*, a bay on the N. coaſt of the iſland of Jamaica. N. lat. 18° 30′. W. long. 77° 16′.

Dry *Maſs*, *Meaſures*. See the ſubſtantives.

Dry *Meat*, in the *Manege*, is uſed for corn and hay. After taking the horſe from graſs, or houſing him, he is frequently put to dry meat.

Dry *Moat*, *Rent*, *Storax*, *Suture*, *Spavin*. See the ſubſtantives.

Dry *Needle*, or *Dry point*, a tool uſed in copper-plate engraving, generally for the more delicate parts, ſuch as the lights of clouds, white drapery, the light fur of animals, &c. It is called *dry*, in contradiſtinction to the *etching*-needle, and becauſe its uſe is not followed by the application of aqua fortis.

Dry-needles are formed of ſteel-wire, which ſhould be of excellent temper, that it may cut the copper freely, without breaking. The wire ſhould be from one to two inches in length, and from the $\frac{1}{8}$th to the $\frac{1}{16}$th part of an inch in diameter, according to the required ſtrength of the lines which they may be intended to cut. Being thus formed and tempered, the wire ſhould be carefully inſerted in ſlender handles, which are commonly formed of ebony or box, and whetted to conical points, more or leſs acute or obtuſe, in proportion as the lines or inciſions in the copper are required to be broad or deep.

That the point may cut lines exactly of the ſame breadth and depth on every ſide, it ſhould be whetted as nearly as poſſible to a perfect cone: in order to which, it ſhould be very carefully inſerted in the handle, and ſo that a right line being ſuppoſed to paſs from its extreme point, to the centre of the upper extremity of the handle, might form an ideal axis to the whole, during the proceſs of whetting. In proportion to the truth of this ideal axis, will be the truth of the conical point, and the conſequent truth of the workmanſhip for which it may be employed: and to enſure purpoſes of ſo much importance to the engraver, the beſt tool-makers generally inſert a braſs ſocket in the handle very correctly, by means of a watch maker's lathe and wheel, before the dry-needle itſelf is introduced.

The dry-needle is uſually whetted to a point, with a little oil, on a hone of the fineſt kind: by the French engravers latitudinally on the flat ſurface of the ſtone, and by moſt of the Engliſh engravers, longitudinally, in a groove of an inconſiderable depth, which is formed in the hone for that purpoſe.

When the dry-needle is thus prepared, it is uſed by different artiſts, with various degrees of freedom or exactitude; the degrees of ſtrength of the inciſions in the copper, being effected by mere dint of preſſure as the needle is held between the fingers and thumb.

It ſhould be mentioned, that in uſing this tool, ſtill more than in uſing the graver, the copper is forced up on either ſide the inciſions, as earth land is forced up in ploughing a furrow. The copper thus forced up, is termed by engravers *the burr*, which is removed either by a ſcraper, (ſee Scraper,) or by a piece of ſoft charcoal with a flat ſurface, uſed either with oil or with water.

Aliamet, Le Bas, and ſeveral other of the French engravers, occaſionally uſed *oval* inſtead of *circular* wire for their dry-needles; and Worlidge, who engraved his ſmall portraits and prints from antique gems almoſt entirely with this tool, uſed *triangular* points, clearing off the burr which he raiſed with charcoal; though, as may be ſeen in his prints, not always clearing it off to the ſurface of the copper-plate.

DRYADES, Dryads, in the *Heathen Theology*, the nymphs of the woods; a ſort of imaginary deities, which the ancients believed to inhabit the woods and groves, and to hide themſelves under the bark of the oak, called by the Greeks δρυς.

The dryades differed from the hamadryades, in that theſe latter were attached to ſome particular tree, with which they were born, and with which they died; whereas the dryades were the goddeſſes of the trees and woods in general, and lived at large, in the middle thereof. For, though δρυς properly ſignifies an oak, it was alſo uſed for tree in general.

We likewiſe find mention made, in divers authors, of a kind of prophetesſes, or witches, among the Gauls, called dryades, or rather druides. See Druids.

DRYÆNA, or CHRYSOPOLIS, in *Ancient Geography*, a town of Asia, in Cilicia. Steph. Byz.

DRYANDER, JOHN, in *Biography*, but whose real name was Eichmens, was born at Wetteran in Hesse, but received his education in France, and took his degree of doctor at Mayence. He went thence to Marpurg, where he was engaged in teaching anatomy for twenty-four years, *viz.* from the year 1536, to 1560, when he died. His works are, "Anatomiæ pars prior, in qua membra ad caput spectantia, recensentur, et delineantur," Marpurg, 4to. 1537. He first observed several distinctions, before unnoticed, between the medullary and cortical part of the brain, and he saw the olfactory nerves, which he miscalls the optic nerves. In 1541, he gave "Anatomiam Mundini ad vetustissimorum aliquot manuscriptorum codicum fidem collatam," 4to. with notes, in which he frequently corrects the errors of his author, and for which he is deservedly placed by Haller among the restorers, and improvers of anatomy. He is also mentioned with honour in the Bib. Anat. of Douglas. Haller Bib. Anat.

DRYANDRA, in *Botany*, (so named by Thunberg in honour of his much-valued friend, Jonas Dryander, M. A. the pupil and friend of the great Linnæus and of his son, long resident in this country, and now a vice-president of the Linnæan Society,) Thunb. Japon. 13. Murray in Linn. Syst. Veg. ed. 14. 612. Schreb. 708. Juss. 389. Mart. Mill. Dict. v. 2. Class and order, *Dioecia Monadelphia*. Nat. Ord. *Euphorbiæ*, Juss.

Gen. Ch. Male, *Cal.* Perianth of two ovate, acute, equal leaves, shorter than the corolla. *Cor.* Petals five, obovate-oblong, reflexed, somewhat spreading, rather above half an inch long. *Stam.* Filaments nine, united below into one set, unequal, half the length of the petals; anthers minute. *Pist.* none.

Female, *Cal.* and *Pist.* not observed. *Cor.* Petals five. *Peric.* Drupa pear-shaped, angular, furrowed. *Nut* of three or four cells. *Seeds* solitary, oval.

Ess. Ch. Male, Calyx two-leaved. Petals five. Stamens nine. Female, Petals five. Drupa. Nut with three or four cells. Seeds solitary.

D. *cordata*. Thunb. Jap. 267. t. 27. (Abrasin; Kæmpf. Amoen. 789. Ic. t. 23.) Dodiekn or Abrasin of the Japanese. Native of the island of Nipon, the country of Fakonia, and other places in Japan, flowering in May and June. It forms a small tree, luxuriantly branched; its wood is compared by Kæmpfer to that of the willow, and the pith is light and very abundant. *Branches* round, with a rugged, dotted bark. *Leaves* about the ends of the branches, spreading, alternate, on footstalks, heart-shaped, acute, entire, smooth, paler beneath, five-ribbed, veiny, broad, three or four inches long. In Kæmpfer's figure they are undulated and sometimes lobed, and bear two stalked glands at the base, or one between the lobes, which he also describes in his *Amoenitates*. Flowers in corymbose, aggregate, nearly terminal panicles, white according to Kæmpfer, Thunberg says yellow. The *seeds* are compared to those of the *Ricinus* or *Palma Christi*, and afford oil for lamps. It is nearly allied to *Jatropa*, or at least to some species incorrectly ranged by Linnæus under that genus.

DRYAS, elegantly so named by Linnæus, from the Dryades, or sylvan goddesses, to whom the oak, Δρυς, which its leaves resemble, was sacred. Linn. Gen. 356. Schreb. 343. Willd. Sp. Pl. v. 2. 1118. Sm. Fl. Brit. 555. Mart. Mill. Dict. v. 2. Juss. 338. Gærtn. t. 74. Class and order, *Icosandria Polygynia*. Nat. Ord. *Senticosæ*, Linn. *Rosaceæ*, Juss.

Gen. Ch. *Cal.* Perianth of one leaf, inferior, in eight deep segments, which are spreading, linear, obtuse, equal, rather shorter than the corolla. *Cor.* Petals eight, oblong, emarginate, spreading, inserted into the calyx. *Stam.* Filaments numerous, capillary, short, inserted into the calyx; anthers small. *Pist.* Germens numerous, crowded, small; styles capillary, inserted into the sides of the germens; stigmas simple. *Peric.* none. *Seeds* numerous, roundish, compressed, each crowned with its long, woolly, permanent style.

Schreber remarks, that the segments of the calyx, and consequently the number of petals, vary from six to ten. This is true, but it happens very seldom.

Ess. Ch. Calyx inferior, in eight equal segments. Petals eight. Seeds with feathery tails. Receptacle depressed.

D. *octopetala*, Linn. Sp. Pl. 717. Fl. Lapp. ed. 2. 181. Sm. Engl. Bot. t. 451. (Chamædrys tertia, sive montana; Clus. Hist. v. 1. 351.) is the original, and as Willdenow justly observes, only genuine species, its generic character depending not only on the number of petals, and corresponding number of the segments of the calyx, but on the equality and uniformity of the latter. By this rule the other species are removed to *Geum*. It is found on most of the high Alpine heaths of Europe, forming wide entangled depressed tufts or patches, flowering from the middle of June till late in August. The *stems* are woody, branched, leafy, a few inches in height. *Leaves* evergreen, crowded, stalked, ovate, blunt, strongly serrated; dark shining green above, snow-white, veiny, downy and concave beneath. *Stipulas* united with the footstalk, as in roses. *Flowers* solitary, white, large, and handsome, each on a long, erect, solitary, terminal, reddish, glandular stalk. *Calyx* also glandular and brownish. *Anthers* yellow. It is one of the most elegant of Alpine plants, and may be cultivated in a gravelly soil, mixed with loam and some bog-earth, under a north wall in our gardens, but it requires a pure air, and some cover during the cold windy weather usual in our tardy spring. S.

DRYAS, in *Ancient Geography*, a river of Greece, in Thessaly, 20 stadia S. of the river Sperchius, and about the same distance N. of Asopus.

DRYAS, in *Zoology*, a species of *Myoxus*, which see.

DRYBACTÆ, or TRYBACTRÆ, in *Ancient Geography*, a people of Asia, in Sogdiana. Ptolemy.

DRYBURG, in *Geography*, a town of Germany, in the circle of Westphalia, and bishopric of Paderburn; seven miles E.N.E. of Paderburn.

DRYDEN, JOHN, in *Biography*, one of the most celebrated poets of which this country can boast, was born about the year 1631, in the parish of Aldwinkle-All-Saints, in Northamptonshire. He was grandson to sir Erasmus Driden, (the name being then spelt with an *i*,) of Canons-Asby, in the same county. The father of our poet possessed a small estate, acted as a county magistrate during the usurpation, and was, in religion, probably, a presbyterian. John laid the foundation of a learned education at Westminster, under the famous Busby, and was thence elected to a scholarship in Trinity college, Cambridge, in 1650. It is said that he was not distinguished for peculiar talents or genius, either at the school or at the university. In the latter he took his degrees, and though he had, at the time of his admission, written two short copies of verses, yet his name is not recorded among the academical poets of the period. His father died in 1654, and John succeeded to so much of the estate as could be spared from the widow, who had other children to provide for. He removed to the metropolis, and was patronized by a distant relation, sir Gilbert Pickering, one of Cromwell's strictest adherents. Dryden was his clerk or secretary, and probably concurred in the opinions

opinions and practices of the family in which he resided. Hence, says his biographer, "in the history of the changes of the human mind, few facts will appear more extraordinary, than that Milton should have been descended from a catholic and loyalist family, and Dryden from a sectarian and republican one." On the death of Cromwell, Dryden celebrated his memory, in heroic stanzas, which fact has been perpetually referred to in dispraise of the poet, who, on the restoration, ardently embraced the royal cause. It must, however, be admitted, that Dryden's praise of the protector went chiefly to that trait in his character, which enabled him first to put an end to domestic contentions, and then to inspire awe and respect for his country throughout Europe. On the return of Charles II. he published his "Astrea Redux," which he followed by "A Panegyric on the Coronation." In 1662, he addressed some lines to lord chancellor Clarendon, in the same strains of loyalty; but it was supposed to be owing to some elegant verses in praise of the modern improvements in philosophy, which he prefixed to Dr. Charleton's treatise on Stonehenge, that he was elected a member of the Royal Society. About the same time he appeared first as a writer for the stage, and his comedy, entitled the "Wild Gallant," was acted in February 1663. By the public this first effort was ungraciously received, but by the interest of Barbara Villiers, afterwards duchess of Cleveland, it obtained a kind reception at court. His next pieces were, the "Rival Ladies," and the "Indian Emperor," in which he displayed a facility of harmonious versification, and a splendour of poetic diction: while his "Essay on dramatic Poesy" exhibited him as an elegant writer in prose, and an able and ingenious critic. About the year 1665, he married lady Elizabeth Howard, daughter of the earl of Berkeley, a connection which promised more advantages than really resulted from it. In 1667, Dryden added to his fame, by the publication of his "Annus Mirabilis," for which the subjects were the fire of London, and the war with the Dutch. He now engaged, under certain conditions, with the managers of the king's theatre, to supply them with three plays annually. His profits under this joint concern have been estimated at nearly 400*l.* a-year, and were probably the principal part of his income. On the death of sir William Davenant, in 1668, he obtained the office of poet-laureat, and soon after the sinecure place of historiographer, the joint salaries of which produced him 200*l. per ann.* For some defects in his style as a tragedian, he was attacked under the name of Bayes, in the "Rehearsal." This satire was written by Villiers, duke of Buckingham, in conjunction with other wits of the time. Dryden felt the lash which the burlesque drama meant to inflict, and candidly acknowledged that several of the strokes contained in it were truly appropriate. In 1679 Dryden himself became a satyrist, but his "Essay" provoked from lord Rochester a severe retaliation by the hands of ruffians hired by his lordship to inflict on the poet a cudgelling, as he was returning from the coffee-house. In 1681, by the royal command, Dryden wrote his celebrated poem of "Absalom and Achitophel," which was an application of the events in the life of David, king of Israel, to the reign of his own sovereign Charles II., relative to the duke of Monmouth and the earl of Shaftesbury. This work was eagerly read, and as it raised him very high in the estimation of the court, so it involved him in irreconcilable enmity with its opponents. The hatred was greatly increased by his "Medal, a satire on sedition," written the same year, on occasion of a medal struck by the whig party, when a grand jury returned *ignoramus* to an indictment preferred against lord Shaftesbury for high treason.

Dryden next tried his powers in literary satire, by the publication of a piece entitled "Mac-Flecknoe," which was written in ridicule of an unequal rival, Shadwell. From this, which cannot well be justified by the poet's warmest admirers, we turn to his more serious poem, the "Religio Laici," which appeared in the same year. Its purpose is to give a compendious view of the arguments for revealed religion, and to ascertain in what the authority of revelation essentially consists. Soon after this, he ceased to write for the stage, but he was then deeply involved in his pecuniary circumstances, and solicited most earnestly any employment, either in the customs or excise, that might be vacant, on the score of absolute necessity. "I have," says he, "three sons, growing to man's estate. I breed them all to learning beyond my fortune, but they are too hopeful to be neglected, though I want.—I am going to write somewhat by his majesty's command, and cannot stir into the country for my health and studies, till I secure my family from want." The case of Dryden, like a thousand similar cases, proved that real want was not the best recommendation to the affluent: his petition was unheeded, and he obtained from those Mœcenases of the age, the booksellers, that patronage which an ungrateful monarch refused to bestow, upon his needy, but very faithful poet and friend.

Soon after the accession of James II., Dryden conformed to the religion of the king, in the profession of which he continued till his death. Whether this important change be imputable to conviction, or to a desire of the royal favour, has been a subject of much dispute. It is, however, certain, that he never seems to have regarded the business of religion with that attention which its importance demands, and on this account, probably, thought the difference between the protestant and catholic faith of no great moment. He obtained from the new king an additional pension of 100*l.* as a reward of his ready compliance; to which was annexed, it is supposed, a condition that he should employ his pen in defence of the religion which he embraced, and he faithfully performed his part of the contract. The revolution, in 1688, deprived the poet of all his posts and pensions, and the laureateship was bestowed upon his rival Shadwell, to the no small mortification of Dryden, and not a little to the disgrace of those who could snatch it from a poet of extraordinary merit, to give it to a man who possessed no qualification worthy of the office.

Dryden, now advanced in life, was obliged to depend wholly upon his own exertions for a security from absolute indigence. Fortunately for him, his faculties were equal to his wants, and what is very surprising, the pieces which he wrote during the last ten years of his life, for actual subsistence, were those which have most contributed to immortalize his name. Among these were his translations of Juvenal and Persius, and Virgil; by the latter he gained about 1300*l.*, it being published by subscription. Soon after the publication of his Virgil, he was solicited by the stewards of the musical celebration of St. Cecilia's day, to write a second ode for the purpose: he had written the first in 1687. This request produced his celebrated "Alexander's Feast," the most popular of all his compositions, and, perhaps, says a good writer, it stands at the head of all the lyric poems in the English language. About this period he meditated a translation of Homer, and agreed, as we are told, to furnish his bookseller with 10,000 lines for the sum of 300*l.* His last work was a collection of fables, of which the subjects are taken from Chaucer, Boccace, Ovid, &c. He died on the first of May, 1700, and his body was interred with every mark of respect, in Westminster Abbey, where a monument was erected to his memory, by Sheffield,

field, duke of Buckingham: his name alone supplied his epitaph.

No modern writer, unless Voltaire be an exception, has possessed equal versatility of talent with Dryden. For the drama he had no original predilection: the bent of his genius would have impelled him to epic poetry: he wrote plays because he was poor: and that he ever wrote them well must be ascribed to the exuberance of his powers. His theatrical pieces are indeed unequal in the extreme. In some he sinks below criticism, in others he soars far above it. The plays of Dryden, though never to be entirely approved, are still read and admired, while those of his competitors are mouldering in oblivion. In his heroic plays, Dryden opened a field of composition peculiarly his own. In the "Conquest of Grenada," he delights by the diversity of his characters, the vivacity of his description, the eloquence of the language, and occasionally the sublimity of the sentiments. What he has produced is not so much a drama as an epic romance, and it has been the subject of regret that he had not leisure to produce a poem on a plan so consonant to his genius. "In his "Don Sebastian," says an elegant writer, "he has rivalled Corneille: in his "Anthony and Cleopatra," he has caught a portion of Shakspear's spirit, and employed it better than his master: in his "Spanish Fryar," he has given the happiest example of a double plot, and in every respect, but morals, of a perfect play. In the drama, therefore, if Dryden sometimes fell short of his own powers, he commonly proves superior to other men; as an original poet he is yet more to be praised. Perhaps no individual writer ever contributed so largely to polish and refine a language: in satire he was a master: his "Medal;" his "M'Flexnoe," and his "Absalom," are all original treasures which have enriched succeeding writers: his characteristic excellencies are versatility and strength; his faults are innumerable, but they are redeemed by the originality and energy of his conceptions. As a translator, he deserves much blame as well as praise. His genius assimilated better with Juvenal and Persius than with Virgil. His fables are not the least pleasing of his performances: his "Alexander's Feast," which alone might have immortalized his name, was among the latest of his productions. Such an accession of valuable poetry no other writer has supplied to our language: but his merits are not limited to poetical compositions; in his various prefaces, and in his "Essay on Dramatic Poetry," he has established his reputation as a prose writer. The inequalities so obvious in his verse are not discovered in his prose; he is uniformly graceful and elegant; always animated and various, and sometimes eloquent. To compare Dryden with Pope would be invidious: the latter could not have written so well, had not the former written before him. Under Dryden's auspices, Congreve wrote for the stage: emulous of his genius, Pope lisped in numbers, for the numbers came; Bolingbroke caught the glow of Dryden's fancy; and Addison learnt from him to construct sentences with that exquisite felicity which eludes censure, and baffles imitation."

In private life Dryden was cold and reserved; yet he was friendly and humane. Though his pen was extremely licentious, his manners were decently regular. He was domestic in his habits, and affectionate towards his family. With a due sense of his own superior merit, he was sensible of his defects and patient under criticism. Biog. Brit. Johnson. Hist. of Knowledge, in New Ann. Register.

Our great bard, besides his dramatic works for declamation, single poems of length, occasional verses, epistles, fables, elegies, prologues, epilogues, epitaphs, and translations, is well entitled to eulogy as a lyric poet; having not only written innumerable songs, "Alexander's Feast," and another "Ode for St. Cecilia's Day," but several dramas expressly for music: as, "The State of Innocence. or, Fall of Man," an opera; "Albion and Albanius," ditto; "King Arthur, or the British Worthies," a dramatic opera; and the "Drama of Diocletian," written originally by Beaumont and Fletcher, which he formed into an opera for Purcell.

Though the State of Innocence is formed into an opera, it can hardly be called a lyric poem: it is written in regular heroic verse, and in rhyme. There is, indeed, much machinery and picturesque and instrumental music planned; but in the two first acts not a single stanza calculated to form an air or duet. There is, indeed, a dance of devils, among other amusements, between the first and second acts; and it is said in the instructions, that they may sing a song expressive of the change of their condition, from what they once enjoyed, and how they fell bravely in battle, having deserved victory by their valour, and what they would have done had they conquered. In the third act only devils sing, disguised like angels. There is no song or vocal music in the fourth act. In the last scene of the fifth act, soft music and a song are mentioned; but for which no words are provided. Eve's last speech, however, might be set and sung, as an adieu to the joys of paradise.

This drama, framed from Milton's Paradise Lost, was never brought on the stage, or even set to music, as we have been able to discover. Nor do we know whether the dialogue was intended for recitative or declamation. The author, while he has endeavoured to preserve the beautiful, bold, and daring sentiments of Milton, quitting blank verse, and Milton's epic style, has dressed his thoughts in his own melodious, powerful, and happy versification.

Throughout the preface to his next opera, as it is called, "Albion and Albanius," Dryden, in his usual manner, diffuses entertainment and instruction; and though he probably had never seen or heard a single scene of an Italian opera performed, his definition of that species of drama, and precepts for its construction and perfection, are admirable, and in many respects still applicable to similar exhibitions.

"An opera," says he, "is a poetical tale, or fiction, represented by vocal and instrumental music, adorned with scenes, machines, and dancing. The supposed persons of this musical drama are generally supernatural, as gods and goddesses, and heroes, which at least are descended from them, and in due time are to be adopted into their number. The subject, therefore, being extended beyond the limits of human nature, admits of that sort of marvellous and surprizing conduct, which is rejected in other plays. Human impossibilities are to be received, as they are in faith; because, where gods are introduced, a supreme power is to be understood, and second causes are out of doors: yet propriety is to be observed even here. The gods are all to manage their peculiar provinces; and what was attributed by the Heathens to one power, ought not to be performed by any other. If the persons represented were to speak on the stage, it would follow of necessity, that the expressions should be lofty, figurative, and majestical; but the nature of an opera denies the frequent use of these poetical ornaments; for vocal music, though it often admits a loftiness of sound, yet always exacts a melodious sweetness; or to distinguish yet more justly, the recitative part of an opera requires a more masculine beauty of expression and sound: the airs must abound in the softness and variety of numbers; their principal intention being to please the hearing, rather than to gratify the understanding. As the first inventors of any art or science, provided they have brought it to perfection, are, in reason, to give laws to it; so whosoever undertakes the writing an opera, is obliged to imitate the Italians, who have not only invented, but perfected this

this ſort of dramatic muſical entertainment. We know that for ſome centuries, the knowledge of muſic has flouriſhed principally in Italy, the mother of learning and of arts; that poetry and painting have been there reſtored, and ſo cultivated by Italian maſters, that all Europe has been enriched out of their treaſury.

"It is almoſt needleſs to ſpeak any thing of that noble language, in which this muſical drama was firſt invented and performed. All who are converſant in the Italian, cannot but obſerve, that it is the ſofteſt, the ſweeteſt, the moſt harmonious, not only of any modern tongue, but even beyond any of the learned. It ſeems, indeed, to have been invented for the ſake of poetry and muſic; the vowels are ſo abounding in all words, and the pronunciation ſo manly and ſo ſonorous, that their very ſpeaking has more of muſic in it than Dutch poetry or ſong. This language has in a manner been refined and purified from the Gothic, ever ſince the time of Dante, which is above four hundred years ago; and the French, who now caſt a longing eye to their country, are not leſs ambitious to poſſeſs their elegance in poetry and muſic; in both which they labour at impoſſibilities: for nothing can be improved beyond its own ſpecies, or further than its own original nature will allow: as one with an ill-toned voice, though ever ſo well inſtructed in the rules of muſic, can never make a great ſinger. The Engliſh have yet more natural diſadvantages than the French; our original Teutonic conſiſting moſt in monoſyllables, and thoſe incumbered with conſonants, cannot poſſibly be freed from thoſe inconveniences."

He tells us, that "this opera was only intended as a prologue to a play of the nature of the "Tempeſt;" which is a tragedy mixed with opera, or a drama written in blank verſe, adorned with ſcenes, machines, ſongs, and dances; ſo that the fable of it is all ſpoken and acted by the beſt of the comedians; the other part of the entertainment to be performed by the ſame ſingers and dancers who are introduced in this preſent opera." The tragedy here alluded to was "King Arthur," which was not performed till about the year 1690.

By dramatic opera, Dryden, and writers of his time, mean a drama that is declaimed or ſpoken, and in which ſongs and ſymphonies are introduced; differing from real operas, where there is no ſpeaking, and where the narrative part and dialogue is ſet to recitative. And this is the plan that has of late years been ſo ſucceſsfully followed by Bickerſtaff and others, in the comic-operas that have appeared on the Engliſh ſtage. To ſay the truth, though recitative was tolerated in Dr. Arne's Artaxerxes in favour of the airs, ſung by favourite ſingers, we have properly no *national recitative*, which, in action, is not languid, or ridiculous.

In the epiſtle dedicatory to his third opera, "King Arthur," to the marquis of Hallifax, the poet makes a very candid, liberal, and unuſual conceſſion to the muſician, Purcell, who compoſed the opera, by ſaying that "theſe ſorts of entertainment are principally deſigned for the ear and eye; and therefore in reaſon my art on this occaſion ought to be ſubſervient to his."

Dryden, no muſician himſelf, ſeems to have been more ſenſible to the charms of muſic, than any of our poets of the higher claſs, except Milton and Maſon, who knew what they were talking about. Burney.

DRYERS, in *Painting*, are ſubſtances, ſo called from their uſe in remedying the fault of oils, which dry too ſlowly. See *Drying* Oil.

DRYINAS, *Oak-ſnake*, in *Zoology*, a ſpecies of *Crotalus*; which ſee.

DRYITÆ, in *Ancient Geography*, a people of Africa, in Mauritania Cæſarienſis, placed by Ptolemy on mount *Durdus*.—Alſo, a people of the iſle of Crete.

DRYITES Lapis, in *Natural Hiſtory*, a name given by authors to a ſubſtance but ill deſerving the name of a ſtone; it being only foſſile wood found in detached maſſes. There is much of this foſſile wood found in Italy, on the banks, and on the ſhores of rivers. We know alſo by what we ſee of the foſſile wood of England, that it may be found in all degrees of petrifaction, from that of almoſt unaltered wood, to abſolute ſtone, or mineral matter, with only the ſuperficial grain of wood. See *Foſſile* Wood.

DRYMA, or Dryme, in *Ancient Geography*, a town of Africa, in Libya, the *Adryma* of Strabo, ſuppoſed to be the ſame with *Adrumetum*.

DRYMÆA, Drymos, or *Drymus*, a town of Greece, in the Phocide, on the banks of the Cephiſſus, N.E. of mount Parnaſſus, and 20 ſtadia from mount *Tithronium*. In this place was an ancient temple, dedicated to Ceres Theſmophora, or Legiſlatrix, in which was celebrated an annual feaſt. The ſtatue of the goddeſs was of marble. Pauſanias ſays that the inhabitants of this town were anciently called *Nauboliani*. It is called *Drymia* by Steph. Byz., and Pliny denominates its territory *Drymia* and *Daulis*.

DRYNESS *of a Place*, means the ſtate of that place with reſpect to the want of moiſture; and, ſince dry and moiſt, dry and damp, dry and wet, are relative terms, a place A may be ſaid to be dryer than another place B; or the place B may be ſaid to be moiſter than the place A, and the meaning of both expreſſions is exactly the ſame. There is no place upon the ſurface of the earth which is perfectly dry, and there is none that may be called perfectly damp, unleſs it were entirely covered by water. The philoſophical inſtrument, which meaſures and indicates the actual degree of dryneſs, or of moiſture, is called an hygrometer, and a vaſt variety of hygrometers have been contrived and uſed; but they are moſtly imperfect. The beſt hygrometers at preſent known, are thoſe of Mr. De Luc, and Mr. Sauſſure. (See the article Hygrometer.) The general principle upon which hygrometers act is as follows:

A ſlender piece of animal, or vegetable ſubſtance, capable of abſorbing and of yielding moiſture with readineſs, and likewiſe capable of expanding itſelf, more or leſs, in proportion to the quantity of moiſture, (of which there is a great number,) is fixed in a proper frame of metal, or wood, or glaſs, &c. and by means of a graduated ſcale, its expanſion is ſhewn to the obſerver; and ſince this expanſion is nearly proportional to the degree of moiſture in the hygrometrical ſubſtance, which is not materially different from the moiſture of the ſurrounding air; therefore, the degree of expanſion of the hygrometrical ſubſtance, indicates the contemporary moiſture of the ſurrounding air. But the more general defects of hygrometers are, 1ſt, that the points of extreme moiſture and extreme dryneſs, or the utmoſt expanſion and contraction of the hygrometrical ſubſtance, cannot be fixed on many of them; and, 2dly, that even in the beſt hygrometers, the animal, or vegetable hygrometrical ſubſtance, is apt to alter its degree of expanſion and contraction in the courſe of no great length of time; hence, two or more hygrometers, made upon the very ſame principle, even by the ſame workmen, but at different times, will hardly ever be found to agree, when placed in the ſame ſituation, and exactly in the ſame circumſtances. The hygrometers of De Luc and Sauſſure, though ſuperior to all the others, are not quite free from this imperfection. In conſequence of theſe defects, and of the recent invention of the two laſt mentioned hygrometers, we have not a great number of periodical hygrometrical obſervations made in different countries; whence, the comparative dryneſs of different

different places might be determined. It is not from the obſervations of one or two years, that a tolerably good eſtimate of the dryneſs of a particular place may be derived. A mean of ſeveral years conſtant obſervation, is the only approximation that can be depended upon. Notwithſtanding theſe defects and theſe difficulties, the dryneſs of places frequently forms the ſubject of common converſation, and common inquiry; for, in truth, the real ſtate of it is a matter of no ſmall conſequence to the welfare of the human ſpecies.

The dryneſs, or moiſture, of a particular ſpot, ariſes from a variety of circumſtances, which muſt be all taken into conſideration, in order to form a proper eſtimate; and, after all, at leaſt in the preſent ſtate of knowledge, the real ſtate of any particular ſpot, with reſpect to dryneſs, or moiſture, may, with more confidence, be derived from viſible effect in common occurrences, than from the meteorological journal. The common occurrences we allude to, are the uſual colour of vegetables; their growing more or leſs readily upon walls, houſes, trees, &c.; the frequent moiſture of common ſalt, and ſo forth.

The average quantity of rain which falls upon a country throughout the year, is by no means a ſure indication of the nature of that country with reſpect to dryneſs; for, if the rains fall ſeldom, though in abundance, the place may be much dryer than if the rain fell frequently and ſlightly. In the former caſe, the great quantity of rain-water is abſorbed, or drained, or evaporated; and not long after the place may be remarkably dry. In the latter caſe, the ſmall quantity of rain which falls at one time is hardly evaporated, or abſorbed, before more rain comes down, and thus a ſucceſſion of moiſture is kept up. Dr. Huxham obſerves, that ſmall rains keep the air moiſt, while heavy ones render it drier, by beating down vapours. The perpendicular height of water which falls at Barbadoes in one year, meaſures 67 inches (a remarkably great quantity); yet the air of that iſland is by no means reckoned damp. In India, the air generally is ſo remarkably dry, as to abſorb moiſture, with ſurpriſing quickneſs, from whatever is expoſed to it; yet, during the rains, *viz.* the period during which the rain falls almoſt inceſſantly, the water that falls, and the copious evaporation of that which has fallen, render the air ſo very damp, as to looſen all ſorts of furniture that are faſtened by means of glue, and the hygrometer nearly points to extreme moiſture. See the article RAIN.

The dews, which fall much more abundantly upon certain places than upon others, contribute, at leaſt for a particular time, to moiſten the air of the place. See the article DEW.

Numerous plants, cloſely growing, contribute to the dampneſs of the place; 1ſt, becauſe they themſelves evaporate abundance of water; 2dly, becauſe they prevent the rays of the ſun, and the action of the winds, having any effect upon the ground below them.

In general, warm countries, *viz.* thoſe which are ſituated near the torrid zone, when they are not ſurrounded by marſhes, are drier than thoſe which lie nearer to the poles of the earth; excepting, however, in a hard froſt.

Iſlands, and eſpecially ſmall ones, moſtly are leſs dry than continental tracts. And valleys, together with other places that lie cloſe to hills, mountains, &c. generally are leſs dry than thoſe which ſtand in open countries. About the latitude of Great Britain, thoſe places which lie cloſe to the weſtern ſhores, are leſs dry than thoſe which are otherwiſe ſituated.

The winds which are predominant in any particular country, influence, in a conſiderable degree, the dryneſs of the place; for, according as they moſtly come from the ſea, or from the land, from the north, or from the ſouth, or elſewhere, ſo they bring dry, or moiſt air with them.

In no place does the hygrometer ever reach the points of extreme dryneſs, or of extreme moiſture; excepting, indeed, when it is improperly ſituated. In London, the mean annual altitude of the hygrometer ſeems to be about 82°; the whole ſcale between the points of extreme dryneſs and extreme moiſture being divided into 100 degrees.

The movements of the hygrometer indicate the changes of dryneſs to moiſture, and *vice verſâ*, in the ſurrounding air, with ſufficient quickneſs. And from the joint movements of the hygrometer and the barometer, the approaching change of weather may frequently be foreſeen. When the barometer falls, and the hygrometer riſes, rain is at hand. When the barometer riſes, and the hygrometer falls, we may expect fair weather.

DRYNESS, *Extreme Point of*, means a total privation of moiſture. But upon the ſurface of the earth a place ſo circumſtanced does not occur; for the air, in its natural ſtate, is always more or leſs combined with aqueous vapour; and hot air holds in ſolution a greater quantity of water, than an equal bulk of colder air can do; ſo that heated air has a greater drying power, becauſe the additional heat has rendered it capable of diſſolving more water; whence, it evidently appears, that heating is not one of the means by which air may be deprived of its moiſture; yet, (in conſequence of the above-mentioned circumſtance,) it is the moſt effectual method of drying other things.

The only method of depriving air of its moiſture, to a very conſiderable degree, if not entirely, is to expoſe a given quantity of it to ſuch ſubſtances as abſorb water with great avidity. Strong ſulphuric acid, hot cauſtic alkalies, and quick-lime recently calcined, have each of them the property of abſorbing the humidity of the air. There are other ſubſtances which likewiſe poſſeſs the ſame power, though not in an equal degree, or which may not be uſed with equal conveniency. For this purpoſe, the air muſt be confined into a veſſel, ſo as to have no communication with the external air, and the ſubſtance which is to abſorb its moiſture, muſt then be introduced to it.

This operation is not frequently required in philoſophical experiments; and the principal uſe to which it is at preſent applied, is to ſettle the point of extreme dryneſs in the conſtruction of hygrometers; and this is accompliſhed in the following manner: About 10, 15, or 20 pounds weight of quick-lime juſt burned, are placed in an oblong tin veſſel, the capacity of which exceeds the bulk of the lime. On one ſide of this veſſel, and againſt its empty ſpace, there is a pane of glaſs, through which one may ſee what paſſes within the veſſel. Now, when the veſſel has been charged with the lime, the hygrometers which are finiſhed, ſo far as to want only the graduation of the ſcale, are placed within the tin veſſel, and exactly behind the pane of glaſs. The lid of the veſſel is then put on, and is waxed, or cemented down, in order to prevent any paſſage of air either in or out of the veſſel. In this ſituation, the whole is left undiſturbed for ſeveral days, during which the movements of the indexes of the hygrometers are obſerved daily through the pane of glaſs. In proportion as the lime abſorbs the moiſture of the air, the index of each hygrometer is ſeen to deſcend; but, after a certain period, they become ſtationary; and that point at which the index of each hygrometer ſtops, gives the point of extreme dryneſs which is there marked, (for which purpoſe a few arbitrary marks are made upon the undivided ſcales of the inſtruments before they are confined within the tin veſſel.) The point of extreme moiſture is afterwards determined, by placing

placing the hygrometer under water. And the diſtance between thoſe two extreme points is divided into a hundred equal parts, called *degrees*.

In the above-deſcribed operation, quick-lime has been preferred, principally on account of its continuing to abſorb moiſture gradually, but for a very long time. For farther particulars relative to the conſtruction and the uſe of this veſſel with quick-lime, ſee the article HYGROMETER.

DRYOPA, in *Ancient Geography*, a town of the Peloponneſus, in the Argolide, near Hermione. Steph. Byz.

DRYOPEIA, Δρυοπεια, in *Antiquity*, an anniverſary day, obſerved in memory of Dryops, one of Apollo's ſons.

DRYOPIS, in *Ancient Geography*, a country of Greece, ſituate in the vicinity of Mounts Oeta and Parnaſſus, and ſo called, as it is ſaid, from Dryope, the daughter of Eurypylus, or, as the poets feign, a nymph raviſhed by Apollo; but more probably from δρυς, an oak, and ωψ, voice, on account of the number of oaks that grew about the mountains and the ruſtling of their leaves. The Dryopes, however, valued themſelves much upon their fabulous origin, and called themſelves the ſons of Apollo; and therefore, Hercules, having overcome this people, carried them priſoners to Delphos, where he preſented them to their divine progenitor, who commanded that hero to take them with him into Peloponneſus. Hercules obeyed, and gave them a ſettlement there, near the Aſinean and Hermionian territories; hence the Aſinæans came to be blended with and to call themſelves Dryopes. Pauſanias, in Meſſen.

DRYOPTERIS, in *Botany*, from Δρυς, the *oak*, and πτερις, a *fern*, ſee POLYPODIUM. Tragus ſeems the firſt modern writer who gave this name to what is now *Polypodium Dryopteris*; but the celebrated Polypody of the Oak is, with Engliſh pharmacologiſts, merely *P. vulgare* happening to grow in that ſituation, which has been ſuppoſed to encreaſe its reputed medical virtues. The Δρυοπτερις of Dioſcorides is deſcribed by him as a fern with very finely cut leaves, growing on old moſſy oaks, and may as probably be the plant of Tragus as any other.

DRYPIS, (Δρυπις of Theophraſtus, ſo called from δρυπτω, *to tear*, appears to have been a thorny leafleſs ſhrub, not now to be aſcertained. Anguillara firſt applied this ancient name to the plant before us, and was followed by Lobel, Gerarde, and Linnæus. It is perhaps the only plant for which the latter quotes Gerarde's herbal.) Linn. Gen. 150. Schreb. 202. Willd. Sp. Pl. v. 1. 1513. Mart. Mill. Dict. v. 2. Juſſ. 303. Gærtn. t. 128. Claſs and order, *Pentandria Trigynia*. Nat. Ord. *Caryophylleæ*.

Gen. Ch. *Cal.* Perianth of one leaf, tubular, divided half way down into five ſegments, permanent. *Cor.* Petals five; their claws narrow, the length of the calyx; borders flat, deeply divided into two linear blunt ſegments, and crowned at the baſe with a pair of ſmall teeth to each petal. *Stam.* Filaments five, as long as the corolla; anthers ſimple, oblong, incumbent. *Piſt.* Germen ſuperior, obovate, compreſſed; ſtyles three, ſimple, ſpreading; ſtigmas ſimple. *Peric.* Capſule roundiſh, clothed with the calyx, ſmall, of one cell, cut all round. *Seed* ſolitary, kidney-ſhaped, poliſhed with ſpiral cotyledons and embryo.

Eſſ. Ch. Calyx with five teeth. Petals five, cloven, crowned. Capſule burſting all round, of one cell. Seed ſolitary.

D. *ſpinoſa*. Linn. Sp. Pl. 390. Jacq. Hort. Vind. v. 1. 19. t. 49. (Drypis; Ger. em. 1112. D. italica aculeata, floribus albis umbellatim compactis; Mich. Gen. 24. t. 23, badly copied in Lamarck t. 214.) This is the only known ſpecies, nor can any plant conſtitute a more natural genus, though it belongs to ſo very natural an order. It grows in Barbary, Italy, and ſeveral parts of the Levant. Dr. Sibthorp gathered the *Drypis* on mount Parnaſſus; ſee Prod. Fl. Græc. v. 1. 209. Jacquin communicated it to the Kew garden in 1775. The *root* is biennial. *Stems* decumbent at the baſe, then aſcending, ſquare; branched in an oppoſite manner. *Leaves* oppoſite, ſeſſile, awl-ſhaped, pungent; thoſe on the main ſtem having often two or three ſpinous ſegments or teeth on each ſide, while thoſe on the branches are all undivided and entire. The ſtem terminates in a forked leafy *panicle*. *Flowers* ſeſſile, white or purpliſh, reſembling thoſe of a *Stellaria*. The whole herb is ſmooth, and of a pale rather glaucous green. Aſſes are ſaid by Micheli to be fond of it.

DRYS, in *Ancient Geography*, a town of Thrace.—Alſo, a town of Italy, in Oenotria.—Alſo, a town of Greece, in Epirus.—Alſo, a trading ſea-port town of Aſia Minor, in Bithynia, over-againſt Nicomedia; it was one of the ſauxbourgs of the town of Chalcedon; and was alſo called *Rufiniana*.

DRYSDALE, JOHN, D. D. in *Biography*, a diſtinguiſhed clergyman of the eſtabliſhed church of Scotland, was the third ſon of the Rev. John Dryſdale, miniſter of Kirkaldy; at which place Dr. Dryſdale was born, on the 29th of April, in the year 1718. The elementary parts of claſſical learning he received under Mr. Miller, who kept a ſchool in that town; and had among his contemporaries the learned Dr. George Kay, and the celebrated Dr. Adam Smith. In 1732, he was ſent to finiſh his ſtudies at the univerſity of Edinburgh; and in the year 1740, was licenſed to preach by the preſbytery of Kirkaldy. Taking holy orders, he was ſeveral years aſſiſtant miniſter of the collegiate church in Edinburgh, and in 1748 was preſented to the church of Kirkliſton. After reſiding there for fifteen years, he was preſented to lady Yeſter's church, by the town council of Edinburgh. This being the firſt inſtance in which the magiſtrates of that city had exerciſed their right of preſentation, and Mr. Dryſdale being ſuſpected of favouring in his diſcourſes the *Arminian* tenets; a formidable oppoſition was made to his inſtitution; but the magiſterial party proving victorious, he obtained a ſettlement in lady Yeſter's church. And the ſermons he delivered there, ſays profeſſor Dalzel, always attracted a great concourſe of hearers, whom he never failed to delight and inſtruct, by an eloquence of the moſt nervous, and intereſting kind. His natural diffidence for ſome time prevented his appearing as a ſpeaker in the eccleſiaſtical judicatories; but he was at length induced to co-operate with Dr. Robertſon, in defence of what is termed the *Moderate Party*, in the church of Scotland. In 1765, the univerſity of Aberdeen, unſolicited, conferred upon him the honorary degree of doctor in divinity; and on the death of Dr. Jardine, he was preferred to the church of Troo, and appointed a king's chaplain, with the allowance of one-third the emoluments ariſing from the deanery of the chapel royal. In 1773, having obtained the character of an able and impartial divine, he was unanimouſly elected moderator of the general aſſembly of the Scottiſh kirk; "the greateſt mark of reſpect," obſerves his biographer, "which an eccleſiaſtical commonwealth can beſtow." In 1784, he was re-elected by a great majority, and again raiſed to the ſame dignity. In May, 1788, he appeared at the general aſſembly, and, the firſt day, acted as principal clerk, but was taken ill, and died on the 16th of June following, aged 70 years. His general character was that of benevolence and inflexible integrity. His candour obtained him many friends; and even ſuch as were of different ſentiments in church affairs, and held different religious tenets, eſteemed the man, and with theſe he kept up a friendly intercourſe. "Indeed," adds the profeſſor, "never any man more ſucceſsfully illuſtrated what he taught

taught by his own conduct and manners." His reputation as a preacher was very great; and, on an occasional visit he made to London, Mr. Strahan endeavoured to persuade him to publish a volume of sermons. On his return to Scotland he began a selection for the purpose, but his modesty hindered his proceeding, and induced him, finally, to relinquish the plan. After his death, his friend, professor Dalzel, who had the inspection of his manuscripts, made a selection of his sermons, and published them in two octavo volumes, with biographical anecdotes of his life, from whence this account has been extracted.

DRYSWIATY, in *Geography*, a town of Lithuania, in the palatinate of Wilna; 16 miles S. W. of Braslaw.

DRZEWICZE, a town of Poland, in the palatinate of Sandomir; 24 miles W. N. W. of Sandomir.

DSAPRONG, or Tchaprong, a town of Asia, in the country of Thibet, on the Lantchau; 345 leagues W. of Lassa.

DSARIN, a lake of Thibet, about 12 leagues in circumference. N lat. 32° 10'. E. long. 77° 24'.

DSATCHOU, or Tsatchou, or *Saichou*, a river of Asia, which rises in Thibet, and passes into the Chinese province of Yun-nan, where it assumes the name of *Lan-tsan*; and after crossing the province of Yun-nan, it is called *Kiou-long*.

DSEPTONG, or Septong, a town of Asia, in Thibet; 8 leagues W. N. W. of Rimbou.

DSJABBE-Tar, a small island of Arabia, in the Red sea, about 40 miles W. S. W. of Loheia. N. lat. 15° 32'. E. long. 41° 35'.

DSJABBEL, a small island in the Red sea, about 8 leagues from the coast of Arabia. N. lat. 14° 4'. E. long. 43° 34'.

DSJALIE, a town of Arabia; 24 miles S. E. of Loheia.

DSJAR, a town of Arabia; 80 miles S.W. of Medina.

DSJEBI, a town of Arabia, in the country of Yemen, 56 miles E. of Hodeida. N. lat. 14° 54'. E. long. 43° 40'. To this town belongs a district of considerable extent, in which are a number of independent scheiks. This district forms with that of Kusma the country of Rema, which is a fertile tract, abounding chiefly in grapes and coffee, and with respect to external appearance, soil, and production, possessing the same character with Kusma.

DSJELLEDI, a town of Arabia, in the country of Yemen; 24 miles E. S. E. of Chamir.

DS JERENANG, in *Botany*, a name by which some authors have called a species of palm-tree, from the fruit of which is procured dragon's blood. Kæmpfer, Amœn. Exot. p. 552.

DSJOBLA, in *Geography*, a town of Arabia, in the country of Yemen; 60 miles N.E. of *Mocha*. This town is the capital of a district, and the seat of a dola. It stands upon the brink of a steep precipice, and contains about 600 houses, of a considerable height and good appearance. Its streets are paved, which is not common in Arabia. The Jews, in this place, and through the whole country of Yemen, inhabit a separate quarter, without the city. This is a place of ancient note, and exhibits the ruins of some mosques. It has neither a castle nor walls. At some distance is a place inclosed with walls, where a Turkish pacha has been interred: whence we may infer, that the conquests of the Ottoman Porte have been extended even over these mountainous regions.

DSJOF, an extensive district of the province of Yemen, in Arabia, reaching southward from Nedsjeran to Hadramaut and eastward from Haschid-u-Bekil to the Desart, by which Yemen is separated from Oman. It abounds with desart and sandy plains; nevertheless, in several places, the inhabitants want neither cheese, nor durra, nor any other necessaries of life. The horses and camels of Dsjof are much valued in the Imam's dominions. This country is divided into Bellad-el-Bedoui, a district occupied by wandering Arabs; Bellad-es-Saladin, the highland district, governed by independent chiefs, who assume the title of sultan; and Bellad-es-Scheraf, the district in which the supreme power is possessed by sheriffs.

The wandering Arabs of this country are of a martial character; and in their military expeditions they ride upon horses or camels. Their arms are a lance, a sabre, and sometimes a match fire-lock. Sometimes they put on coats of mail, a piece of defensive armour, which the other Arabs have ceased to wear. They are troublesome to their neighbours, who are settled in villages, plundering them, and often carrying away their young women. But though they are robbers, they are not ferociously cruel. These Bedouins of Dsjof are said to have uncommon talents for poetry, and to excel all the other Arabs in this elegant art. In the district of Bellad-es-Saladin are many petty sovereigns. The title of sultan is no where used in Arabia, except in Dsjof and Jafa; and it seems to distinguish the scheiks of the Highlanders from those of the Bedouins. The most considerable princes in the district of Bellad-es-Scheraf are the three sheriffs of Mareb, Harib, and Rachvan. But the first, although chief of the descendants of Mahomet in this country, possesses only the town of Mareb, with some adjacent villages. (See Mareb.) The only other place in the country of Dsjof, that is at all remarkable, is Kasser-el-Nat, a citadel which stands upon a lofty hill, and was built by the Hamjare princes.

DSOUKIOAG, a lake of Thibet, 15 leagues in circumference. N. lat. 30° 30'. E. long. 74° 24'.

DSJULFAR, a name given by the Persians to the principality of Seer in Arabia. See Seer.

DUABOS, Le, a town of the island of Cuba; 36 miles E. of Villa-del-Principe.

DUALISM, or Ditheism, an opinion which supposes two principles, two gods, or two independent uncreated beings, of which one is the first cause of good, the other of evil. See Manichees.

DUANESBURG, in *Geography*, a post-town of America, in the state of New York, and county of Albany; containing 2787 inhabitants.

DUARE, a town of Venetian Dalmatia; 20 miles E.N.E. of Spalatro.

DUARZE, a river of Spain, in the province of Guipuscoa, which runs into the Orio at Tolosa.

DUATUS Sinus, in *Ancient Geography*, a bay of Arabia Felix. Pliny.

DUAULT-Quelin, in *Geography*, a town of France, in the department of the North Coasts; 3 leagues N.W. of Rostrenen.

DUBBA Fettee, a river of Hindoostan, one of the branches of the Sinde.

DUBBING *a Cock*, cutting off his comb and wattles.

DUBCHESKIAIA, in *Geography*, a town of Russian Siberia, in the government of Tobolsk, on the Enisei; 164 miles N.N.E. of Enisei'sk.

DUBDU, or Dubudu, a walled town of Africa, on the farther side of the kingdom of Fez, in the province of Shaus or Chaus, near the river Mullavia, seated on an eminence, and surrounded by fertile vallies. This town, supposed to have been built by the ancient Africans, was a considerable place in the 16th century, when the race of Merini

Merini reigned at Fez. At prefent it contains few inhabitants, though it has a garrifon, and a confidential alcayde to guard the frontier; 80 miles E. of Fez.

DUBEN, anciently *Döbin*, a fmall town of the kingdom of Saxony, in the circle of Leipfick, fituated on the river Mulde, 20 miles of Leipfick, on the high road to Wittenberg and Berlin, with a population of about 1,300 individuals. It has a flourifhing woollen cloth manufacture; and a confiderable quantity of pitch is made in the adjacent extenfive foreft.

The diftrict of Düben comprifes, befides the town, 6 villages and 7 hamlets, containing all together above 3000 inhabitants, and is remarkable for its alum works.

DUBENDORF, a fmall town of Switzerland, in the canton of Zurich, in the neighbourhood of which, at a place called Oerliken, is a fpring of mineral water.

DUBENINKEN, a town of Pruffian Lithuania; 4 miles E. of Goldapp.

DUBENOW, a town of the duchy of Courland; 20 miles S.E. of Seelburg.

DUBICE, a town of Lithuania, in the palatinate of Wilna; 20 miles W.N.W. of Lida.

DUBIECZ, a town of Poland, in the palatinate of Lemberg; 52 miles W. of Lemberg.

DUBINKY, a town of Lithuania, in the palatinate of Wilna; 24 miles N. of Wilna.

DUBITATIVE CONJUNCTIONS. See CONJUNCTION.

DUBITZA, in *Geography*, a fmall town of Bofnia, in Turkifh Illyricum, in the diftrict of Banialuck, on the river Unna.

DUBITZA, a town and fortrefs of Croatia, on the Unna; 11 miles N.E. of Kaftanovitz.

DUBKI, a town of Ruffia, in the government of Peterfburg, on the gulf of Finland; 16 miles N.N.W. of Peterfburg.

DUBLIN, a county of Ireland, in the province of Leinfter, and nearly in the centre of the eaftern coaft. It has Meath on the north; the fame county and Kildare on the weft; and Wicklow on the fouth. It is from north to fouth 24 Irifh miles ($30\frac{1}{2}$ Englifh), and from eaft to weft 15 (19 Englifh) miles. It contains in Irifh meafure 147,840 acres, or about 231 fquare miles; and in Englifh meafure 237,513 acres, or about 371 fquare miles. Of this, about an eighth part is wafte and mountain. The number of houfes, as returned in 1792, was 25,510, including the city, which exceeded 14,000; but thefe muft have increafed, notwithftanding the circumftances which have fince that period contributed to check population. Reckoning the city at 10 to each houfe, and the reft of the county at 6, this would give a population of about 210,000, which is lefs than what the city alone has been often eftimated. There are 108 parifhes, of which 21 are within the city; feveral of the country ones are without churches. This county is not to be claffed among the moft fruitful, or the beft cultivated; and towards the borders of Wicklow, affumes the mountainous and rocky character of that county. The remainder is flat and uninteresting, except in the neighbourhood of the feacoaft, which, being broken into bays and creeks, affords many picturefque and pleafing profpects. The foil is in general a cold wet clay: but it is not like thofe deep and tenacious clays fo common in England; there being fcarcely any part of it without a mixture of gravel; and in moft parts there may be found, at no very great depth, lime-ftone, or other beneficial gravels, with this uncommon advantage, that the operation of draining the ground generally raifes a fufficiency of gravel to manure the whole furface. Great improvements have been made in many parts of this county, by this practice: and where caution is obferved in the mode of filling in the drains over the fods or other materials, with which the drains are conftructed, the practice, aided by the great facility of procuring manures from Dublin and elfewhere, muft tend to counteract the bad effects attendant on retentive foils. In the northern part of this county, called *Fingal*, the fyftem of husbandry has been ftigmatifed as very bad; but, from the efforts of the Dublin Society, and the Farming Society of Ireland, it may be hoped that it will not long deferve the character given it. The old fyftem of *fallowing* feems to have been more pertinaciouffy adhered to in this than almoft any other diftrict, from its farmers having been formerly in high eftimation, and having acquired an opinion of their own fuperiority, which prevents their attending to the fuggeftions of others.

The minerals of the county of Dublin are various, but not likely to contribute much to the wealth of the country. The mountains in the fouthern part confift of granite, which is very ufeful for building, and for paving the ftreets of the capital. There is alfo abundance of lime-ftone, lime-ftone gravel, and marle. Amongft thofe which have been reckoned as lime-ftone is *calp*, or the black quarry ftone of Dublin, firft made a diftinct fpecies by Mr. Kirwan, and particularly defcribed by Mr. Knox in the Tranfactions of the Royal Irifh Academy. (See CALP.) Siderocelcite is often found interfecting and investing calp. Copper and lead have been found in this county, and mines of them have been formerly worked; and a lead mine lately difcovered at the Scalp, near the county of Wicklow, which is likely to prove productive. The principal river of this county is the Liffey, or, as it is fometimes called, *Anna*, or *Awin*, *i. e.* river *Liffey*, which runs nearly through the middle of it, difcharging itfelf into the bay of Dublin. A few other ftreams of no confiderable note empty themfelves into this river, and have a number of mills for various manufactures. The navigation of the Liffey will be noticed in another place. (See DUBLIN *City*, and LIFFEY.) The Dodder, though next in importance, is a fmall ftream, which takes its rife in the mountains bordering on Wicklow, and running by the villages of Rathfarnham, Milltown, and Donnybrook, difcharges itfelf into the bay of Dublin at Rings-end. There are other fmall ftreams, which run through different parts of the county, and fall into the Irifh fea; but they are too infignificant to be particularly mentioned. But if the county of Dublin cannot boaft much of its rivers, it may of its canals; for there are two paffing through it, which contribute greatly to its profperity, and which for extent, if not for ufefulnefs, may vie with almoft any in Great Britain. Thefe are the Grand and Royal Canals, of the firft of which there is a fhort account in our article CANAL, to which we are now able to add fome particulars. The Grand Canal was commenced in 1753, by the commiffioners of inland navigation; and in 1772, a company was incorporated for carrying on and completing it, from Dublin to the river Shannon, with a power of levying a toll of 3*d. per* ton *per* mile. The difficulties to be overcome were, however, fuch, from the nature of the ground through which the line lay, that, together with fome mifmanagement, *upwards of one million fterling* has been expended, of which 116,000 *l.* has been from time to time given by parliament. The length of the canal is 62 Irifh, or $78\frac{1}{2}$ Englifh miles, from Dublin to Shannon harbour, on the Shannon near Banagher. There is alfo a branch, of 21 Irifh miles, to the river Barrow, at Athy, and two or three fhorter branches, making in all 96 Irifh, or 122 Englifh miles, on the different parts of which boats are now conftantly employed. At Dublin there is a complete floating dock, capable of containing upwards of 400 fhips, with three

 large

large graving docks for repairs. The principal commodities carried on it are flour, malt, wheat, oats, and barley, turf, Kilkenny coal, timber, bricks, furniture, and camp equipage. The number of boats plying on it exceeds 400. The amount of freight in the year 1801 was 120,000 tons, ſince which time it has been completed to the Shannon. When the French landed at Killala, the late marquis Cornwallis found the canal very uſeful for tranſporting his troops without the fatigue of marching, and thus had them freſh for ſervice at a conſiderable diſtance from the capital. There are 56 locks and eight aqueducts on this canal and its branches. The locks are 70 feet long, and 14 feet ſix inches wide. Their average fall is nine feet. The ſummit level is well ſupplied with water; its height is 240 feet above the ſea. The depth of the canal is five feet over the cills of the locks and aqueducts, and five feet ſix inches in the body of the canal; it is 25 feet wide at bottom and 40 feet wide at water ſurface. For ſeveral miles from Dublin the banks are planted with trees, which have a very pleaſing effect. The revenues of the Grand Canal company have been gradually riſing. In 1787 the amount was only 6984 *l.*, but in 1802 47,100*l.*; and it is expected that it will exceed 100,000 *l. per annum.* The Royal Canal commenced, under an act of parliament and a charter from his majeſty, in the year 1789, and it alſo has received large grants from the national purſe. Theſe grants amounted to 91,000 *l.* previous to 1801, at which time the directors general of inland navigation, in conſequence of a reduction of the tolls, agreed to give a further ſum of 95,866*l.* The object of this canal is to carry a line of navigation from Dublin to the Shannon, at Tarmonbury, in a north-weſt direction; and it has been already carried nearly to Mullingar, in the county of Weſtmeath, which is about fifty Engliſh miles from the capital. The ground through which the canal runs is ſo favourable, that one level is ſix miles in length, another ſixteen, and the ſummit level will be 17 miles in extent without a lock; into this laſt the grand ſupply of water comes from Lough Owel, near Mullingar. The conſtruction of this canal is much approved; the locks are 80 feet clear in length and 14 in breadth, the banks ſloping 20 inches for each foot they riſe. At preſent great quantities of goods are carried by this canal; but the national benefit muſt riſe ſtill higher when it reaches the Shannon, as coals, manufactured iron, clays and ores of various kinds, will then be brought from the counties of Roſcommon and Leitrim.

To return from a digreſſion, which the importance of the ſubject, and the want of a better opportunity of introducing it, will, it is hoped, excuſe: the coaſt of the county of Dublin extends for about 30 miles along the Iriſh ſea; on the northern part are ſeveral ſmall fiſhing towns, which were formerly noted for ſmuggling. The iſlands of Lambay and Ireland's Eye form intereſting objects from the coaſt, and are frequented by ſhooting parties. The Hill of Howth is a peninſula projecting conſiderably into the ſea, and forming the northern boundary of Dublin bay. New works have lately been erected on the northern ſide of it, for maintaining a better communication with England, for an account of which, ſee HOWTH.

To the ſouth of the bay the land alſo projects as far as Howth, and then the coaſt takes a ſouthern direction. There are no towns of any conſequence in this county, except the capital, and, like Middleſex, it has a ſeſſions for adminiſtration of juſtice entirely diſtinct from the circuits. It is repreſented in parliament by four members, two for the county and two for the city of Dublin, beſides a member for the univerſity. This county of courſe formed a part of the *Engliſh pale*, and contains the ruins of a great number of caſtles and religious foundations. Archer's Statiſtical Account of Dublin. Dutton's Remarks on it. Beaufort's Memoir.

DUBLIN, the capital of Ireland, the ſecond city in the Britiſh dominions, and ſometimes reckoned the fifth for extent in Europe, is on the eaſtern coaſt of Ireland, in the province of Leinſter, and in the county deſcribed in the preceding article. Dublin is ſeated in view of the ſea on the eaſt, and in a fine country, which ſwells into gently riſing eminences on the north and weſt, whilſt lofty mountains bound the horizon on the ſouth. The city itſelf cannot be ſeen to full advantage on entering the harbour, but the approach to it from thence exhibits a fine proſpect of the country for improvement and cultivation, interſperſed with numerous villas, which have a moſt agreeable effect to enliven this delightful ſcene. The Wicklow mountains, on the ſouth, with the pointed cone of the ſugar-loaf, contribute not a little to embelliſh a landſcape ſo extenſive and picturesque as not to be equalled by any one view in Europe, excepting, perhaps, the bay of Naples, to which it has been thought to bear a very ſtriking reſemblance. The early hiſtory of Dublin, previous to the landing of the Engliſh, is not well aſcertained; and though its name has employed the talents of many antiquarians, it has not been ſatisfactorily accounted for. A town, ſuppoſed to be on the ſite of the preſent Dublin, is mentioned by Ptolemy under the name of *Eblana*, about A. D. 140; and the Danes are ſuppoſed to have entered the Liffey, and encircled Dublin with walls in 498. In a charter of king Edgar's, called *Oſwald's law*, dated at Glouceſter in 964, Dublin is mentioned as a place of conſequence, but this charter is by many ſuſpected to be a forgery. The Danes appear to have been in poſſeſſion of Dublin in the 11th century, and were perhaps the founders of it, as they were of other maritime towns. It was then beſieged and ſtormed by the Iriſh, under Brien Boromhe, who was killed at the battle of Clontarf; and after this event the Danes, or *Oſtmen*, as they were called, ſeem to have admitted the ſovereignty of the king of Leinſter, though they were often in rebellion. The conteſts, indeed, among the Iriſh chieftains, afforded them a favourable opportunity of reeſtabliſhing their independence; and when the league was formed againſt Dermod M'Morrough, king of Leinſter, his Oſtmen ſubjects of Dublin, under their governor M'Torkill, or as Cambrenſis calls him, Haſculphus, took an active part againſt him. A ſtrong force, under Raymond le Gros, having reduced Dublin in 1171, M'Torkill eſcaped by ſea, and returned ſoon after with a ſtrong fleet to recover it; he was however taken priſoner and put to death. Strongbow, who laid claim to the kingdom of Leinſter in right of his wife Eva, daughter of Dermod, was ſoon after beſieged in Dublin by the confederate Iriſh, and reduced to great difficulty, from which he was delivered by the deſperate valour of his followers. In the year 1172, Dublin was given up by Strongbow to king Henry, that he might appeaſe his reſentment, and we find that this monarch paſſed the enſuing Chriſtmas in his new acquiſition. The Iriſh chieftains who had ſubmitted flocked to Dublin from all quarters; and we are told, that, as the city afforded no building capable of receiving the royal train, Henry cauſed a temporary ſtructure to be raiſed after the Iriſh faſhion, where his new vaſſals were admitted freely and feaſted ſumptuouſly. Soon after he had taken poſſeſſion of Dublin, Henry granted it, by charter, to a colony of Briſtolians, with the ſame privileges which they had enjoyed at Briſtol; and he, afterwards, confirmed to his burgeſſes of Dublin, or *Divelin*, as it is called in ancient records, all manner of rights and immunities throughout his whole land of England, Normandy, Wales, and

and Ireland. On his departure he alſo appointed it to be the reſidence of his governor, and ordered a caſtle to be built there. In 1210, upwards of 20 Iriſh princes ſwore allegiance to king John at Dublin, engaging to eſtabliſh the Engliſh laws and cuſtoms, and in the ſame year courts of judicature were inſtituted. In 1217, the city was granted to the citizens in fee farm, at 200 marks *per annum*. In 1308, the civil government of Dublin was eſtabliſhed under a provoſt and two bailiffs; but in 1409, the title of the chief magiſtrate was changed to that of mayor, by charter of Henry IV.; and in 1547, the office of bailiffs was changed to ſheriffs. Stanihurſt, who compiled the deſcription of Ireland for Holinſhed, which was re-publiſhed by Hooker in 1586, gives a particular account of the hoſpitality of theſe magiſtrates: "They that ſpend leaſt in their mayoralty," ſays he, (as thoſe of credit and ſuch as bear the office have informed me) "make an ordinary account of 500*l.* for their viands and diet that year." This was no ſmall ſum, when the cheapneſs of proviſions is taken into account. In 1609, the charter of the city of Dublin was renewed by James I. After the reſtoration, Charles II. gave to the mayor a collar of S.S., and a company of foot-guards; and in 1665, he conferred the title of lord mayor on the chief magiſtrate, and granted him 500*l.* *per annum* in lieu of the foot company. The government of the city was further regulated by the earl of Eſſex in 1672. It is executed by a lord mayor, a recorder, two ſheriffs, 24 aldermen, and a common-council, formed of repreſentatives from the 25 corporations. The aldermen are elected from amongſt thoſe who have ſerved or fined for the office of ſheriff, and the lord mayor is elected from amongſt the aldermen by the common council. The next in rotation is generally choſen; but there have been inſtances of departure from this rule, when ſuch perſon has been obnoxious to the commons. The lord mayor tries all offences, even capital ones, except murder and treaſon, and matters of property for any ſum under 20*l.* Though Dublin became early the ſeat of the Engliſh governor, it continued a very ſmall town. In 1610, when a map of it was drawn by W. Speed, the Liffey was not embanked by quays on the north ſide, and only a part of it on the ſouth. There were only three or four ſtreets on the north ſide, which went by the name of *Oxmantown*, or *Oſtmentown*, and ſome villages at a ſhort diſtance, which are now part of the city. On the ſouth of the river it was alſo very much confined. The college was at ſome diſtance from the walls, and, comparatively, a very ſmall part of what is called the Liberty was built. The great increaſe of population will, however, mark the change which has taken place more ſtrikingly. In 1644, it appears that the inhabitants were numbered by order of government, when there were only 8159 perſons. Perhaps at this time the population was leſs than it had been from the diſtreſſed ſituation of the country. In 1681, the number was 40,000. Between the years 1711 and 1755, above 4000 houſes were built, and, in the laſt of theſe years, the inhabitants were eſtimated at 128,570, by the late Dr. Rutty. By the apparently accurate enumeration of the Rev. James Whitelaw, in 1798, of which he has publiſhed an account, and which agrees very nearly with the return made by the diſtrict committees in 1804, the number of inhabitants appears to be 182,370, including the garriſon, houſe of induſtry, college, &c. The number of houſes, according to the ſame enumeration, was 16,401, allowing a population of above 10 to each houſe. It appears evident, therefore, that the population of Dublin is below 200,000, though it is frequently reckoned at 300,000.

Dublin would be a commodious ſtation for ſhipping, were it not for two ſand banks, called the *North* and *South Bulls*, which prevent large veſſels from croſſing the bar, and ſad experience has proved that the bay is not a ſafe place for anchorage. In conſequence of this a new harbour is forming at Howth, of which an account will be given hereafter. (See Howth.) The river, however, has been greatly improved for ſuch veſſels as do not draw too much water to croſs the bar, by a prodigious work on the ſouth ſide of it, called the *South wall*, which was begun in 1748, and which extends from the point of Ringſend to the light-houſe about three miles. It is formed of large blocks of granite ſtrongly cemented, and ſtrengthened with iron cramps. The breadth of the road is near forty feet, riſing five feet above high water. About midway, between Ringſend and the light-houſe, at a place called the *Blockhouſe*, a new baſon has been formed of an oblong ſhape which is 900 feet long and 450 broad, where the packets of all deſcriptions uſually lie. The light-houſe was begun in 1762 under conſiderable difficulties from the depth of the water, from the power of the winds in ſuch an expoſed ſituation, and from the raging of the ſeas. Theſe, however, were overcome by the architect, Mr. Smyth, who collected vaſt rocks, and depoſited them in a caiſſoon or cheſt, which was ſunk to the bed of the ſea, and afterwards guarded with a buttreſs of ſolid maſonry, 25 feet broad at the baſe. On this he raiſed a beautiful circular ſtructure, three ſtories high, ſurrounded by an octagonal lantern of eight windows. It is compoſed of white hewn granite, firmly cemented, gradually tapering to the ſummit, and each ſtory ſtrengthened with ſtone archwork. A ſtone ſtaircaſe, with an iron baluſtrade, winds round the building to the ſecond ſtory, where an iron gallery ſurrounds the whole. The lantern is ſupplied with large oil lamps, the light of which is powerfully increaſed by reflecting lenſes. From Ringſend, up through the whole city, the river is commodiouſly embanked with quays; and excellent docks are laid out on each ſide ſufficiently large to contain ſeveral hundred veſſels. There are ſeven bridges, of which that formerly called *Iſland bridge*, but which having been rebuilt is now called *Sarah bridge*, has been conſidered as the *Iriſh Rialto*. It forms one grand arch that ſweeps in a beautiful and well proportioned direction from north to ſouth, extending three hundred and fifty-ſix feet: the arch is an ellipſis, the ſpan of which meaſures one hundred and four feet, being twelve feet wider than the celebrated Rialto at Venice. Eſſex bridge was built in imitation of Weſtminſter bridge. Carliſle bridge is remarkably wide, being ſixty feet between the baluſtrades, which leaves ample room both for carriages and foot paſſengers. The old bridge, which was lately carried away by a flood, will be replaced by a handſome one oppoſite to the courts of juſtice, which is to be named Richmond bridge. It was not until the year 1768 that even in London the projecting ſigns and penthouſes were removed, the ſtreets flagged, and the houſes numbered. The ſame regulations were effected in Dublin by an act of parliament in 1774, and another act was paſſed in 1785 for better paving, lighting, and cleanſing the city, by which an additional number of globes with double burners were erected. In conſequence of the exertions of the paving board, the ſtreets are, in general, ſufficiently wide, and well flagged; there are, however, ſome exceptions, and in the old part of the city, the buildings are very irregular. The numerous ſtreets and ſquares which have been added of late years, are magnificent and ſpacious, and the buildings regular and commodious. Among thoſe on the ſouth ſide of the river, thoſe wherein perſons of diſtinction reſide, lie chiefly to the eaſtward of the college and Stephen's green. This laſt, though it does not rank with the new buildings, poſſeſſes much grandeur and elegance, being one of the largeſt ſquares

in Europe: it is an Engliſh mile in circumference, ſurrounded by a gravel walk planted on each ſide with trees; within this walk is a ſmooth level meadow, having in the centre an equeſtrian ſtatue of George II. There are ſeveral handſome houſes, but they are by no means uniform, and have others amongſt them of a very mean appearance. Merrion ſquare, to the eaſt of it, is nearly as extenſive, and the buildings are elegant and uniform; the centre is incloſed with iron paliſades, and formed into a beautiful garden, adorned with ſhrubberies, gravel walks, and handſome entrance lodges. On the north ſide, Rutland and Mountjoy ſquares are deſerving of attention. The garden of the lying-in-hoſpital, which is ſurrounded by iron paliſades, is in the centre of the former, and that of the latter is laid out like Merrion ſquare. Sackville ſtreet, which, though built upwards of ſixty years ago, is often reckoned amongſt the new ſtreets, has been lately extended, and conſiderably improved. It is 120 feet wide from Carliſle bridge to the rotunda and public aſſembly rooms, and having on the other ſide of that bridge Weſtmoreland ſtreet, extending to the college and national bank. Towards the middle of Sackville ſtreet a noble column, with ſuitable decorations, has been erected to the memory of that illuſtrious naval officer lord Nelſon. The circumference of Dublin, as it now ſtands, is above ten miles varying to an irregular oval form. A road, called the *Circular*, is carried round the greater part of the city, but whilſt in ſome parts it includes gardens and orchards, ſome new ſtreets are ſituated without it in other parts. There is, perhaps, no city of its ſize, which can boaſt of ſuch a number of magnificent and uſeful buildings. Of theſe, as well as of ſome valuable eſtabliſhments, it will be neceſſary to give ſome account. The caſtle of Dublin was built, or at leaſt completed and flanked with towers by Henry de Londres, archbiſhop of Dublin and lord deputy, about 1213. Of theſe towers the ſtrongeſt and moſt famed was that called Birmingham tower, from ſir William Birmingham, who was impriſoned there and afterwards executed about 1331. It was long uſed as a ſtate priſon, but the old tower having been taken down and a new one erected on the ſite, this has been uſed for preſerving the archives of the kingdom. The caſtle was diſmantled of its warlike garb in the reign of queen Elizabeth, being intended for the reſidence of the governor. It has continued ſince that period to be the ſeat of government, and, at preſent, like St. James's in London, is the place where the viceroy gives audience, and which is uſed on other ſtate occaſions. There are two courts; the upper court is that in which are the ſtate apartments, and the chief ſecretary's apartments; in the lower court are the treaſury, regiſter office, and an armoury. The whole is encloſed, and ſince the rebellion, has been fortified, ſo as to be able to reſiſt a ſudden attack. The royal exchange, which adjoins the caſtle, was finiſhed in the year 1779, at an expence of forty thouſand pounds. As this building, however, does not poſſeſs all the advantages which the merchants expected from it, a new ſtructure has therefore been erected in Dame ſtreet, called the "Commercial buildings," which is more immediately intended for a ſtock exchange, brokers' ſales, ſhip inſurance, &c. The National bank is a moſt ſuperb ſtructure, and is fronted with a grand arcade of Ionic columns, all of Portland ſtone. This is the building in which the ſenators of Ireland were accuſtomed to aſſemble; and ſince the union it has been converted to its preſent purpoſe. Oppoſite to this is the college, of which a ſeparate account will be given, (ſee DUBLIN, *University of*). The ſtamp office, in William ſtreet, formerly Powerſcourt houſe, is another fine building, the architecture of which is chiefly Doric. The barracks on the north ſide of the river were founded in 1704, and are reckoned the largeſt and moſt commodious in Europe. They conſiſt of five large ſquares, capable of containing 4000 cavalry and infantry. On the oppoſite ſide of the river ſtands Kilmainham hoſpital, founded by Charles II. for invalids of the Iriſh army, on the plan ſimilar to Chelſea in England. The building was finiſhed in 1683, and coſt 24,000*l.*; it is of a quadrangular form, with a ſpacious area in the centre laid out in gravelled walks. The commander in chief, the maſter and officers, have excellent apartments and gardens. The ground anciently belonged to the knights templars. The new courts of juſtice on the north ſide of the river are extremely handſome and convenient: the building is of a circular form; and within, the upper part of the dome is ornamented with the buſts of the moſt celebrated legiſlators, ancient and modern, adorned at the ſame time with ſculptured devices, executed in a maſterly ſtyle. A range of law-offices, finiſhed in a ſtriking manner, completes this beautiful edifice. The Linen hall is a neat building, erected in the year 1728, for the purpoſe of detecting frauds in this the grand manufacture of Ireland. The merchants have rooms where the cloth is ſold, and the trade is under the controul of a board conſiſting of the principal men in the country. The Cuſtom houſe, if we conſider the beauty of its architecture, or the judicious choice of ſite and accommodations, muſt be acknowledged to ſtand at the head of all thoſe eſtabliſhments erected for commercial purpoſes among European nations. It is ſituated on the northern diviſion of the city cloſe by the ſide of the river. The expence of this magnificent ſtructure, which is larger than the trade of Dublin ſeemed to require, was no leſs then 255,000 pounds. The buildings of the Dublin ſociety in Hawkins's ſtreet are alſo extenſive. (See DUBLIN *Society*.) The private houſes which chiefly deſerve attention are, Leinſter houſe, Waterford houſe, and Charlemont houſe. The latter contains a valuable library, and ſome excellent works of Titian and Rembrandt, chiefly collected by the late earl of Charlemont, whoſe patronage of ſcience, as well as his other public virtues, will long be remembered. Dublin contains 20 pariſhes, that have nineteen churches and two chapels of eaſe, fifteen Roman catholic chapels, and about ſixteen places of worſhip belonging to different claſſes of proteſtant diſſenters. Dublin is the ſee of an archbiſhop, and contains two cathedrals, both within the city. Chriſt-church, or the church of the Bleſſed Trinity, was firſt built by the Oſtmen of Dublin about the year 1038. Its ſituation is nearly in the middle of the city, and the whole building ſpacious and ornamental, containing a vaſt number of ſuperb and curious monuments, particularly that of Strongbow, which ſtill continues in good preſervation. This church was founded for regular canons and converted into a collegiate for a dean and chapter by Henry VIII. in 1514. The biſhop of Kildare unites this deanery to his biſhopric. The other cathedral, that of St. Patrick, was founded for thirteen prebends, which number has ſince been increaſed to 22. This cathedral, ſituated on the ſouth ſide of the city, was erected about the year 1190 by John Comyn, then archbiſhop of Dublin. In its firſt conſtitution it was collegiate, but De Londres, Comyn's ſucceſſor, made it his cathedral. In the year 1370 archbiſhop Minot added to it a high ſteeple of ſquared ſtone; and in 1750 Dr. Sterne, biſhop of Clogher, on this ſteeple erected a lofty and beautiful ſpire, little inferior to that of Saliſbury, and which is ſeen at a conſiderable diſtance. This cathedral contains ſeveral excellent monuments, among which that of Dr. Swift, who was dean of St. Patrick's, and whoſe name is ſo juſtly dear to the Iriſh nation, claims pre-eminent regard. Of the other churches, many are neat ſtructures, and

and capable of containing large audiences, but that which moſt deſerves attention is St. Andrew's, in the neighbourhood of the college. If none of the diſſenting meeting houſes is remarkable for its appearance, yet two of them can boaſt of having had as miniſters two of the ableſt defenders of religion in the Engliſh language, Abernethy and Leland. The charitable inſtitutions in Dublin are very numerous, and the buildings in ſome inſtances very ornamental. To enter into a detailed account of theſe would ſwell this article beyond reaſonable bounds, yet there are ſome which ought not to paſs unnoticed. The houſe of induſtry was partly founded for receiving ſuch as were by age, ſickneſs, or misfortune, rendered incapable of earning their bread, and for relieving the city from the clamours and impoſitions of ſturdy beggars. Poor perſons of every deſcription are always admitted into this houſe, whether young or old, that are in apparent diſtreſs; here they are lodged and fed, but not clothed, it being found to be productive of bad effects, many going into the houſe merely to be clothed, and afterwards diſpoſing of their apparel for ſpirituous liquors; they are now, therefore, obliged to ſupply themſelves with this comfort from their own exertions, from ſhops kept for that purpoſe within the walls of the inſtitution, and by this means are better clad than formerly. The average number annually maintained is 1718, yet the ſtreets of Dublin are ſtill crowded with beggars. The lying-in hoſpital is an elegant piece of architecture. It was founded by Dr. Moſſe, a phyſician of Dublin, who obtained a charter for it, and in addition to private ſubſcriptions, it has an annual grant from parliament. There are about 700 females delivered here every year. The Fever hoſpital is an extenſive building, capable of containing above a hundred patients, and is admirably well conducted. The Foundling hoſpital receives all expoſed and deſerted children of either ſex, and is ſupported partly by a tax of three-pence in the pound on all houſes in Dublin, and partly by a parliamentary grant. There are ſeveral infirmaries and medical charities of various kinds, and beſides ſeveral ſchools on public foundations, almoſt every place of worſhip in Dublin has a ſchool connected with it, which is ſupported by an annual charity ſermon. Beſides the Univerſity and Dublin Society, which require particular notice, the literary inſtitutions in Dublin are, the Royal Iriſh Academy, which has publiſhed ſeveral volumes, the Dublin Library Society, the colleges of Phyſicians and Surgeons, and the King's Inns, where Iriſh barriſters muſt now paſs a certain number of terms before they can be called, and which has a good library. There are ſeveral good private libraries, and ſome valuable private collections of minerals, and other natural productions. The Farming Society of Ireland, which moſtly holds its meetings in the capital, is likely to render moſt eſſential ſervice to the country.

Dublin is remarkably well ſupplied with fleſh, fowl, and fiſh, the latter in much greater perfection than any other capital in Europe. It is ſupplied with coals chiefly from Cumberland and Scotland, and with turf by the canals. Water is conveyed to the city on the north ſide from the Lower Liffey, by machines conſtructed for the purpoſe at an outlet called Iſland bridge. The ſouth ſide is ſupplied from a reſervoir or baſin, which joins the grand canal, with the directors of which, the corporation contract for a ſupply. As a tax is laid on every houſe, ſo the ſupply is general, and there are beſides fountains erected in various parts of the city, for the convenience of the poorer inhabitants. The Phœnix park is a fine extenſive encloſure at the weſt end of the town, which is diverſified with woodland, champaign, and riſing ground, and is a moſt intereſting ride. It is ſeven miles in circuit, and contains the Vice Regal Lodge, where the lord-lieutenants now conſtantly reſide, the ſeat of the principal ſecretary, and ſome other handſome lodges. In this park are alſo a magazine for powder, and a battery that commands the city. In 1747, a fluted pillar, thirty feet high, with a phœnix on the top, was erected in the centre of a ring in this park, by the celebrated earl of Cheſterfield, when lord-lieutenant of Ireland. Such is Dublin, a city which rapidly increaſed for many years, and was beautified at the national expence. It was aſſerted, previous to the act of union, that the effect of that meaſure would be to ruin Dublin, and *that graſs would ſoon grow in the ſtreets*. It muſt be admitted that no place was likely to receive ſo much injury as Dublin from that important change, but the parliament would not have been juſtified in rejecting an arrangement beneficial to Ireland in general, becauſe it might interfere with the intereſt of thoſe who inhabited the capital. The injury ſuſtained, however, does not appear ſo great as was apprehended. The nobility have indeed in great meaſure forſaken Dublin, and their manſions have become the habitations of bankers or wealthy merchants; and in ſome inſtances have been converted into ſplendid hotels. Some particular claſſes of tradeſmen alſo appear to have ſuffered, and the often beneficial buſtle occaſioned by the meeting of parliament is no longer felt. There are, however, many cauſes which draw numbers to the capital, and the high rent of houſes, with the exception of very ſplendid ones, is a proof that they do not yet exceed the demand for them, though ſome new ſtreets have been laid out ſince the union. Dublin is repreſented by two members in the imperial parliament, who are choſen by the freemen at large. It is ſixty miles W. from Holyhead in Wales, and 330 miles N.W. from London, in long. 6° 30′ W. from Greenwich, and in 53° 14′ N. lat. Archer's Survey of Dublin. Dodd's and Wilſon's Directories, &c. &c.

Dublin, *Archbiſhopric of*, one of the four provinces into which Ireland is divided, which contains five ſees under four prelates, *viz.* the archbiſhop of Dublin, and the biſhops of Kildare, Leighlin and Ferns, and Oſſory. The firſt mention of the ſee of Dublin is in the 7th century. In the year 1152, it was erected into an archbiſhopric. At the time of the landing of the Engliſh, it was filled by a prelate named Laurence, who appears to have had great influence in the country, and who was afterwards canonized. In the year 1214, the biſhopric of Glandelough, which had been founded in the 6th century, was incorporated with it. This ſee is 50 miles in length from north to ſouth, and 36 in the greateſt breadth, containing the whole county of Dublin, the moſt of Wicklow, and part of the counties of Wicklow and Wexford. It contains 209 pariſhes, which form 86 benefices. In theſe are 82 churches, twenty of which are in the city of Dublin. Amongſt thoſe who have filled this ſee was Dr. King, author of an eſteemed work on the "Origin of Evil." The archbiſhop of Dublin is primate of Ireland, and is the ſecond in point of dignity. It was long the policy of the Engliſh government, as appears from the letters of archbiſhop Boulter, to confine the chief offices to men of Engliſh birth, regarding thoſe who had been born and ſettled in Ireland, although of Engliſh extraction, as not ſufficiently attached to the intereſt of England. At that time the archbiſhopric of Dublin was the higheſt dignity an Iriſhman could obtain. Dr. Beaufort's Memoir. Abp. Boulter's State Letters.

Dublin *Society*. This ſociety, which, as Mr. A. Young obſerves, has the undiſputed merit of being the father of all the ſimilar ſocieties now exiſting in Europe, was eſtabliſhed in the year 1731, and owed its origin to one of the moſt patriotic individuals

dividuals which any country has produced, Dr. Samuel Madan. For some years it was supported only by the voluntary subscriptions of the members, forming a fund under a thousand pounds a-year, but for a long time past parliament has regularly granted ten thousand pounds each session in aid of the subscriptions. To enter upon the history of this society, and detail the various objects which formerly engaged its attention, would be tedious; but some account of its present objects, and the progress made in accomplishing them, will be interesting to many readers. The society was incorporated in 1749, by the title of the Dublin Society, for promoting husbandry and other useful arts in Ireland. The members of it have accordingly adopted many measures for the improvement of agriculture, plants, &c. They have contributed in particular to the increase of plants, and to the formation of large and extensive nurseries. They also, like the London Society, give premiums for all useful inventions, and for proficiency in the fine arts. They purchased the celebrated Leskean collection of minerals, and have adopted different measures to encourage the study of mineralogy. They have established annual lectures on chemistry, with a particular view to its application to manufactures. They have appropriated above 27 English acres to a botanic garden, at Glasnevin, in the neighbourhood of Dublin, in which particular attention is paid to promote a practical knowledge of botany, so far as it is useful to the farmer, the grazier, the planter, and the artificer, and they have also established lectures on this science. They have further established lectures on natural philosophy, and on the veterinary art. They have procured surveys to be made of the counties of Ireland, which have been published at their expence. They have formed a valuable library, which is open to the members, and have various collections of objects of natural history, and of models for the imitation of young artists. The buildings of the society in Hawkin's-street are very extensive and convenient, and if useful knowledge be not advanced in Ireland, it cannot be attributed to any want of exertion in this society, or of liberality in parliament. A. Young's Tour—Appendix. Charter and Petition of the Society.

Dublin, *University of.* This noble institution was founded by queen Elizabeth in 1591; Loftus, archbishop of Dublin, having prevailed on the corporation of that city to give up for this purpose the monastery of All-hallows, at that time in the neighbourhood of Dublin, on the south-eastern shore; it having been vested in the mayor and citizens, on the dissolution of religious houses. By the charter, the college was erected as "mother of a university," by the style of "the College of the holy and undivided Trinity, of queen Elizabeth, near Dublin." It deserves notice, that the justly celebrated Usher, afterwards promoted to the primacy, was the first student admitted. Several grants of land in different parts of Ireland were made for its support; and the patronage of several livings in the counties planted by James I. was assigned to it. In 1637, the original constitution being found imperfect, a new charter was given to it, and a set of statutes compiled by archbishop Laud, which are still in force. This prelate made several essential alterations in the constitution of the college; the most material of which was the depriving the fellows of the election of their provost, the appointment to that important office being from thenceforth reserved to the crown. To make the fellows some amends for the loss of their first privilege, it was appointed by the new charter that they should be tenants for life in their fellowships, if they remained unmarried, or unprovided with a benefice of more than 10*l.* in the king's books; whereas, by the first charter, they were to quit their office in seven years after they became of master's standing. At the same time, the number of fellowships was enlarged; and the government of the college was placed in the provost and major part of the senior fellows, from whose decision an appeal was given to the visitors, who are the chancellor of the university, or his vice-chancellor, and the archbishop of Dublin. The office of provost, being of considerable dignity and emolument, has in some instances been given to laymen, and persons previously unconnected with the university; but such appointments are always disagreeable, and, in general, so much respect is paid to the feelings of the members of this learned body, as to place over them one who had for some time filled the office of fellow, and is capable of filling the station with propriety. During the provost's absence, his place is filled by the senior of the fellows, who is always called vice-provost. The provost and seven senior fellows form a council called *the board*, which meets every Saturday, and by which all matters relating to the internal government of the college are decided. The income of a senior fellow, arising from various sources, is generally estimated at about a thousand pounds *per annum;* but it necessarily fluctuates according to the offices held, and, on an average, is probably not so great. The number of junior fellows is at present (1808) sixteen; but it is intended to augment it. These are the tutors of the college; and their income depends, in a great measure, on the number of their pupils. Some who, from merit or interest, have a large number, have 700l. or 800l. *per annum.* Attempts were made by former provosts, to assign tutors to every young person entering the college, which would give very great influence; but, at present, the parents, or guardians of the pupils chuse the tutor under whom he is placed. The number of livings in the gift of the university is 19, the value of which was, some years ago, from 500l. to 1000l. *per annum*, and must have considerably advanced from the increase of tillage. On one of these becoming vacant, it is offered to the clerical fellows in rotation, beginning with the senior, until one chuses to accept of it, who then vacates his fellowship. The professors, also, of divinity and common law must vacate their fellowships to hold these two offices. The supplying the benefices and professorships as they become vacant, keeps up a constant circulation among the leading members of the university. By this means, there is a constant encouragement to exertion among the students, and the church of Ireland is supplied with some of its most useful and respectable members. There is, perhaps, no patronage so beneficial to the country as this. The mode of filling a senior fellowship, on its becoming vacant is, for the board to elect the senior of the junior fellows, if no objection lie against him, within three days after a vacancy is known. But, to a junior fellowship, admission is obtained only by sustaining publicly one of the severest trials of the human faculties of which there is any account. The candidates for this office, who must have taken a bachelor's degree in arts, are examined in the public hall, three days successively, for two hours in the morning, and as many in the afternoon of each day; the first morning in logic and metaphysics; first afternoon in all the branches of the mathematics; second morning in natural philosophy; second evening in ethics; third morning in history and chronology; third evening in the Greek, Latin, and Hebrew languages. The fourth day is private, and is devoted to composition. The examination is in Latin; and the days appointed for it are the four days immediately preceding Trinity Sunday. The examiners, who are the provost and seven senior fellows, (or, in the absence of any of these, the next in seniority among the juniors,) after a scrutiny among themselves in the board-room, on

on the succeeding Monday, proceed to give their votes, in the most solemn manner, for the candidate, or candidates, they think fittest to supply the vacancies, when, if the provost do not chuse to interpose, the vote of the majority is decisive, and the successful candidate is presently after sworn into office in the college chapel. As the struggle is often close, and the decision, consequently, difficult, the result is naturally expected with much anxiety; for the successful candidate is considered as honourably and happily provided for. It will often happen, that men of great merit will fail from various causes; but, when unsuccessful candidates have answered respectably, they have a sum of money allotted to them at the time; and, if they chuse to decline further attempts, generally succeed in procuring pupils, or entering some of the learned professions, derive benefit from their past exertions. The difficulty, indeed, is so great, that it is considered honourable to have made the attempt, even without success. There are only three of the fellows allowed to be members of the lay professions, one of medicine, and two of law, without an express dispensation from the crown. All the rest must become clergymen of the established church, and take their share of the clerical duties of the university. By the statutes of the college, every fellow, on marrying, may be obliged to vacate his fellowship; but several dispensations have been given by the crown; and, of late years, most of the fellows have married, without any attempt to enforce the penalty. Besides the fellows, there are 70 scholars, who have a right of voting at the election of the member returned by the college to parliament, and who have some other privileges and emoluments. Twenty of these have what are called native places, attended by an additional income; and these are filled up, as vacancies occur, from the most diligent of the scholars. The candidates for a scholarship must have arrived at the rank of sophisters; and are examined, for two days in the week, before Whitsuntide, in the Greek and Latin classics, by the provost and senior fellows. As a scholarship cannot be held by one arrived at the standing of master in arts, it terminates in four, or, at most, five years, from the time of obtaining it; but it is often vacated before that time, as the emolument is trifling, and the necessary attendance on college duties often interferes with professional pursuits, after the completion of the undergraduate course. The students are classed under three ranks, distinguished by the names of *fellow commoners*, *pensioners*, and *sizars*. The number of the two former is unlimited, and generally exceeds 500. They are publicly examined before admission, by the senior lecturer, and such fellows as he chuses to associate with him, in several Greek and Latin books appointed to be read at schools for this purpose, and in Latin composition, either prose or verse. The candidates admitted, are entered according to their merit; and to obtain the first place on this occasion is esteemed very honourable. Extraordinary rewards are also adjudged, on some occasions, to those who distinguish themselves; whilst those who are shamefully deficient are refused admission, and are obliged to return to school, or to seek refuge in some other college, where the proficiency of the students is less attended to. The fellow-commoners are distinguished by a peculiar gown and cap, and have the privilege of dining at the same table with the fellows, for which they pay a much higher stipend; whilst pensioners, at a less expence, possess all the real advantages which the college affords; and, if they conduct themselves with propriety, receive every attention from their superiors. The sizars are limited in number to about 30, and receive their commons and instruction *gratis*. As vacancies occur, they are selected, after examination, from a number of competitors. Though their situation may appear degrading, yet, by good conduct, they may remove any thing that would be painful, and, in a very short time, by continued diligence, they may raise themselves to a higher rank. Some of this class have, indeed, risen to the highest honours of the university; but this does not generally happen. The undergraduate course continues for four years, during the two first of which, the students are called *freshmen*, and the two last sophisters; and there are four examinations in each year in the public hall, in a course of reading appointed by the board. Judgments are given for each branch of the examination, which are publicly read, and those who get a very bad judgment lose the examination for that time. To encourage application, premiums and certificates are liberally, but not negligently, bestowed; and the youth who omits no examination, and obtains good judgments at every one, during his undegraduate course, is honoured with a gold medal, which, being only obtained by the union of respectable talents, with unremitting application, is justly and highly valued. The premiums are books, stamped with the college arms; and the certificates, which are on vellum, are given only to those who, being the best in the division, are precluded from a premium, in order to spread the flame of emulation more widely. Besides these regular rewards, there are occasional ones for composition; and the provost is empowered to give annual sums, called *exhibitions*, to those he esteems deserving. There are also premiums for Hebrew, mathematics, divinity, &c.; for those who, having taken their bachelor's degree, continue in the college, either with a view to a fellowship, or in pursuance of their professional studies. Besides the advantages derived from the regular examinations, &c. there is a society composed of a number of those who have arrived at the standing of sophisters, called the Historical Society, under the patronage of the fellows, in which questions are debated, portions of history examined into, and compositions in prose and verse occasionally read. These exercises serve to call forth the exertions of the students, and have particularly contributed to form some of the most distinguished members of the Irish bar, who here cultivated those powers of oratory, by which they have since risen to the most eminent stations. Having given this general account of the system of education pursued in Dublin college, it may be expected that some notice should be taken of the illustrious characters it has produced. Here, however, if we consider the length of time since its establishment, it must be acknowledged, that the number is very few; and some of those who are most celebrated, appear to have derived little advantage from their *alma mater*. Amongst these last, we must, perhaps, consider Swift, Congreve, and Goldsmith. But though the list will not be great, it will include Usher, Berkeley, Molineaux, and Edmund Burke. To these we may add the less eminent, but truly respectable names of archb. King, bishops Bedell, P. Browne, Chandler, H. Hamilton, and Young, Drs. T. Leland, Helsham, Delaney, Lawson, Murray, Parnell; Messrs. Farquhar and Dodwell, with a long list of distinguished lawyers and statesmen, such as lord chancellor Clare, Yelverton, lord Avonmore, Hussey Burgh, Henry Flood, &c. Persons yet living have been purposely excluded from this list, or it might have been increased by names well known, and highly respected throughout the British empire. It may, however, be asked, why the number of eminent writers is not greater? And it may be answered, that the course of study necessary to obtain a fellowship is very fatiguing; that when this honour is obtained, the time of a fellow is usefully employed in teaching his pupils, and that when after several years of labour, he arrives at

at a ſtate in which he can enjoy "otium cum dignitate," it can hardly be expected that he ſhould devote himſelf to new labours, without that inducement which moſt authors have of thus providing for the maintenance of a family. It requires uncommon exertion in men ſo ſituated, to become authers, and it is perhaps rather to be wondered at, that ſo many have added this to their other labours. Is it then to be inferred, that the univerſity of Dublin is leſs uſeful, or its fellows leſs reſpectable? Is authorſhip more honourable than forming the youth of their country for active life? And is it to be deſired, that the fellows ſhould ceaſe to labour as tutors, or that they ſhould be compelled by reduced incomes to add to this labour; that Dublin college may be able to rival her ſiſter univerſities in the production of authors? Is it not rather their firſt duty and their higheſt honour to watch over the morals of the youth entruſted to their care, to maintain ſtrict diſcipline, to encourage and aſſiſt riſing merit, and to form their pupils for future uſefulneſs? After all, though Dublin cannot boaſt any name equal to Bacon, Newton, or Locke, yet conſidering the much greater number of ſtudents in Oxford and Cambridge than in it, there will not be as much reaſon to ſhrink from the compariſon as might at firſt be imagined. The ſyſtem of education in Dublin has alſo been objected to, eſpecially by thoſe who admire that of the Scotch univerſities. It is ſaid, that learning would be more conſiderably advanced, by each fellow devoting himſelf to ſome one ſcience, and lecturing on it, than by his being obliged to inſtruct in all. There is ſome force in this objection; but if the ſyſtem in Dublin college be not as favourable to the advancement of ſcience, it will be found much more ſo to the diffuſion of it, for every tutor is more intereſted in the general improvement of his pupils, feeling himſelf in ſome degree anſwerable for it, than if they were merely to attend to a diſcourſe delivered by him. In fact, in education, it is of much more conſequence to have good elementary works carefully explained to a ſtudent, than that a lecturer ſhould aim at eſtabliſhing his own character by new diſcoveries, when more than three-fourths of his hearers probably want to be inſtructed in the firſt principles. The conſequence is, that at other univerſities, the youth who has been well trained at ſchool, and who burns with the deſire of knowledge, may learn more in a ſhorter time, than he can do in Dublin, but on the other hand, the many, thoſe who require the ſtimulus of reward, or the dread of puniſhment to induce them to ſtudy, and who are unable to proceed, without the aſſiſtance of a tutor, will perhaps derive much greater advantage in Dublin, than at any other. Beſides, though the junior fellows inſtruct the undergraduates in every part of their courſe of inſtruction, the lectures to the more advanced ſtudents, are given by profeſſors who have only one purſuit, and the lectures on natural philoſophy and mathematics, will not be found inferior to thoſe given at other univerſities. It may be added, that the attention paid throughout the courſe to logic and mathematics, lays a very uſeful foundation for future labours. It may be perceived, from what has been already noticed, that a conſiderable ſum out of the college revenues is devoted to giving rewards to the ſtudents, a ſyſtem purſued here more regularly and extenſively than in any other univerſity, and which has been of late years adopted at two or three colleges in Oxford and Cambridge. The advantage of a large revenue is alſo apparent in other inſtances. The library, eſpecially ſince the addition of the Fagel collection, is of the firſt rank, and is highly creditable to the college. This library is open for four hours each day, from eight to ten in the morning, and from twelve to two in the afternoon, and ſtudents may remain in it for the intermediate hours, if they chuſe to be locked in, during the abſence of the librarian. Every perſon who has taken the degree of bachelor of arts in the univerſity is entitled to go there, if he once enter into an engagement to obſerve the rules of the library, and this privilege is liberally extended, by the ſpecial favour of the board, to gentlemen, who, having no claim, may derive benefit from the uſe of it. If undergraduates cannot obtain this privilege, it is becauſe they are thought to be moſt uſefully employed in preparing for their reſpective examinations, and the frequenting the library would interfere with their peculiar ſtudies. The manuſcript room contains many curious Iriſh manuſcripts, and Dr. Barrett, the preſent vice-provoſt, diſcovered there an old manuſcript of the goſpel of Matthew, of which he has publiſhed a *fac ſimile*. The collection of apparatus for lectures on natural philoſophy is very valuable, and was in great part a donation from that active promoter of ſcience, the late primate Robinſon. The muſeum is a fine room, and contains many curious articles; the collection of minerals, in particular, has been conſiderably increaſed, and would be eſteemed valuable, if it were not naturally compared with the neighbouring one belonging to the Dublin Society, which is excelled by very few in the world. The anatomy-houſe contains the celebrated wax models of the human figure, executed by monſieur de Roue at Paris, and purchaſed by the earl of Shelburne, who preſented them to the college in 1752. On the ſummit of Dunſink-hill, about four miles north-weſt from the caſtle of Dublin, an obſervatory was founded at the inſtigation of the late Dr. Henry Uſher, profeſſor of aſtronomy, and one of the ornaments of the univerſity, of which a particular account is given in the Tranſactions of the Royal Iriſh Academy. No expence has been ſpared to provide the building with the beſt inſtruments. Amongſt others, a circular inſtrument, begun by Ramſden and completed by his ſucceſſor, has been lately brought over at an expence of more than 1000*l*. The board alſo, with a liberality not often met with, in electing a profeſſor of aſtronomy to ſucceed Dr. Uſher, paſſed over a reſpectable candidate of their own college, in favour of a gentleman from another univerſity, who appeared more fit for the ſituation. A lot of ground, of about four acres, has been lately taken at about a mile diſtance from the college, for a botanical garden, which is laying out in the beſt manner, at a conſiderable expence. Such are the advantages which the univerſity of Dublin poſſeſſes, and theſe advantages are not, as at Oxford and Cambridge, confined to thoſe who can ſubſcribe the articles, or attend on the worſhip of the eſtabliſhed church. The Roman catholic and the Proteſtant diſſenter, may paſs through every ſtage of education, without being required to do any thing inconſiſtent with their opinions as ſuch, and ſubſcription which is at Oxford required on matriculation, and at Cambridge on taking the loweſt degree, is here never aſked except on attaining a fellowſhip, or on admiſſion to a degree in divinity. Such liberal conduct muſt add conſiderably to the number of ſtudents, though it will be in ſome meaſure counteracted by the influence of faſhion, and by the unwillingneſs of many young men to ſubmit to theſe ſalutary reſtrictions which have been introduced, and which, in ſo large a city, are peculiarly neceſſary. It may be proper to add a ſhort account of the buildings, which, though formerly only in the neighbourhood, are now within the city, and contribute greatly to its ornament. Theſe buildings conſiſt of two ſpacious ſquares. The area of the firſt, called Parliament ſquare, is 212 feet by 316, and was built chiefly by grants from parliament. It is formed entirely of hewn ſtone, ornamented with Coriothian pillars, and contains the refectory, chapel, and theatre for lectures and examinations. The front of the theatre is well decorated

decorated with four Corinthian columns, supporting a pediment. The interior, exclusive of a semicircular recess, 36 feet in diameter, is 80 feet long, 40 broad, and 44 high, excellently ornamented with stucco work. A rustic basement supports a range of pilasters of the Composite order, highly decorated, from which the rich mosaicked ceiling rises in groined arches: and in the pannels, between these pilasters, are hung the portraits of queen Elizabeth the foundress, and of seven eminent persons educated in the society. The only portrait of a living person, was that of the Right Hon. Henry Grattan. This portrait of one, who must be ever considered an honour to the university, was removed on some disapprobation of his political sentiments, and that of the Right Hon. John Foster substituted in its place. If the removal be regretted, it must however be acknowledged, that the latter gentleman has deserved well of the college and of his country. Directly opposite to the theatre, on the north side of the square, is the chapel with a front exactly similar. In this is placed a noble monument of Dr. Baldwin, a former provost, who left a fortune of 80,000 pounds to the university. This monument was executed by an Irish artist at Rome, and does the highest honour to his abilities. The theatre and chapel were both built from the designs of sir Wm. Chambers. The library extends the entire length of the inner square; it is a double building composed of brick and faced with stone, with a magnificent Corinthian entablature crowned with a balustrade. It is the most superb room in Europe for such a purpose, being 210 feet long, 41 broad, and 40 high. Beyond this is a well planted and extensive park, containing seven acres, on the northern side of which is the printing office, ornamented with a good portico of the Doric order. Opposite to this is a building containing the laboratory, and anatomical lecture room. The grand front of the college is 350 feet in extent, ornamented with Corinthian pillars and other decorations. Over the vestibule, which is an octagon, terminated with groined arches, in the centre of this front, is the museum, a fine room 60 feet by 40. At a small distance to the south side of this front, is an elegant edifice, in which the provost resides. Such is the university of Dublin, yielding to no other in proportion to its extent. It has its defects, but there is a disposition to correct them, and a discussion of them here would swell an article already too long. The writer cannot conclude, what he trusts will be found a fair and impartial account of his *alma mater*, without adding his sincere prayer *esto perpetua*.

DUBLIN, a township of America, in the state of New Hampshire and Cheshire county, seated on a branch of Ashuelot river, and north of the great Monadnock, containing 1188 inhabitants; 28 miles S.E. of Charlestown, and 63 W. of Portsmouth; incorporated in the year 1771.

DUBLIN, *Lower*, a pleasant town in Philadelphia county and state of Pennsylvania, 10 miles N.E. of Philadelphia, and as far S.W. of Bristol, containing 1495 inhabitants.—Also, a township of Huntingdon county in Pennsylvania, including 978 inhabitants.

DUBNO, a town of Poland, in the palatinate of Volhynia; 24 miles S.S.E. of Lucko.—Also, a town of Poland, in the palatinate of Belcz; 40 miles N. of Belcz.

DUBOJA, a town of Lithuania, in the palatinate of Brzesc; 10 miles W.S.W. of Brzesc.

DUBOIS, WILLIAM, in *Biography*, was born in 1656, at Brive-la-Gaillarde in Limosin, where he received the early parts of his education, and exhibited those nascent talents which evince to the possessor the power of becoming great. When he was very young, he manifested a propensity to falsehood that seems never to have left him. To complete his studies, he entered himself at the college of St. Michael at Paris: such, however, was his indigence, that he was obliged to serve the principal in the subordinate office of valet. Having acquired a good portion of learning, as well in philosophy as in the languages, he became a preceptor in different families, and at length was sub-governor to the duke de Chartres, afterwards the regent duke of Orleans. Here he acted his part so well, that he was shortly made preceptor, with a considerable salary. The principles of Dubois at this period were pliant and corrupt, so that nothing stood in his way of preferment. He was employed to persuade his pupil to marry the king's natural daughter, madame de Blois; and his success in this was rewarded with the abbacy of St. Just. He was sent to England in a political character; and on this and other occasions performed the duties required of him with so much diligence, that he obtained very considerable preferment in the church: this being regarded as the only proper method of rewarding the agents of the court. In the year 1715 his pupil became regent; and such was the character of Dubois at this time, that almost the only condition imposed on the prince by his mother was, "that he should not employ the knave Dubois." To this, however, he paid but little attention; and after a short time appointed him counsellor of state; and in 1717, he was sent ambassador into England, where he signed the triple alliance. On his return he was made minister and secretary of state; and shortly after, he obtained the richest archbishopric in the kingdom, *viz.* that of Cambray, though no man seems to have been less fitted for the office than Dubois. Against this elevation cardinal Noailles entered his protest, regarding it as calculated to destroy all veneration for the church in the minds of the laity. In the next year, 1721, he was made cardinal, but not without meeting with a decided opposition from the pope, Innocent III., who was well acquainted with the infamy of his moral character. In this rank of life he commanded the highest offices of state, and was admitted into the council of regency in 1722, and first minister of state. He also claimed the right of being a member of the French academy, under the title of "Monseigneur;" and, in the following year, the French clergy chose this man to be their first president. Thus, arrived at the summit of power and place, rolling in opulence, and beholding almost every thing crouch in obeisance before him, there seemed nothing wanting to render him great and happy, if happiness could be the result of power; but, in the midst of his honours, he was attacked with a fatal disease, the consequence of early debaucheries, which, after a painful chirurgical operation, put a speedy end to his life. He died August, 1723, at the age of 67, leaving behind him a character more infamous than can well be conceived. Moreri.

DUBOIS, JOHN, born at Lisle in Flanders, after finishing his course of classics, applied to the study of medicine; and in 1557, he was admitted a doctor in that faculty, at the university of Louvain. On taking his degree, he pronounced a declamation, in Latin, "De Lue Venerea," which procured him some credit. He then went and settled at Valencien, where he distinguished himself so well, as to be appointed principal of the college of St. John. In 1562, he was made professor of medicine, in the university which Philip II. had recently founded, at Douay. In this post, which he filled with credit, he continued 13 years. He died April 5th, 1576. His works are, "De Curatione Morbi Articularis, Tractatus quatuor," 8vo. 1557; "Morbi popularitER grassantis Præservatio et Curatio," Lovanii, 1572; "De Studiosorum et eorum qui Corporis Exercitationibus addicti non sunt, tuenda Valetudine," Duaci, 1574, 8vo. Haller Bib. Med. Eloy Dict. Hist.

DUBOIS, FRANCIS, or FRANCIS SYLVIUS DE LE BOE, born at Hanau, in the circle of the Upper Rhine, in 1614, received

received the rudiments of his education at Sedan, whence he went to Bale, where he was admitted doctor in medicine in 1637. Not satisfied with his acquirements, he visited several of the universities in France and Germany. At length he went to Leyden; and in 1658 he was appointed to the chair of professor in medicine in that university, which had become vacant by the death of Albert Kyper. His character here, both as a teacher and practitioner, soon became so extended, that as there were few cases in medicine that were difficult in which he was not consulted, so there were none of the classes so numerously attended as that over which he presided. In 1670 he was made rector of the university, and two years after he died, in the 58th year of his age. He attended with his pupils the sick wards of the hospital, explained to them the nature of the diseases with which the patients were afflicted; and he opened before them such of the patients as died, and shewed them the changes which had taken place in the organs that were the seat of the diseases. He had the merit of being one of the most strenuous defenders of the doctrine of the circulation of the blood, as described by Dr. Harvey, and which, we know, at first met with much opposition. He also made considerable advances in the study of chemistry, to which he was much attached. He was, however, too much attached to the humoral pathology, attributing all diseases to some fault in the blood or juices, which he supposed, in most cases, were vitiated by a redundancy of acid. His remedies, therefore, were principally taken from the alkalies, a doctrine which by degrees became general over Europe. Notwithstanding his numerous avocations, he found time to write a considerable number of treatises on various parts of medicine, though few of them were published in his life-time. They have been since collected, and form a large volume in folio. "Opera medica, tam hactenus inedita, quam variis Formis et Locis edita, nunc vero certo Ordine disposita, et in unum Volumen reducta," Amstel. 1679. It has been several times reprinted. For the titles of the several treatises, see Haller's Bib. Med. Eloy Dict. Hist.

Dubois, or, as he is more commonly called, James Sylvius, a learned and voluminous writer of the 16th century, was so attached to the ancients, particularly to Hippocrates and Galen, the greater part of whose works he translated and edited, that he constantly opposed every thing that was novel in doctrine or practice. Hence he kept up a constant warfare with Vesalius, his cotemporary, whose discoveries and improvements in anatomy, although obvious to the senses, he refused to admit. Sylvius was born in the diocese of Amiens, in 1478, and was educated under his brother Francis, who had so far distinguished himself by his knowledge of the Greek and Latin languages, that he was promoted to the office of principal of the college of Tourney. After remaining several years with his brother, and having been initiated in the knowledge of medicine, which he also taught to younger students, to obtain what was necessary for his maintenance, he went to Montpellier in 1529, where, by the favour of the university, and in consideration of his great learning and his age, he was immediately received bachelor, and the year following doctor in medicine. He then returned to Paris, and was appointed professor in medicine; a post which he filled with honour to himself and advantage to his pupils, to the time of his death, which happened on the 13th of January, 1555, in the 76th year of his age.

His works, which were numerous and much esteemed in his time, were collected by Rene Moreau, and published in one volume folio, at Geneva, in 1635, under the title of "Opera medica, jam demum in sex Partes digesta, castigata, et cum Indicibus necessariis instructa." For the titles of the particular treatises, with the times and order of their publication, the reader is referred to Haller's Bib. Med. As Dubois had suffered much, for want of being able to procure proper aids for his studies in the younger part of his life, and he was old before he attained to affluence, it is probable he could not then give up the habits of parsimony which his indigence had obliged him to adopt. Some wit has lashed that vice with the following:

> "Sylvius hic situs est, gratis qui nil dedit unquam,
> Mortuus, et gratis quod legis ista, dolet."

Haller Bib. Med. Eloy Dict. Hist.

Dubois, Simon, a painter of portraits, battles, and cattle, was born at Antwerp; and having become rich by his profession, died in 1708.

Dubois *Lake*, in *Geography*. See *Lake Du* Bois.

DUBOS, Charles Francis, in *Biography*, was born in the year 1661, in the diocese of St. Flour in Auvergne. He was sent to Paris for education, where, after having gone through a course of classical learning and philosophy, he devoted himself to the study of theology, and took his degrees in the college of the Sorbonne. Many offers of preferment were proposed to him, at length he closed with one from the bishop of Luçon, who appointed him principal archdeacon of his church, and confidential grand vicar. In this situation, he obtained the friendship of the prelate, became an inmate in his house, and entrusted by him with the most important of his concerns. After the death of his worthy patron, he was elected to a deanery under very honourable circumstances. This office he held till the 64th year of his age, when he died. He lived honoured and esteemed by all ranks, and his death was lamented by his friends, to whom he was endeared by the tenderest tie, and by the poor, who had experienced in him a kind and active benefactor. Dubos resumed the celebrated "Luçon conferences," which, after the publication of five volumes had been suspended about ten years. To these he added 17 others in 12mo., and left materials for 15 more. He was also the author of "A sketch of the life of M. Barillon, bishop of Luçon," published in 1700. Moreri.

Dubos, John Baptist, abbot of Resons, was born in 1670 at Beauvois, where he was educated for the church, but some disappointments caused him to turn his attention to the civil law, history, and politics. In 1695, he published his "History of the Four Gordians proved and illustrated by Medals," in which he attempted to prove the existence of a fourth of this imperial family, in addition to the three usually reckoned. After this, he was employed in many foreign negociations. He came to England to persuade the people to consent to a peace with France; for this purpose he published a work, entitled "The interests of England ill understood in the present War," 1704, which obtained a very limited circulation, and made scarcely any impression on those for whom it was intended. The only thing remarkable in it, is a prediction of the future separation of the North American colonies. In 1709, he published a "History of the League of Cambray against the Venetian republic," which was intended to serve the cause of peace, by affording a striking example of the ill success of a league of many powers against an individual state. Dubos was employed in the negociations at Utrecht, Baden, and Radstadt, and his labours were rewarded by church preferment. He was an agent in the hands of the duke of Orleans, and cardinal Dubois, but never acted even for these a dishonourable part, though he usually gave them satisfaction. Wearied, perhaps, of a political life, he became distinguished for his zeal in polite literature and the fine arts, and in 1719, published

published a work, entitled "Critical Reflections on Poetry and Painting," in two vols. 12mo. which has gone through several editions. This work obtained for the author the office of perpetual secretary to the French Academy, in the place of Andrew Dacier. He next employed himself in elaborate enquiries relative to the early French history, which led him to publish "A critical History of the Establishment of the French Monarchy in Gaul," in 3 vols. 4to. which was highly esteemed by many of the most eminent authors of the day. He wrote several other pieces, and died in March 1742. Moreri.

The abbé Dubos, an eminent writer on many subjects, was neither so faithful as an antiquary, nor so ingenious in his conjectures as he was long imagined. His agreeable style, and insinuating manner, were such as to make his readers forget to doubt. In his "Reflexions critiques sur la Poesie et sur la Peinture," tom. iii. there are some bold and unqualified assertions concerning ancient music, that seem to require particular notice among musical articles. The abbé does not write ex professo on music; it is chiefly in his dissertation on the theatrical representations of the ancients that he speaks with so much firmness of Greek music, as a good judge might be allowed to do of music which he heard but yesterday.

Voltaire, in characterizing this ingenious writer in his "Siecle de Louis XIV." says: "he did not understand music, had never written a line of poetry, and was not in possession of a single picture; but he had read much, and seen and reflected much on the arts. He was as well acquainted with ancient literature as the modern, and with ancient and foreign languages as with his own." But it does not follow, that because Voltaire was a man of wit, and a good poet, that he was a good judge of painting and music, for neither of which does he manifest partiality, or discover the least knowledge in its principles.

Dubos's eloge on Lulli, whom he styles the greatest poet in music, with whose works he was acquainted; on the sublimity of his airs for dancing, &c. ceases to command attention. The same raptures, and still greater, were afterwards expressed in France for the works of Rameau, than for those of Gluck and Piccini; and now for those of Haydn, Mozart, and Paesiello. At present, however, there does not remain in France a single idea of that music, which Dubos so exclusively extolled; and his notions of ancient music are still less to be confided in, than the modern: among other absurdities he asserts, boldly, that the performer in the ancient dramas was accompanied by a *basso continuo*, not like that of the French opera, but like the base accompaniment to Italian recitative; and determines, from a passage and plate in Bartholinus, that the instrument upon which this *continued base* was played, was a flute! With the same courage, and the same truth, this lively author asserts, that the *semeia*, or musical characters of the Greeks, were nothing more than the initial letters of the names of the sixteen notes in the great system; or diagram! Opinions which merely to mention, is to confute.

Dilettanti, musical critics, without possessing the necessary præcognita, know not what is practicable, what impossible, what is already known, or what is still to be discovered. We have known many gentlemen and ladies who have been admirable performers of the music of others; but when they erect themselves into composers and critics, they discover more ignorance than the lowest and most clumsy professor that was ever admitted into an orchestra or organ-loft.

What Dubos says in defence of the *masks* through which theatrical performers spoke or sung, is more reasonable. "The Spectator, says he, lost but little on the side of *face-playing*, by the introduction of *masks*; for not one-third of the audience was near enough to the actor to discern the play of muscles, or working of the passions in the features of his face; at least to have received pleasure from them; for an expression must have been accompanied with a frightful grimace and distortion of visage, to be perceptible at so great a distance from the stage." But when he says, "foreigners find that the French understand *time* and *rhythm* better than the Italians,"—all must know, except his countrymen of the old school, that the direct contrary is true, and indeed almost all the opinions of this writer, concerning both ancient and modern music, which were respected four score years ago, would be defended now by few, even among the natives of France.

DUBOVKA, in *Geography*, a town of Russia, in the government of Saratof, on the west side of the Volga; 60 miles S. of Kamischin.—Also, a fort of Russian Tartary, in the government of Caucasus, on the Malwa; 12 miles W. of Kizhar.

DUBOURG, Matthew, in *Biography*, a very eminent performer on the violin, whose conduct as well as performance, acquired him patrons and friends, which rendered his long life happy, and honourable to himself and profession.

This excellent performer, born in 1703, was the natural son of the celebrated dancing-master, Isaac, and had instructions on his instrument by Geminiani, soon after his arrival in England, 1714. In 1715, the young Dubourg, at twelve years old, had a benefit concert at the great room, afterwards the Tennis-court, in James'-street; and is said to have played, standing on a joint stool, a solo, at Briton, the small coal-man's concert, much earlier. From this time till the year 1720, when the Royal Academy was formed at the opera-house, Dubourg played solos and concertos at almost every benefit concert besides his own. From that period he was sufficiently steady and powerful to lead the band at the concerts, where he performed solos, till the year 1728, when he had arrived at such fame and patronage as procured him the appointment of composer, and master of his majesty's band in Ireland. He resided several years in that kingdom afterwards. But from the the year 1735, when he was taken into the service of the late prince of Wales, he frequently visited England. We saw and heard him while at his best in the summer of 1744, at Chelsea, and had the pleasure of accompanying him in Corelli's 5th solo, which he performed in a manner so superior to any one we had ever heard, that we were equally astonished and delighted, particularly with the fulness of his tone, and spirit of his execution.

It has been erroneously said, that Dubourg was no composer; he was indeed no publisher, but the odes which he set for Ireland, and innumerable solos and concertos which he composed for his own public performance, are now in the possession of one of his disciples, and of some of them the composition is excellent.

On the demise of Festing, in 1752, he was appointed leader of the king's band, and upon that and the produce of his place in Ireland, he seems to have enjoyed ease and tranquility to the end of his life, which was terminated in 1767, at the age of 64. He was buried in Paddington church-yard, and on his monumental stone are engraved the following lines:

"Though sweet as Orpheus, thou cou'dst bring
Soft pleadings from the trembling string,
Uncharm'd the king of terror stands,
Nor owns the magic of thy hands."

DUBRAVITZ, in *Geography*, a town of European Turkey, in the province of Moldavia; 36 miles N.W. of Galatz.

DUBRAW, Johns, in *Biography*, a German prelate, statesman, and historian in the 16th century, was born at

Pilſen, in Bohemia. He was educated in Italy, and obtained the degree of doctor of laws. He was afterwards employed in a political capacity by Stanilaus, biſhop of Olmutz, in Moravia. By this prelate he was engaged in various negociations of conſiderable importance, and was entruſted by him with the direction of his troops which he ſent to the relief of Vienna. He was afterwards raiſed to the ſee of Olmutz himſelf, which he enjoyed about ſix years. His character as a divine did not prevent him from continuing his ſervices as a ſtateſman, which in ſeveral inſtances were of the higheſt intereſt to his country. He publiſhed, in the year 1552, a hiſtory of Bohemia in thirty-three books, which is highly commended for fidelity and accuracy, and in the following year he died. A new edition of his work, with additions, was publiſhed in 1574, by Thomas Jourdaine; and another at Frankfort in 1688, to which is added a hiſtory of Bohemia, by Æneas Sylvius. Moreri.

DUBROWA, in *Geography*, a town of Lithuania, in the palatinate of Wilna; 74 miles E.S.E. of Wilna.

DUBROWICA, a town of Lithuania, in the palatinate of Brzeſc; 46 miles S.E. of Brzeſc.

DUBUDY. See Dubdy.

DUC, Fronton du, in *Biography*, a learned French jeſuit, was born at Bourdeaux about the year 1558. He entered into the order when he was nineteen years of age, and was almoſt immediately appointed to the tuition of the junior members in the principles of rhetoric. As a teacher he was employed, in different places, about twenty years, when he began to be known as an author. His firſt production of importance was a Latin tranſlation of the works of St. Chryſtoſtom, in ſix volumes folio, with notes. He was afterwards engaged in a theological controverſy with the celebrated Mornay du Pleſſis-Marli, on the ſubject of the practice and doctrine of the ancient churches, relative to the euchariſt. This diſpute laſted ſeveral years, after which Du Fronton was appointed librarian to the jeſuits at Paris, and about the ſame time Henry IV. had determined upon printing the ſelect MSS. from the collection of the royal library, and had engaged ſeveral learned men to employ themſelves on editions of the profane writers. The clergy of France, in one of their aſſemblies, aſſigned to the jeſuits the care of preparing for publication the writings of the Greek fathers, and father Du Fronton was, on account of his great learning, appointed to that buſineſs, in which he ſpent the remainder of his days. The laſt years of his life were ſpent in almoſt inceſſant pain from repeated attacks of the ſtone, to which he fell a victim in the year 1624. His various works as an original author, tranſlator, and editor, are enumerated by Moreri. He was eſteemed one of the moſt learned men and ableſt critics of his day, and was at the ſame time unaſſuming, and pious. He enjoyed the correſpondence and friendſhip of the moſt diſtinguiſhed literary characters of the age, as well of the proteſtant, as of his own communion. Moreri.

Duc, John Le, a painter of animals, was born at the Hague in 1636, where he was appointed director of the academy of painting, and died in 1671.

DUCA, in *Geography*, a town of Italy, in the kingdom of Naples, and province of Bari; 6 miles N.W. of Bari.

DUCÆ, in *Ancient Geography*, a people of Africa, in Mauritania Ceſarienſis, according to Ptolemy; but as he places them in the vicinity of Sitifi, they ſeem to belong to Mauritania Sifitenſis.

DUCAL. The letters patent granted by the ſenate of Venice, are called ducals: ſo alſo are the letters wrote in the name of the ſenate, to foreign princes.

The denomination of ducal is derived hence; that, at the beginning of ſuch patents, the name of the duke, or doge, is wrote in capitals, thus, "N ——— Dei Gratia Dux Venetiarum, &c." The date of ducals is uſually in Latin, but the body is in Italian. A courier was diſpatched with a ducal to the emperor, returning him thanks for renewing the treaty of alliance (in 1716) againſt the Turks, with the republic of Venice.

DUCAREL, Andrew Coltee, in *Biography*, was born in Normandy, in 1713, but was brought to England by his father during infancy. He received his grammar learning at Eton ſchool, and from that ſeminary he went to St. John's college, Oxford, where he took his degree of LL. B. In 1742, he became a member of the college of civilians in Doctor's Commons; and, in 1752, he made a tour in his native country, of which he publiſhed an account ſoon after his return, which he reprinted in 1767, under the title of "Anglo-Norman Antiquities." He had, however, ſome years previouſly to this, been elected to an office in the chapel of St. Catharine near the tower, which was peculiarly grateful to him on account of its affording him a good opportunity of purſuing his antiquarian ſtudies. In 1757, he was appointed librarian of the palace of Lambeth, and in the following year was made commiſſary and official of the city and dioceſe of Canterbury. About this period he addreſſed to the antiquarian ſociety, of which he had been ſome years an active and indefatigable member, a ſeries of above two hundred Anglo-Gallic, or Norman and Aquitaine coins of the ancient kings of England, exhibited in copper-plate engravings, and illuſtrated with letter-preſs. In 1762, he was elected a member of the Royal Society, and was ſoon after a contributor to its Tranſactions, in an account of the early cultivation of botany in this country. Dr. Ducarel's ſituation in the library at Lambeth led him to the ſtudy of eccleſiaſtical antiquities, and he made large collections on the ſubject. In the year 1763, he was appointed, with ſir Joſeph Ayloffe and Mr. Aſtle, to methodiſe the records in the ſtate paper office in Whitehall, and in the augmentation office. In 1782, he publiſhed "The Hiſtory of the Royal Hoſpital and Collegiate Church of St. Catharine," and in the following year, an account of the town and palace of Croydon. In the Bibliotheca Topographica he gave "The Hiſtory and Antiquities of the Archiepiſcopal palace of Lambeth from its foundation to the preſent time." He continued an unwearied application to buſineſs, and his favourite ſtudies till his death which happened in the ſpring 1785. Independently of the works of which this learned man was the ſole author, he contributed to ſeveral others connected with antiquarian ſubjects, and had a conſiderable ſhare in the "Account of Alien Priories." It was his cuſtom for many years, previouſly to his death, to take a ſummer journey, with a ſingle friend, and as privately as poſſible, for the purpoſe of purſuing his favourite reſearches. *Biog. Brit.*

DUCART, Isaac, a painter of flowers, generally on ſatin, was born at Amſterdam in 1630, and died in 1697.

DUCAT, a foreign coin, either of gold or ſilver, ſtruck in the dominions of a duke; being about the ſame value with the Spaniſh piece of eight, or a French crown, of four ſhillings and ſix-pence ſterling, when of ſilver; and twice as much, when of gold. See Coin.

The origin of ducats is referred to one Longinus, governor of Italy; who, revolting againſt the emperor Juſtin the Younger, made himſelf duke of Ravenna, and called himſelf *Exarcha, i. e.* without lord or ruler; and, to ſhew his independence, ſtruck pieces of money of very pure gold, in his own name, and with his own ſtamp, which were called *ducati*, ducats; as Procopius relates the ſtory.

After

After him, the first who struck ducats were the Venetians, who called them also Zecchini, or sequins, from Zecca, the place where they first were struck. This was about the year 1280, in the time of John Danduli: but we have pretty good evidence, that Roger, king of Sicily, had coined ducats as early as 1240. And Du-Cange scruples not to affirm, that the first ducats were struck in the duchy of Apulia, in Calabria. The chief gold ducats now current, are, the single and double ducats of Venice, Florence, Genoa, Germany, Hungary, Poland, Sweden, Denmark, Flanders, Holland, and Zurich. The heaviest of them weighs five penny-weights seventeen grains, and the lightest five penny-weights ten grains; which is to be understood of the double ducats, and of the single in proportion.

The Spaniards have no ducats of gold; but, in lieu thereof, they make use of the silver one; which, with them, is no real species, but only a money of account, like our pound. It is equivalent to eleven rials. (See Rial.) The silver ducats of Florence serve there for crowns.

DUCATOON, a silver coin, struck chiefly in Italy; particularly at Milan, Venice, Florence, Genoa, Lucca, Mantua, and Parma: though there are also Dutch and Flemish ducatoons.

They are all nearly on the same footing; and, being a little both finer and heavier than the piece of eight, are valued at two-pence or three-pence more, *viz.* at about four shillings and eight-pence sterling.

There is also a gold ducatoon, struck and current chiefly in Holland: it is equivalent to twenty florins, on the footing of one shilling and eleven-pence halfpenny the florin.

DUCE, in *Geography*, a small town of France, in the department of La Manche, chief place of a canton in the district of Avranches; 6 miles S. E. of that place, with a population of 1611 individuals. The canton has an extent of 120 kiliometres, and comprizes 12 communes, with 8754 inhabitants.

DUCENARIUS, in *Antiquity*, an officer in the Roman army, who had the command of two thousand men.

The emperors had also ducenarii among their procurators, or intendants, called *procuratores ducenarii*. Some say, that these were such whose salary was two hundred sesterces; as in the games of the circus, horses hired for two hundred sesterces, were called ducenarii. Others hold that ducenarii were those who levied the two hundredth penny, the officers appointed to inspect the raising of that tribute. In the inscription at Palmyra, the word ducenarius, in Greek δεκανάριος, occurs very often.

DUCENTESIMA, a tax of the two hundredth penny, exacted, by the Roman emperors.

DUCES Tecum, in *Law*, a writ commanding one to appear at a certain day in the court of chancery, and to bring with him some evidences, or other things, which the court would view.

Duces *tecum licet languidus*, a writ directed to a sheriff, who, having in his custody a prisoner, in a personal action, returns, upon a *habeas corpus*, that he is *adeo languidus*, that, without danger of death, he cannot have his body before the justices. This is now out of use. Where a person's life would be in danger by removal, the law will not permit it to be done.

DUCHAL, James, in *Biography*, was born at or near Antrim in the year 1697. For the principal part of his early education he was indebted to the celebrated Mr. Abernethy. His college studies he pursued at Glasgow, from whence he removed to, and settled among, a small congregation of dissenters at Cambridge, where he remained several years, improving the advantages which the situation afforded in the best manner possible. About the year 1732, he accepted an invitation to Antrim, to succeed his friend and preceptor Mr. Abernethy, whom he again succeeded at Dublin in the year 1740. In the year 1752, Mr. Duchal published his work, entitled "Presumptive Arguments for the Truth and divine Authority of the Christian Religion, in ten sermons: to which is added, a sermon upon God's Moral Government." Almost immediately upon the appearance of this volume, the author had the degree of doctor in divinity conferred upon him by the university in which he had been educated. He died in the year 1761, deeply regretted by his friends. He ever maintained a high character for piety, and every Christian virtue. In his religious sentiments he was liberal, and candid, and as a preacher he maintained a high rank among his contemporaries. After his death three volumes of his sermons were published, which have been highly esteemed on account of their excellent tendency. Besides these, Dr. Duchal published three discourses while he was at Cambridge, entitled, "The Practice of Religion recommended;" and he is supposed to have been the author of various occasional publications, both in England and Ireland, which related to the theological controversies of the period in which he flourished. Biog. Brit.

DUCHESS, in *Geography*. See Dutchess.

Duchess, *La*, a town of Naples, in the province of Abruzzo Ultra; 11 miles S.S.W. of Aquila.

DUCHOUTSCHINA, a town of Russia, in the government of Smolensk; 24 miles N. of Smolensk, and 300 S.S E. of Petersburg.

DUCHY Court *of Lancaster*. See Court.

DUCK, Stephen, in *Biography*, was an English poet, more distinguished by his fortune and his fate than by the brilliancy of his genius, or the excellency of his poetry; and whose labours excited more attention, and received more patronage, than any cotemporary writings, though far superior in meritorious claims. For a rustic genius was then a novel thing, and a poet from the barn appeared as great a prodigy as a dictator from the plough. He was born at an obscure village in Wiltshire, A.D. 1700. His early education was such as was afforded by a common country school; where he learned to read and write, to which was added a little knowledge of arithmetic. At the age of 14, he was taken from school, and employed afterwards in all the menial offices of a country life. His inclination for learning, however, must have been prodigiously great; for he was married in service; was possessed of no books, nor money to purchase them. He contrived, by working overhours, to obtain sufficient money to buy a few, and others he borrowed of his friends. These he perused, by frequently stealing a few hours from sleep. Though limited in time, he could read but little; yet he thought more. His scanty library consisted chiefly of works in verse, which probably turned the bias of his mind in favour of poetry. And the scattered pieces in the Spectators induced him to try, if he could not succeed in making verses himself. A very early poem, though not the first written, was that on his own occupation, entitled, "The Thresher's Labour," addressed to the Rev. Mr. Stanley; and which, excepting the one on "Friendship," is perhaps the best in the whole collection. Duck now became noticed as a surprising genius, and obtained some little notice from the neighbouring gentry. But had it not been for his friend and admirer Mr. Spence, he

he might have written verses, and still been doomed to plod on in the same dull round of abject servitude, till the close of life; and continued to complain:

"Thus as the year's revolving course goes round,
No respite from our labours can be found:
Like Sisyphus, our work is never done;
Continually rolls back the restless stone:
New-growing labours still succeed the past;
And growing always new, must always last."
The Taresher's Labour.

Through the means of Mr. Spence, he was introduced to queen Caroline, who took him under her patronage, and allowed him a pension of 30*l. per annum;* which he gratefully acknowledged in the dedication of his poems. After he had taken holy orders, he was presented to the valuable living of Byfleet in Surrey. But it does not appear that this preferment, though great, contributed at all to his happiness: for he was observed ever afterwards to be melancholy. Whether his ambition had been disappointed, in not being exalted still higher; or his vanity hurt at the diminution of his early popularity; or that conscience accused him for having assumed an office, for the duties of which his previous learning by no means had qualified him, and which he had accepted as a kind of sinecure, or at least with a view to the emoluments attached,—is not known. Perhaps cessation from his usual labours might have been the cause. In a fit of insanity, he threw himself into the Thames, and was drowned, in the month of June, in the year 1756. His works were published in 8vo. London, 1730; and in 4to. with an account of the author, by Mr. Spence, prefixed, London, 1736.

Duck, in *Geography*, a river of America, in Tenessee, which rises on the N.W. side of the Cumberland mountains, runs a N.W. course, and discharges itself into the Tenessee, in N. lat. 36°. At 5 miles from its mouth, 57 miles westerly of Nashville, it is 200 yards wide; and it is passable by boats for 90 miles.

Duck, a lake of North America. N. lat. 54° 50′. W. long. 108° 30′.

Duck *Creek Cross Roads*, or *Salisbury*, a considerable and thriving post-town of America, in the state of Delaware, situated on Duck creek, which in part divides Kent and Newcastle counties. It contains about 100 houses in one street, and carries on a considerable trade with Philadelphia; and is one of the largest wheat markets in the state. It has an episcopal church, and a post-office; 11 miles N.W. of Dover, and 36 from Wilmington.

Duck *Island*, a small island in the Atlantic, near the coast of Main in America. N. lat. 44° 45′. W. long. 67° 43′.

Duck *Islands*, called the *real ducks*, lie in lake Ontario, Upper Canada, between Wolfe island and Point Traverse.

Duck, in *Ornithology*, the name of a large tribe of birds, synonymous with the Linnæan term Anas, and comprehending the whole of those families of the aquatic kind, which are known by the denomination of swans, geese, ducks, and teal. The word duck may be understood to imply only that family which is commonly so named, but, in a general sense, must be considered as the English generic appellation of anas. The character of the genus consists in having the bill convex and obtuse, with the edges divided into lamellate teeth; tongue fringed, obtuse; three fore-teeth connected, the hind-one solitary. The following species are described by Linnæus, Gmelin, Latham, and others.

* *Anas, with the bill gibbous at the base.*

Cygnus. Bill semi-cylindrical, blackish and yellow; cere yellow; body white. *Cygnus ferus*, Linn. *Cygne sauvage*, Buff. *Wild swan*, Br. Zool. *Whistling swan*, Lath.

This is rather smaller than the tame swan, and inhabits Europe, Asia, and America. The wild swan is gregarious, and is sometimes seen in severe winters in Britain, assembled together in flocks of five, six, or more. It has a remarkable whistling note, whence it derives the name of whistling swan. This note, which it utters chiefly in flight, is so loud as to be often heard when the bird itself is so high in the air as to be imperceptible to the naked eye. It appears that this ability arises from the peculiar construction of the wind-pipe, which is extremely different from that in the common swan: in the first of these, the wind-pipe, after entering the chest a little way, is reflected from thence in the form of a trumpet, and again returning into it, divides into two branches, and joins the lungs; in the other, on the contrary, the wind pipe enters at once into the lungs, and, in consequence of this, it is enabled only to make a hissing noise. The wild swan runs swiftly, and swims with its neck erect. The female lays four eggs. The flesh of this bird is not only eatable, but held in much consideration in the north of Europe, and in America. The various useful purposes to which the feathers of the swan are applied are well known. Their skins are worn by the Indians, in many parts of America; and having the downy surface turned inwards, afford an article of warm and comfortable clothing. The legs of this bird are sometimes reddish.

Olor. Bill semi-cylindric and black; cere black; body white. *Anas olor*, Gmel. *Anas cygnus* (*manjuctus*), Linn. *Le cygne*, Buff. *Tame swan*, Albin., &c.

Found in a wild state in Russia and Siberia, from whence they have been conveyed to various parts of Europe and Asia; and being easily tamed and domesticated, form an elegant and appropriate ornament to parks and other grounds, possessing the advantages of an ample sheet of water. Nothing can indeed exceed the grace and dignity with which the swan glides or swims through the watery element, assuming the proudest attitudes, and seeming conscious of deserving admiration. In England, they are protected by law: those kept on the Thames are esteemed royal property, and stealing their eggs is deemed felony. The tame swan is a strong, robust creature, and is said to live to the age of an hundred years. They feed on fish and aquatic plants, and build in high grass near the water. Their eggs, from six to eight in number, are laid one every other day. The young swans are called cygnets, and were formerly considered as a delicacy for the table; the flesh of the adult birds is hard and ill-flavoured.

Nigricollis. Bill semi-cylindric and red; head and neck black; body white; legs flesh coloured. Gmel. *Melancorypha*, Molin. *Black-necked swan*, Bougan. *Black-necked swan*, Lath.

Except in having the neck of a velvet black, the plumage agrees with the tame swan, and is about the same size. The species inhabits the Falkland islands, Rio del Plata, and the straits of Magellan; it is likewise met with in Chili.

Atrata. Black; wings edged with white; bill red. *Black swan*. Phillip's Voy.

The black swan is rather smaller than the common kind; the upper mandible is blackish at the tip, and marked with a yellow spot; the legs black, with the feet paler. This kind inhabits Botany Bay, and has been introduced into England within the last few years.

Brachyptera. Bill fulvous; body cinereous; wings short; vent and band on the wing white. Lath. *Anas cinerea*, Gmel. *Oiseau gris*, Peruet. *Race-horse duck*, ibid. *Logger head duck*, Phil. Transf.

Length thirty-two inches; the bill orange, with black tip; secondary quill-feathers white on the outer edge; posterior part of the belly blueish-black; on the bend of the wing a yellow knob half an inch long; legs brownish-orange, with dusky webs and black claws. These inhabit the Falkland islands, Staaten Land, &c. and were observed by our navigators with captain Cook to appear generally in pairs. From the shortness of their wings they were unable, it is said, to fly; but their wings are serviceable to them on the water, being used as oars, with the aid of which they swim along with astonishing velocity. In order to catch them, our sailors used to surround a flock with boats, and drive them ashore, where, being unable to raise themselves, they ran very fast, but soon becoming tired, squatted down, and being easily overtaken, were knocked down and killed without difficulty. The flesh is rank and has a fishy flavour.

Hybrida. Bill semi-cylindrical; cere red; tail somewhat pointed. *Molin.* Hybrid swan.

A native of Chili. Its size is that of a goose, but the neck is shorter, and the legs and wings longer; the male is white, with the legs and bill yellow; the female black, with a few feathers edged with white; bill and legs red. These birds are found on the sea-coasts, lay from six to eight eggs on the sands, and are observed to fly in pairs.

Cygnoides. Bill black and semi-cylindrical; cere gibbous; eye-lids tumid. Linn. *Anser guineensis*, Brif. *Oie de Guinée*, Baff. *Spanish goose*, or *swan goose*, Albin. *Chinese goose*, Arct. Zool.

An inhabitant of Europe, Asia, and Africa. The length is about three feet; the bill wrinkled near the front, gibbous, ascending, and surrounded at the base with a whitish line; the crown and longitudinal band down the neck and nape testaceous; back and flanks grey-brown, the plumage edged with whitish; beneath white; legs tawny, with black claws; protuberance on the chin blackish.

The variety of cygnoides, called by Linnæus *Orientalis*, and by Albin the Muscovy gander, is smaller than the other; the bill is orange, the irides yellow; on the forehead is a large knob as in the last, and which is the same colour as the bill; beneath the throat is a wattle; the head and neck are brown, deepest on the hind part; back, wings, and tail the same, but deeper, and edged with paler; the quills, breast, and belly white; the female is smaller than the male. There appear to be some other varieties of this species. These birds breed freely with the common tame geese, and are rather abundant in England at this time.

Gambensis. Bill semi-cylindrical; cere gibbous; body black, beneath white; back purplish; bill, forehead, and legs red. *Cambensis*, Linn. *Anas chilensis*, Klein. *Spur-winged goose*, Lath.

Size of the common goose, but taller; the bill more than two inches long, of a red colour, with a protuberance of the same colour at the base; the cheeks and chin white, and the bend of the wing armed with a strong spur of a horn colour, and about an inch and a half in length. The species inhabits Gambia and other parts of Africa.

Indica. Grey, beneath pale ash; head and neck white; lunule on the hind-head and spot beneath black; rump and vent white. *Barred-headed goose*, Lath.

A native of India, where it occurs in flocks of an hundred together, in the winter months, and is very destructive to the corn. It is supposed to come from Thibet, and other parts toward the north, disappearing again as the summer approaches. The flesh is good. This bird is about the size of the tame goose; the bill two inches long and bright yellow, with the nail black; the head, throat, and hind part of the neck are white; at the back part of the head below the eye is a crescent of black, having the horns curved upwards towards the eye, below this a second, and the back of the neck for the most part under this black; the back part of the belly is brown, edged with white; tail grey, with white tip; and the legs tawny.

Goscoroba. Bill dilated and rounded at the point; body white. Molin. Chili.

This species inhabits Chili. It is of a large size, the bill and legs are red, and the eyes black.

Melanotos. White; bill and caruncle at the base black; head and neck spotted with black; back, cuneated tail, and wings black. Gmel. Zool. Ind. &c. *L'Oie bronzée de Coromandel*, Buff. *Black-backed goose*, Lath.

A species common in the island of Ceylon, and along the coast of Coromandel. Its size is that of a goose, but of a more slender form; the bill pale, large, and curved downwards at the point; and in the middle a large rounded fleshy knob, the same colour as the bill; the head, and half the neck is white, dotted with black, and the feathers are ruffled, or reflected; the rest of the neck and under parts are white, tinged on the sides with grey; the back, wings, and tail, black, glossed with greenish, and inclining to blue towards the tail; the legs dusky. The female differs from the male in having the caruncle smaller, and the plumage less vividly glossed with green and blue. Both sexes have the shoulder of the wing armed with a long and dangerous spur. In India it is known by the name of Nuckdah.

Grandis. Body blackish, beneath white; bill black; legs scarlet. Gmel. *Great goose*, Lath.

A large species, found in the east of Siberia, from the Lena river, as far as Kamtschatka, and is taken in great numbers, according to Pallas, in decoys contrived for this particular purpose; the bill is black, with the base tawny.

Hyperborea. Body snowy; front yellowish; first ten quill-feathers black; bill and legs red. Gmel. *Anser niveus*, Brif. *White brant*, Lawf. Car. *Snow goose*, Arct. Zool.

Size of the common goose; the bill somewhat ferrated at the edges with the upper mandible scarlet, the lower whitish. The plumage, in young birds, is of a blue colour, until after the first year. At Hudson's bay they are found in vast numbers, and are called by the natives *way-way*, and *wapa*, *whe whe*. In the month of October they are taken in abundance by the inhabitants, who pluck them, and after taking out their entrails, put their bodies into holes dug in the ground, which they cover with earth; the surface of the ground freezing, preserves the birds, in a perfectly sweet state, throughout the winter, and thus these subterraneous receptacles furnish an occasional supply of fresh food to the inhabitants, with little cost or labour, during the severer months of winter. They are represented as very stupid birds, common in the arctic regions during the summer, but pass the winter in more temperate climates.

Picta. Blackish-ash, with transverse black lines; head, neck, middle of the belly, bar on the wings, and coverts white. Gmel. *Painted goose*, Lath.

The length of this bird is twenty eight inches; the bill is small, about an inch and a half long, and of a black colour. The legs, primary quill-feathers, and tail, black; wings with an obtuse spur on the bend. The species was first described by Dr. Latham, from the drawings of Sir Joseph Banks, the bird delineated was met with at Staaten-Land in January.

Magellanica. Rusty brown; body, on the fore part and beneath, transversely varied; bar, across the wings and coverts, white. Gmel. *L'Oie des terres Magellaniques*, Buff. *Magellanic goose*. Lath.

Observed in the straits of Magellan. The length of this bird is twenty-four inches; the bill short and black; wings and tail black, vent grey; legs yellow; and claws black.

Antarctica. Sooty; bill black; legs yellow (*mas.*) Variegated; belly, vent, rump, and thighs white; legs with a green spot (*fem.*) Mus. Carls. *Anas antarctica*, Gmel. *Antarctic goose*, Lath.

These birds inhabit the Falkland islands, and are from twenty-four to twenty-six inches long. The male entirely white; the female, with the bill, flesh-colour; body brown, with transverse white lines.

Variegata. Body above brown, spotted with white; beneath chestnut, spotted with white and black; bill, tail, and primary quill-feathers black; secondary green; wing-coverts white; rump and vent ferruginous. Gmel. *Variegated goose*, Lath.

Size of a large duck; the bill an inch and a half long, and black at the tip and base; tail and legs black. This bird inhabits New Zealand, and was found by captain Cook in Dusky bay, in April, where it is called *Pooa dugghee dugghee*. Dr. Latham considers the antarctic goose as the female of this species, in his Synopsis; but in the Ind. Orn. since published, it appears as a distinct bird.

Leucoptera. White; bill, two middle tail-feathers, primary quill-feathers, and greater wing-coverts black; nape, and upper part of the body, with numerous black lines. Gmel. *L'Oie des Malouines*, Buff. *White winged antarctic goose*, Brown. *Sea goose*, Phil. Trans. *Bustard goose*, Lath.

Inhabits the Falkland islands, and is known by the name of the *bustard goose*. It is a tall bird, and measures nearly forty inches in length; it walks and flies with great ease, and lays six eggs; the flesh is deemed wholesome and palatable. The wings have a blunt spine at the bend, and a dusky green spot; the greater wing-coverts are white at the tip; secondary quill-feathers half black and half white; and the legs black.

Tadorna. Bill knobbed at the base, with the front compressed; head greenish-black; body variegated with white. Linn. *Vulpanser*, Klein. *Shieldrake*, Brit. Zool. Donov. Brit. Birds.

A native of Europe and Asia, about two feet long, and subsists chiefly on fish, and aquatic plants. The female is smaller than the male, but is not materially different in plumage; it breeds most commonly in deserted rabbit burrows, and has hence acquired the name of *burrow-duck*. The female lays fifteen or sixteen roundish white eggs, and sits about thirty days; the young take to the water as soon as hatched, and swim extremely well. The shieldrake is a bird of elegant plumage, and is common on many of the British sea coasts.

Spectabilis. Bill compressed at the base, with a black feathery keel; head hoary. Linn. *Anas freti Hudsonis*, Briss. *Le canard à tete grise*, Buff. *Grey-headed duck*, Arct. Zool.

Inhabits North America, Europe, and Asia. Length about two feet. This bird builds on the sides of rivers, and lays four or five eggs, which are white, and as large as those of a goose. The female is chiefly black and brown; the belly dusky.

Fusca. Blackish; lower eye-lid, and spot on the wings, white. Linn. *Anas nigra major*, Briss. *Grande, ou double macreuse*, Buff. *Velvet duck*, Brit. Zool.

Native of Europe and South America. The length is about twenty-two inches; the bill black in the middle, at the base gibbous; and the legs red. The female has no gibbosity on the bill; and the body is brown.

Nigra. Entirely black; bill gibbous at the base. Gmel. *La macreuse*, Buff. *Scoter*, or *Black diver*, Brit. Zool.

Inhabits North America and Europe, and feeds on grass and shell-fish. The length is twenty-two inches, the bill yellow in the middle; head and neck sprinkled with purple; tail sub-cuneated. The female has no gibbosity at the base of the bill, and is browner than the male. The flesh of this species is rancid.

Regia. Caruncle compressed; body blue, beneath brown; collar white. Molin. Chili.

This is much larger than the common duck, *Anas boschas*.

Nilotica. Whitish, with hoary spots; sides of the breast and belly with hoary lines; marginal callosity on the bill and caruncle purple-red. Hasselq *Nilotic goose*, Lath.

Inhabits the Nile, in Upper Egypt, and is said not to be found in any other parts except on the borders of the Red sea. The species is cultivated, with other domesticated poultry, in Egypt. Its size is less than the common goose; its tail rather long and rounded; legs red, and claws black.

Beringii. White; wings black; neck blueish; caruncle, at the base of the bill, yellow, radiate in the middle, with blueish feathers. Gmel. *Bering goose*, Arct. Zool.

This is the size of the common wild goose, and was seen by Steller in the month of July, in great abundance on Bering island. The natives pursue them in boats, and kill them in the moulting season, or, at other times, hunt them on land with dogs.

Albifrons. Cinereous; forehead white. Gmel. *Anas erythropus*, (*fem.*) Linn. Faun. Suec. *Anser septentrionalis sylvestris*, Briss. *L'Oie rieuse*, Buff. *Laughing goose*, Phil. Trans. *White-fronted goose*, Arct. Zool.

Inhabits the north of Europe and Asia, and is likewise met with in America. Length two feet four inches.

Erythropus. Cinereous, above waved black and white; neck black; face and abdomen white. *Anas erythropus*, Linn. Fn. Suec. (*male*). *Bernicla*, Briss. *Anas belsingen*, Olaff. *Anser brenta*, Klein. *La bernache*, Buff. *Bernacle*, or *Clakis*, Arct. Zool. Donov. Brit. Birds, &c.

Common in the north of Britain, and other parts of Europe, and is occasionally seen in America. This is a large species, measuring about two feet in length, and is the tree goose of Gerrard and other naturalists about his own time; a bird which they gravely asserted to be generated and hatched in the shell of the bernacle, *Lepas anatifera* of modern authors. This silly conjecture has been long since exploded, but the species still retains the name given to it under this erroneous idea.

*** Bill equal at the Base.*

Marila. Black; shoulders waved cinereous: belly, and spot on the wings white. (*male.*) Linn. *Anas subterranea*, Scop. *Fuligula Gesneri*, Raii. *Scaup duck*, Arct. Zool. Donov. Brit. Birds, &c. *Anas frænata*, Linn. Mus. Carls.

Length about 18 inches; the bill broad, blueish ash; head and neck glossed with green; the legs and primary quill-feathers dusky; secondaries white with black tips; tail, coverts, and vent black. The female is brown, with black bill surrounded with a circle of white feathers; neck rusty; belly and bar on the wings white; legs black. Its size rather larger than the male. This species inhabits the north of Europe, Asia, and America, and is found during winter in

in ſmall flocks on the coaſts of England. A ſuppoſed variety of this ſpecies has the head and neck purple green; back and ſhoulders waved with cinereous, and the belly and wing-ſpot white.

Lobata. Blackiſh with tranſverſe greyiſh lines, beneath paler, under mandible lobate beneath. Nat. Miſc.

Inhabits New Holland. Its ſize is that of the common duck; the bill broad at the baſe and black, the lower mandible with a large, black, flat round wattle, placed longitudinally; the body dark cinereous, paler beneath and on the neck, and waved with numerous tranſverſe whitiſh lines, legs black.

Montana. Head, neck, and quill-feathers red-green. Gmel. *Hill or mountain gooſe*. Kolben.

Larger than the tame gooſe, and inhabits the hilly parts of the Cape of Good Hope, and feeds on graſs and herbs.

Cana. Reddiſh-ferruginous; head and neck grey; wing ſpot green; ſhoulders white. Gmel. *L'Oie ſauvage à tête de Coromandel*, Sonn. *Grey headed gooſe*, Brown.

Leſs than the brent gooſe, and inhabits the mountains of the Cape, where it is called *Bergenten* by the Dutch. The female differs from the male in having no white on the cheeks, and, in general, the colours of the plumage more obſcure. There is a ſmall knob a little below the bend of the wing in this ſpecies.

Ruficollis. Black, beneath white; bill ſmall, conic; neck rufous; ſpot between the bill and eyes white. Pallas. *Red breaſted gooſe*, Arct. Zool.

Native of the north of Ruſſia, and has been twice ſhot in Britain: it is a very rare and beautiful ſpecies.

Casarca. Rufous; wings and tail black; wing ſpot white. Linn. *Anas rutila*, Lepech. *Collared duck*, Gent. Mag. *Ruddy gooſe*, Lath.

Nearly as large as the Muſcovy duck. The ſpecies inhabits Ruſſia and Siberia during ſummer, and migrates into India at the approach of winter. Like the ſhieldrake it forms burrows under ground, and conſtructs its neſt in holes in the craggy banks of rivers. Their voice is ſhrill and powerful, and at times reſembling that of the peacock. The bill and legs are black; the head and upper part of the neck white, and collar black. This is the male bird, from which the female differs chiefly in being deſtitute of the black collar.

Ægyptiaca. Bill ſub-cylindric; body undulated; crown white, wing ſpot with a black collar. Linn. *L'Oie d' Egypt*, Buff. *Ganſer*. Albin. *Egyptian gooſe*, Lath. Donov. Brit. Birds.

Native of Egypt, the Cape of Good Hope, and other parts of Africa, from whence they have been imported into England, and have now become generally naturalized; it is a beautiful ſpecies, and highly ornamental in pleaſure grounds. It is as large as the common gooſe, and has the bill reddiſh with the tip black; the body waved with brown and ferruginous; temples, orbits, and ſpot on the breaſt cheſnut; back, rump, wings, and tail black; belly white; legs red, with black claws. In the female the cheſnut patch round the eye is ſmaller; the chin white; the cheſnut ſpot on the breaſt ſmaller, or ſometimes entirely wanting; the leſſer wing-coverts white; the others pale aſh with darker margins; the lower ones fringed with white, and forming a bar on the wing; ſcapulars and ſecond quills inclining to cheſnut. There is a variety with the bill grey; ſpot on the breaſt black, and the back, wings, and rump cheſnut.

Segetum. Cinereous, beneath dirty white; bill compreſſed at the baſe; tail-coverts white; legs ſaffron. Gmel. *Bean gooſe*, Arct. Zool.

Length two feet ſeven inches; the bill black, reddiſh in the middle; head and neck inclining to ferruginous; quill-feathers edged with black, tail with white; legs ſometimes reddiſh brown, with black claws. The ſpecies inhabits Europe and America; they breed in the Orkneys, and come in the autumn into the more ſouthern parts of Britain, and depart again in May. They are in particular fond of green wheat, and are therefore very deſtructive in corn fields.

Borealis. Bill narrow; head green; breaſt and belly white. Gmel. *Greenland duck*, Arct. Zool.

A ſpecies of the middle ſize between the duck and gooſe; it inhabits the fens of Iceland, and is very rare.

Cærulescens. Brown, beneath white; wing-coverts and hind part of the back blueiſh. Gmel. *Blue winged gooſe*.

Native of North America. Rather ſmaller than the common gooſe; the bill and legs red; crown yelloiſh; reſt of the head and neck white; ſhoulders and tail waved white and grey. Known at Hudſon's bay by the name of *Cath-catue-we-we*.

Bernicla. Brown, head, neck, and breaſt black; collar white. Linn. *Brenta*, Briſ. *Le Cravant*, Buff. *Brent gooſe, or Brand Gooſe*, Arct. Zool.

Leſs than the Bernacle gooſe, inhabits the north of America, Aſia, and Europe, and migrates towards the ſouth in autumn: feeds on ſea plants, berries, and marine inſects. The plumage of the female is more obſcure in colour than the male, and in young birds the white on the ſide of the neck is ſmall or entirely wanting. Like the Bernacle gooſe, theſe birds are frequent on our coaſts during winter. On the coaſts of Holland they are often taken at that ſeaſon in nets placed acroſs the rivers. Buffon relates, that they are ſometimes ſo abundant on the coaſts of France as to become extremely troubleſome; and mentions in particular, that, in the year 1740, they were literally a peſt to the inhabitants, not only deſtroying the ears of corn, but tearing up the ſtalks by the roots. They are eaſily tamed, and, when fattened, are eſteemed delicate eating. In Shetland it is called the Horra gooſe, being found in the ſound of that name.

Canadensis. Cinereous; head and neck black; cheeks and chin white, Linn. *L'Oie à cravate*, Buff. *Canada gooſe*, Cateſby. &c.

Length three feet and a half; the bill, tail, rump, and primary quill-feathers black; a triangular white ſpot reaching from the back of the head to the chin; the nape, tail-coverts, vent, and lower part of the belly white; legs lead colour. The ſpecies inhabits North America, where it appears to be met with in vaſt flocks during the ſummer, when they retire farther northward. In the vicinity of Hudſon's bay they conſtitute a principal article of food, the Indians killing ſome thouſands annually, which are either eaten freſh or ſalted and barrelled. It is ſaid the Indians wait the arrival of theſe birds with much expectation, and form a row of huts, conſtructed of the boughs of trees, at a muſket ſhot diſtance from each other, acroſs thoſe parts where the birds are expected to paſs, where they lie ſecreted, and, when the geeſe fly near, ſo exactly mimick their note as to decoy them near enough to kill them with their muſket ſhot. Theſe birds are very ſhy, but an expert marksman by this means has been known to take two hundred geeſe in one day. The fleſh is good and the feathers in much requeſt, being equally fine as thoſe of the common gooſe.

Mollissima. Bill cylindrical; cere on the hind part bifid and wrinkled. Linn. *Anſer lanuginoſus*, Briſ. *Eidergans Waulibnum. Oie à duvet*, Buff. *Eider, or Cuthbert duck*, Arct. Zool.

The Eider duck inhabits the north of Europe, Aſia, and America, extending to the higheſt northern latitudes, and becoming ſcarce towards the ſouth. In Britain it is ſeldom found more ſoutherly than the Farn iſles, or in America than New York. They are numerous in the Eſquimaux iſlands, and in

in Greenland. The male has the bill, legs, front-band across the eyes, breast, and lower part of the back and belly black; middle of the head, upper part of the back, shoulders, and wing-coverts white, and beneath the hind part of the head a blotch of pea-green. In young birds the neck and breast are commonly spotted black and white, and the crown of the head black; and it is said, when they attain a great age, which sometimes does happen, the plumage becomes entirely grey. The female is in general of a reddish brown, barred with black, and the hind part of the neck marked with longitudinal dusky streaks; two bars of white on the wing; tail dusky, and legs black.

These birds are smaller than the common goose, and feed on shell-fish, in search of which they dive under water to a great depth; their flesh is good, and the down obtained from their nests in the breeding season so abundant, and of such an excellent quality, as to render it an article of considerable commercial importance in the north of Europe. The quantity of down found in one nest weighs only about three quarters of an ounce, yet is sufficient to fill the crown of a man's hat. Salerne relates, that three pounds of this down may be compressed into a space not larger than one's fist, notwithstanding it is so dilatable as to fill a quilt five feet square. That found in the nests is called live-down, and is more valued than the down plucked from the skins of the dead birds.

Anser. Bill semi-cylindrical; body above cinereous, beneath paler; neck striated. Linn. *Anser sylvestris*, Brif. *Anas Araki*, Forsk. *Wild goose*, Will. *Grey Lag goose*, Arct. Zool.

β. var. domesticus. Varies much in colours by domestication.

The wild goose weighs about ten pounds; its length is two feet nine inches, and breadth five feet. The bill is flesh colour, with the tip white; the rump and vent white; the legs flesh colour, and claws black. These birds inhabit the fens of England, and are supposed not to migrate from hence, as in many other countries on the continent, being met with throughout the summer, and being also known to breed in Lincolnshire, and Cambridgeshire. During the winter season they associate in large flocks. On the continent they migrate in flocks of five hundred together; their columns, when their flock is large, are somewhat triangular, with one point foremost, but when small, appear in a direct line. The goose, in a wild state, seems pretty generally diffused over the globe: they are met with in Iceland, and from Lapland to the Cape of Good Hope. In Arabia, Persia, and China they are frequent; indigenous to Japan, and on the American continent from Hudson's bay to Carolina. They are also met with in the straits of Magellan, in the Falkland isles, and at Terra del Fuego. They are easily tamed, and have from seven to eight young at a time.

In a state of domestication the grey lag goose varies from its parent origin in the colour of the plumage, but in a much slighter degree than either the mallard or the cock, being more or less grey, and having both the vent and tail-coverts almost constantly white. Tame geese are no where seen in greater abundance than in the fens of Lincolnshire, many persons keeping no less than a thousand breeders. The use of the quills and feathers is well known, and for the sake of these the birds are frequently stripped of their plumage whilst alive; about Michaelmas they are despoiled of both quills and feathers, and four times afterwards between that period and the ensuing Michaelmas they are again stripped, but of their feathers only. Numbers die in consequence of this cruel treatment, if the weather prove cold, otherwise they soon recover their strength, and seem to suffer no very material injury. During their fitting, each bird has its allotted space, in rows of wicker pens placed one above another; and it is said the person, who takes charge of them, and is called a Gozzard or Goose-herd, twice in a day drives the whole to water, and bringing them back to their habitations, places every bird in its respective nest without missing one. In some counties the common price of geese is regulated by that of mutton, the former being stripped of the feathers, and both being the same *per* pound. The usual weight of a fine goose is about sixteen pounds, which, however, may be greatly increased by cramming them with bean meat and other fattening diet. Some nail the geese to the floor by the webs of their feet, during the time of fattening, a proceeding apparently cruel, but which is said to occasion no pain, and is intended to prevent the least possibility of action. The French add to this the refinement of putting out their eyes, an act of barbarity, we conceive, devoid of any useful purpose. The geese in England, when fully fattened, have been known to weigh thirty pounds. The number of geese driven annually from distant counties to the London market appears incredible. They will walk from eight to ten miles a day on the average, travelling from three in the morning till nine at night. In this manner they are often brought to London in droves of many thousands together. The weaker ones are much fatigued, and are fed on oats instead of barley, their usual food, on the journey.

Moschata. Face naked and papillous, Linn. *Anas sylvestris Brasiliensis*, Ray. *Anas Indica Gesneri*, Will. *Le canard musqué*, Buff. *Anitra muta*, Zinnan. *Muscovy duck*, Will.

Larger than the wild duck; the bill two inches long, and red, except about the nostrils, and at the tip, which are dark brown; face red; the crown of the head black; temples, chin, and throat, white, varied with black; breast and lower part of the belly brown, mixed with white; back and rump brown, glossed with golden green; upper part of the belly white; the three first quill-feathers white, the rest brown; tail-feathers twenty in number and golden green, except the outer one on each side, which is white; the legs red. The plumage of the female is more obscure in colour, and the naked papillous space about the head smaller.

The name of Muscovy duck usually given to this species seems to imply that the breed originated in that part of the world; but, according to Ray, it is so called from the musky odour, which it exhales, a scent arising from the gland on the rump; and it appears also from Marcgrave that they are indigenous in Brasil. In an unconfined state, they make their nests on the stumps of old trees; and perch under the shade of the foliage during the heat of the day. The flesh is accounted excellent.

Rufa. Cinereous; head and neck rufous; breast black; back lineated with brown; wings cinereous brown. Gmel. *Anas ruficollis*, Scop. *Rufous necked duck*, Lath.

Size of the mallard; the bill black; head and neck rufous; breast black; back variegated with brown lines pointing backwards; tail short; legs black. A species described on the authority of Scopoli, the native place not mentioned.

Leucocephala. Bill broad; tail-feathers rigid, pointed, grooved; the middle ones longest. Scop. *Anas mersa*, Pallas. *White headed duck*, Shaw. *Ural duck*, Lath.

Rather larger than the common teal; bill large, broad, and tumid above the nostrils, the colour blue; head and part of the neck white; on the crown a large patch of black; breast chestnut, with black streaks disposed transversely; belly grey with small black spots; back rufous; wings

reddiſh, with brown dots and lines, ſmall, and without any appearance of a ſpeculum; tail long and wedged, the colour black; legs brown, on the forepart blueiſh, and placed far behind, as in the divers. The female is entirely brown, except the throat, which is white. The ſpecies is not unfrequent in the greater lakes of the Ural mountains, and the rivers *Ob*, and *Irtiſch*. It is ſeldom ſeen on the ground, as it is, from the ſituation of its legs, ſcarcely able to walk, but it ſwims very well, and what is remarkable, the tail is at that time immerſed in the water as far as the rump, and ſerves as a kind of rudder to direct its courſe, contrary to the manner in which the duck tribe uſually ſwim. The neſt is formed of reeds like that of the grebe, and floats in the water.

Monacha. White, varied with black; bill yellowiſh with black tip; wing-ſpot violet green, Scopoli.

Larger than the wild duck; the lores grey; head, bill, and upper part of the breaſt ſpotted with black; firſt quill, and tail-feathers white with brown tip. Native place unknown.

Torrida. Head white; neck above black, beneath cheſnut. Gmel. *Branta torrida*, Scop. Torrid duck.

Native place unknown.

Albicans. Front and body beneath whitiſh, above brown, head and neck brown rufous. Gmel. *Branta albifrons*, Scop.

The feathers of the breaſt are cinereous, edged with pale ruſty, and a rufous bar near the tip; quill-feathers within, and at the tip white.

Georgica. Cinereous-waved; wing-ſpot greeniſh, edged with white; wings and tail duſky. Gmel. *Georgia duck*, Lath.

Deſcribed by Dr. Latham from a drawing in the Bankſian collection; the ſpecimen was found in South Georgia in the middle of January; it was a male bird, and the fleſh was excellent. The total length of this bird was twenty inches; the bill two inches long, turned up a little at the tip and yellow; irides cheſnut; wing-coverts pale-aſh; legs greeniſh-grey.

Bahamensis. Grey; bill lead-colour, with a lateral tawny ſpot; wing-ſpot green and pale yellow. Linn. *Mareca prima Aldr.* Ray. *Le maree*, Buff. *Ilathera duck*, Cateſby, Lath, &c.

Native of Braſil and the Bahama iſlands, particularly that called Ilathera, whence its name, but it is not numerous. It is ſaid to perch and rooſt on trees. Its ſize is that of the common duck; the crown is reddiſh aſh, neck, back, ſhoulders, and rump reddiſh brown; cheeks and throat white; breaſt and belly rufous-grey, ſpotted with black; primary quill-feathers and leſſer wing-coverts duſky; greater ones green, with black tips; ſecondary quill-feathers yellow; legs lead-colour.

Brasiliensis. Brown, beneath cinereous; between the bill and eyes a yellow ſpot; chin white; tail wedged and black. Gmel. *Le mareca*, Buff. *Mareca duck*, Lath.

Inhabits the ſame country as the former, and with that ſpecies is indiſcriminately called by the natives *Mareca*. The bill is black; upper wing-coverts brown, gloſſed with green; greater ones edged with blue green, and black at the tip; quill-feathers white at the extremity; legs red.

Erythrorhyncha. Bill red; brown beneath, and temples white; tranſverſe bar on the wings white, and another below yellowiſh; tail black. Gmel. *Crimſon-billed duck*, Lath.

The length of this ſpecies is fifteen inches; the bill two inches long, and turning up at the end; legs black. It inhabits the Cape of Good Hope.

Albeola. White; back and wings black; head blueiſh; the hind head white, (male) Linn. *Querquedula ludoviciana*, Briſſ. *Anas hyberna*, Briſſ. *Sarcelle blanche et noire*, Buff. Pl. Enl. *Petit canard à groſſe tete*, Buff. Oiſ. *Spirit duck*, Arct. Zool. *Buffel-headed duck*, Cateſby. (Female.) *Anas ruſtica*, Linn. *Querquedula carolinenſis*, Briſſ. *Sarcelle de la Caroline*, Buff. *Little brown duck*, Cateſby.

The two ſexes of this duck have been deſcribed as diſtinct ſpecies. They inhabit North America, and are found at New York in the winter, returning ſouthward in the ſummer to breed. They arrive about June in Hudſon's bay, and make their neſts in trees, in the woods near ponds. The male is rather larger than the teal, and about ſixteen inches in length; the female only fourteen.

Stelleri. White; hind-head ſomewhat creſted; tranſverſe ſpot on the nape, and each ſide of the bill green; tail brown; ten firſt quill-feathers blackiſh brown; the reſt black blue. Pallas. *Weſtern duck*, Arct. Zool.

A rare ſpecies, found on the ſea coaſts of Kamtſchatka, where it breeds in the moſt inacceſſible rocks, and flies in flocks. Its ſize is that of the common wigeon; the bill and legs black; orbits lunule at the baſe of the neck; and band from the wings to the back black. Female ferruginous.

Clypeata. Extremity of the bill dilated and rounded with an incurved nail. Linn. *Anas platyrynchos altera*, Ray. *Anas virescens*, Marſ. *Avis latiroſtra*, Klein. *Souchet*, Buff. *Shoveler*, Brit. Zool.

A native of Europe, Aſia, and America; in England the ſpecies is ſcarce, in Germany rather more common, and alſo throughout the Ruſſian dominions as far as Kamtſchatka; its food conſiſts of inſects, and ſhrimps have been likewiſe found in its ſtomach on diſſection. It breeds in the ſame places as the ſummer teal, laying its eggs on a bed of ruſhes; theſe eggs are of a rufous colour, and from ten to twelve in number. The ſize of the male is about twenty-one inches; the bill black; irides yellow; head and neck violet green; breaſt white; back, wings, and tail brown; belly cheſnut; vent white; firſt and ſecond wing-coverts pale blue, greater, brown tipped with white, the reſt edged with white; legs tawny. The female is ſmaller, and in general brown. Both ſexes vary occaſionally in colour. Dr. Latham conſiders the *Anas muſcaria* of Linnæus as a variety of this ſpecies, as it differs only in having the belly white; and another ſuppoſed variety inhabits Mexico; this is the *Tempatlahoac* of Ray, *Le canard ſauvage du Mexique* of Briſſon. It is the ſize of the tame duck. The bill is large and black; the head and neck greeniſh, gloſſed with purple; breaſt white; reſt of the body beneath fulvous, with two white ſpots on both ſides near the tail; and the legs red.

Mexicana. Tawny; above black and white lineated; wings brown; leſſer coverts white; greater next the body green gold. Lath. *Anas clypeata mexicana*, Briſſ. *Tucatpatlahoac*, Ray. *Mexican ſhoveler*, Lath.

Smaller than the common duck; the bill browniſh-red; greater wing-coverts brown; and the legs reddiſh. The ſpecies inhabits New Spain.

Rubens. Brown; chin and breaſt cheſnut; wings tipt with grey; wing-ſpot purple, edged with white; tail ſhort and white. Gmel. *Red breaſted ſhoveler*, Lath.

Size of the common duck; the bill is broad, and browniſh yellow; head large, eyes ſmall, and the legs ſlender and bay colour. Inhabits Europe.

Jamaicensis. Varied with brown, ſaffron, and ruſty; back, wings, and tail brown; upper part of the head black beneath, and chin white, with black ſpots. Gmel. *Teal of Guiana*, Bancroft. *Jamaica ſhoveler*, Lath.

Length ſixteen inches; the bill broad, blueiſh, orange at

the ſides; legs orange; back brown, ſprinkled with yellowiſh ſagittated dots, and tail cuneated. It is a native of Jamaica, where it firſt appears in October or November, and retires northward in March.

Scandiaca. Cheſnut; back, wings and tail black; belly white. Gmel. *Anas latiroſtra*, Brun. *Lapmark duck*, Arct. Zool.

Inhabits Denmark, and is common about Chriſtianſtedt, and alſo at Lapmark. Its ſize is that of the common duck; the bill is broad, with the legs black; the ſecondary quill-feathers white, with black tips; and the flanks ferruginous. The ſpecies frequents both the freſh and ſalt waters.

Strepera. Wing-ſpot rufous, black, and white. Linn. *Anas platyrhynchos*, Ray. *Chipeau*, Buff. *Gadwall*, Will, &c.

Size of a wigeon; the bill flat and black; legs tawny; rump black; back brown, waved with paler; breaſt and belly grey, varied with white. The female is marked in a manner ſomewhat ſimilar to the male, but is more obſcure. In the breeding ſeaſon it is found throughout Sweden, Ruſſia, and Siberia, and as far north even as Kamtſchatka; in the winter it appears in France and Italy. It is ſeen in England during the latter ſeaſon, but not commonly. This bird is very ſhy, concealing itſelf during the day time among the ruſhes, and venturing out to feed only in the morning and evening. Its voice is like that of the mallard, but louder; and the fleſh is good.

Falcaria. Creſted, variegated with hoary and brown; breaſt ſcale-waved; front, chin, collar, and bar on the wings white. Pallas. *Anas falcata*, Georgi. *Falcated duck*, Arct. Zool.

This is found in the eaſtern part of Siberia, from the river Jeniſei to the Lena, and beyond lake Baikal, and is ſuppoſed to winter in the Mongolian deſerts, and in China. Its ſize is that of the common wigeon; the bill black; crown teſtaceous, and the reſt of the head ſilky green, with a ſmall white ſpot on the front; ſpeculum blue black, edged with white; five inner quill-feathers long, falcated and varied with white and violet; legs lead-colour. A variety is deſcribed by Buffon under the title of *Sarcelle de Java*, in which the quill-feathers are not falcated; in this the vent is brown and the thighs white. This is deſcribed as a native of Java and China, and is perhaps the young or female bird.

Dominicana. Rufous; front of the head ſooty; wing-ſpot white; ſhafts of the tail-feathers deep black. Gmel. *Canard dominicain du Cap de Bonne Eſperance*, Sonn. *Dominican duck*, Lath.

Inhabits St. Domingo, and meaſures in length about twelve inches. The bill is black; breaſt and belly grey-brown mixed with white, and ſome of the greater wing-coverts white; wings brown; tail cuneated, the feathers pointed, and the legs brown.

Spinosa. Brown; crown black; tail-feathers pointed. Gmel. *Sarcelle à queue épineuſe*, Buff. *Spinous-tailed teal*, Lath.

A native of Cayenne and Guiana. The bill is blueiſh; band acroſs the eyes, white in the middle, and black each ſide; tail ſhort; legs fleſh-coloured. Length from eleven to twelve inches.

Africana. Reddiſh-brown; back, wings, and tail black; ſpot on the breaſt and tranſverſe bar on the wings white. Gmel. *Sarcelle d'Egypte*, Buff. *African teal*, Lath.

Rather larger than the garganey, length ſixteen inches. The colours of the female agree with thoſe of the male, excepting in being more obſcure, and the white ſpot on the breaſt waved with brown. This ſpecies is a native of Europe.

Madagascariensis. Duſky green, beneath white; cap, front, and chin white; hind-head and neck greeniſh-black; throat and breaſt ferruginous, waved with brown. Gmel. *Sarcelle male de Madagaſcar*, Buff. *Madagaſcar teal*, Lath.

A native of Madagaſcar. This ſpecies is about twelve inches long, and has the bill yellow, tipped with black; between the ears is a pale green patch of an oval ſhape; and the legs and wings duſky, the latter marked with a white ſtreak.

Coromandeliana. Above gloſſy-brown, beneath white; crown black, the reſt of the head and neck white, ſpotted with black. Gmel. *Sarcelle de Coromandel*, Buff. *Coromandel teal*, Lath.

Much ſmaller than the common garganey; its bill is duſky; the lower part of the neck marked with decuſſating black lines; vent ferruginous at the ſides; and the legs black. The female is varied beneath with white and grey. Native of Coromandel.

Manillensis. Head and chin white; neck, breaſt, and wing-coverts bay; wings and tail pale greeniſh. Gmel. *Sarcelle de l'iſle de Luçon*, Sonn. *Manilla teal*, Lath.

Leſs than the common teal, and inhabits the iſland of Manilla.

Formosa. Brown; crown black, edged with white; chin reddiſh, ſpotted with black; wing-ſpot black, edged with teſtaceous, and marked on the fore part with an oblique green ſpot. Georgi reiſe. *Baikal teal*, Lath.

Size of the common teal, and inhabits Ruſſia about the lake Baikal. The bill is black; legs duſky red; from the eye to the chin extends a black ſpot, paler on the hind part, and edged with green; the nape and ſides of the neck waved; vent black, with a white band, and tawny at the ſides; middle tail-feathers whitiſh. A variety of this bird inhabits China; it is of a brown colour, with the crown black; head yellowiſh brown at the ſides, and behind the eyes green with a curved black ſpot.

Hina. Region of the eyes green. Oſbeck. *Hina teal*, Lath.

Deſcribed on the authority of Oſbeck, who does not mention the ſize; the bill, he ſays, is blackiſh grey and ſoft, the head and chin brown; a white line paſſes below the eyes, and all the ſpace above is green; the neck and upper part of the back are white, ſpotted with black; lower part of the back and rump aſh-colour; upper part of the neck white, ſpotted with black, breaſt and belly white; feathers of the rump edged with white; feet and legs aſh-coloured. The female has the head and region of the eyes grey; chin white, above black, and in ſome parts of a reddiſh white, ſputted with black. In China it is called *Hina-a*.

Sparmannia. Beneath dull white, above black, varied with ferruginous and white; ſcapulars white, edged and lineated with ruſty-white on the diſk. Lath. *Anas alandica*, Muſ. Carlſ.

Length twenty-three inches. The bill and legs black; tail ferruginous, ſomewhat faſciated with black. Inhabits the vicinity of Aboana.

Clangula. Varied black and white; head tumid and violet; at each corner of the mouth a large white ſpot. Linn. *Le Garrot*, Buff. *Golden eye*, Arct. Zool. Donov. Brit. Birds.

Inhabits Europe and the north of Aſia and America. It preys on ſhell-fiſh, frogs, and other aquatic animals, and forms a neſt of graſs of a rounded form, lined with feathers

from the breast, and in which it depositS from seven to ten eggs of a whitish colour. In the Linnæan Fauna Suecica, it is said to build in the hollows of trees. The flesh of this kind of duck is much esteemed.

Perspicillata. Black; crown and nape white; bill with a black spot behind the nostrils. Lath. *Anas perspicillata*, Linn. *Macreuse à large bec*, Marchand, Buff. *Black duck*, Cook's Voy.

Size of the velvet duck, length twenty-one inches. The bill and legs are red; crown and neck marked with a white triangular spot. The female is smaller, sooty and without the spot on the nape; on the cheeks two whitish spots. A native of America, breeds along the shores of Hudson's bay, and feeds on grass; the nest is also composed of grass, lined with feathers, and contains from four to six white eggs, which hatch the end of July. It is called by the natives *Misse qua gw ta wow*. Captain Cook met with it in Prince William's sound.

Glaucion. Body blackish; breast waved; wing-spot white and linear. Linn. *Anas peregrina*, S. G. Gmel. *Morillon*, Brif. *Glaucium*, Arct. Zool. Smaller than the golden eye, and inhabits northern regions.

Novæ Hispaniæ. White, spotted with black; head tawny, varied with blackish and greenish blue; wing coverts and vent blue; spot between the bill and eyes, and bar on the wings white. Gmel. *Querquedula mexicana*. Brif. *Tolteco-cocili*, Ray. *Sarcelle du Mexique*, Buff. *Mexican duck*, Lath.

Size of the common teal; the upper mandible of the bill is blue, the lower black; the middle quill-feathers green without, tipped with tawny; legs pale red. The female differs in having the head, posterior part of the neck, back, scapulars, wing-coverts and rump black, some of the feathers edged with fulvous, and others white; beneath black, varied with white, and the legs ash-coloured. It inhabits the lakes of Mexico and Surinam, where it is said to be continually dabbling in the mud with its bill for worms, frogs, fish, &c.

Malacorhynchos. Blueish-lead colour; bill membranaceous at the tip; crown greenish ash; wings with a transverse white spot. Gmel. *Blue-grey duck, with a soft bill*, Cook's Voyage. *Soft billed duck*, Lath.

This bird is about the size of the wigeon, and inhabits New Zealand. Our circumnavigators met with it in Dusky bay in April. The bill is an inch and a quarter in length, of a pale ash-colour, with the tip black; the latter part is membranaceous, and of such a soft and flexible nature, that the bird is supposed to live by suction, or on worms which it finds in the soft mud on the sea shore when the tide is down; it is said to whistle like the whistling duck. The inhabitants of New Zealand call it *He-weego*.

Americana. Pale rusty, waved with black; crown and front ochraceous; wing-spot large, white; wings and tail brown. Gmel. *Canard gensier*, Buff. *American wigeon*, Arct. Zool.

Rather larger than the common wigeon, and inhabits America. The bill is lead-coloured, tipt with black; hind-head and neck varied with white and black; behind the eyes a black spot; vent black, and legs dusky. It is found from Carolina to Hudson's bay, but is no where common. They are gregarious, and in Martinico, where they are abundant, associate in large flocks, and do great mischief in the rice plantations during the rainy season. They seldom appear till after sun-set, when they come forth from their hiding places in quest of food; they sit in January, and in March the young are hatched. The flesh is excellent, but that of the domesticated ones is preferable to those killed in a wild state.

Capensis. Dirty white; back bay; wing-spot, blueish green edged with white. Gmel. *Cape wigeon*, Lath.

Length fifteen inches; the bill red, and black at the base; head speckled with dusky; and the legs red. Inhabits the Cape of Good Hope.

Penelope. Tail rather pointed; vent black; head brown; front white; back cinereous waved. Linn. *Anas fistularis*, Brif. *Canard siffleur*, Buff. *Wigeon*, Arct. Zool. Donov. Brit. Birds.

This species is common in various parts of Europe, Asia, and Africa, migrating from Europe as far as Egypt: it is also found in Aleppo during the winter in plenty, and likewise on the borders of the Caspian sea. Both sexes are alike in young birds till the following spring after hatching, when the male about March gains his full plumage. These birds are common in England during the winter months.

Acuta. Tail pointed, long, beneath black; a white line on each side on the hind-head; back cinereous and waved. Linn. *Anas caudacuta*, Ray. *Anas longicauda*, Brif. *Canard a longue queue*, Buff. *Sea pheasant*, or *cracker*, Will. *Pintail*, Donov. Brit. Birds, &c.

Found in England, but in less abundance than in many parts of the continent. It is very common in Russia, appearing in flocks of some hundreds on the borders of the Don, and extending as far as Kamtschatka. In the winter season it is common in France, Austria, and Italy, and in plenty about the lake Baikal in Asia. Upon the sea-coasts of China it is often seen in flocks; and is not uncommon in America. The flesh is fine flavoured and very tender.

Ferruginea. Reddish-brown; bill dilated and rounded at the tip; legs blueish. Gmel. *Anas rufa*, Linn. Fn. Suec. *Red duck*, Arct. Zool. *Ferruginous duck*, Donov. Brit. Birds.

A rare species, found in Denmark and Sweden, and has been once taken in Lincolnshire.

Glacialis. Tail pointed, long; body black, beneath white. Linn. *Canard a longue queue*, Buff. *Swallow-tailed shieldrake*, Will. *Long-tailed duck*, Brit. Zool. (male.) *Anas hyemalis*, Linn. (young male.) *Long-tailed duck*, Arct. Zool. (female.)

Size of the wigeon; the bill an inch and a half long, and black, except down the middle and at the tip, which parts are orange; the head in front and at the sides are greyish, inclining to red; the posterior part, with the breast and belly, white; on each side of the neck, just below the head, is an oval spot of black; the back, wings, and tail chocolate; the tail is white, except the four middle feathers, which are black, and of these the two middle ones are much longer than the rest, exceeding them by more than three inches; the legs are dull red, sometimes blackish, and furnished with black claws. This is the description of the male bird in the adult state: when young, they vary considerably. The variety described by Linnæus as a distinct species, under the name of hyemalis, has the tail nearly as in the preceding, but the two middle feathers rather shorter, the belly white, the back of the head cinereous; the temples, with the breast, back, and wings black. This kind has been described as the female by some authors: but, from recent observations, it appears that the latter sex has the tail short, cuneated, and destitute of the two middle long feathers; the body varied with rufous and grey; the body black, and the collar, with the lower part of the belly, white. This relates to the adult female; for, in young birds, the crown and collar are black, sprinkled with white, and the black dull cinereous.

There

There is ſtill another variety of this ſpecies, called by Buffon *Sarcelle de Ferroe*, a bird found in the Ferroe iſlands, where it is known among the natives by the name of O'edel. The colour of its plumage is blackiſh-brown, beneath white; the bead pale-grey at the ſides; the orbits white; hind-head, chin, and neck ſpotted with brown; wings with a reddiſh-brown ſpot.

Theſe birds inhabit the north of Europe, Aſia, and America. In England they are confined chiefly to the Orkneys, where they are met with from April to October. In Sweden, Lapland, and Ruſſia, it is not an uncommon ſpecies, and thence extends even to Kamtſchatka. In America it is found from Hudſon's bay to New York, remaining in Hudſon's bay and in Greenland throughout the year. Like the Eider duck, it forms the neſt of graſs near the ſea, and lays from ten to fifteen eggs of a white colour, and the ſize of a pullet's. The neſt is lined with down of a ſoft and valuable kind, but not in ſufficient abundance to reward the labour of collecting it. They fly with ſwiftneſs, and ſwim well; have a loud and ſingular cry, and ſubſiſt principally on ſhell-fiſh.

Fulva. Tawny; back, ſhoulders, wings, and rump tranſverſely ſtreaked with tawny and brown; tail varied with white and black. Gmel. *Penelope mexicana*, Briſ. *Quapachauktli*, Ray. *Mexican pochard*, Lath.

The ſize of this bird is uncertain; the bill and legs are duſky, with black claws; and the eyes are black. The ſpecies inhabits Mexico.

Ferina. Cinereous waved; head brown; band on the breaſt, vent, and rump black. Linn. *Anas fera fuſca*, Ray. *Penelope*, Briſ. *Poker, pochard*, or *red-headed wigeon*, Will. Lath.

Native of Europe, the north of Aſia, and America, paſſing from the north to the ſouth in the winter. During the latter ſeaſon, they are frequently in the fens of Lincolnſhire, where they are often caught, and ſent in conſiderable numbers to the London markets; the fleſh being much eſteemed. With us they are known by the name of *dun* birds. They paſs far to the ſouth in the winter, being met with at that time in Egypt. Feed on aquatic inſects and ſhell-fiſh. Their flight is ſtrong and rapid; their voice a peculiar kind of hiſſing. The ſize of the pochard is that of the wigeon; the female is darker in colour than the male, and has the head pale reddiſh-brown, with the belly and wing-coverts cinereous.

Lurida. Black; head cheſnut; breaſt tranſverſely lineated with red. S. G. Gmel.

Rather larger than the common teal; the belly whitiſh, ſpotted with blackiſh, on the ſides and vent ſnowy; quill-feathers varied with cinereous and black; tail-feathers twelve in number and black. Native of the ſouthern part of Ruſſia, and found by Gmelin in his travels on the borders of the Caſpian ſea.

Kekuschka. Ochrey-yellow, beneath ſnowy; back cinereous; rump and tail deep-black; quill-feathers from fifteen to nineteen, the tips white. S. G. Gmelin.

Found on the borders of the Caſpian ſea. Length twenty inches. The fleſh rancid.

Querquedula. Spot on the wings green; above the eye a white line. Linn. *Garganey*, Brit. Zool. Donov. Brit. Birds, &c.

Length ſeventeen inches; the bill lead colour; crown duſky and ſtreaked; cheeks and neck purple, with ſhort white lines; breaſt brown, with ſemi-circular black bars diſpoſed tranſverſely; belly white, ſpeckled behind; ſcapular feathers long, narrow, and ſtriped with white, aſh-colour, and black; tail duſky; legs lead-colour. Female browniſh-aſh, and without a green ſpot on the wing. Found, but not in any plenty, during the winter ſeaſon, in Britain and France; retiring towards the north to breed, as the ſummer approaches. In Sweden, Ruſſia, and Siberia, it is more common; and in Kamtſchatka it breeds.

Crecca. Wing-ſpot green; a white line above and beneath the eyes. Linn. *Querquedula minor*, Briſ. *Krikente*, Bl. *Common teal*, Br. Zool. Arct. Zool., &c.

This well-known bird is about fourteen inches in length, and weighs twelve ounces; the bill is black; head and neck bright-bay; behind the eyes to the nape extends a broad green band, which terminates beneath in a white line; the body is whitiſh, with tranſverſe blackiſh lines above, and the fore-part of the neck and breaſt ſpotted with black; the vent black in the middle. The female has the head and neck varied with whitiſh and brown; and the vent totally white. The teal is very abundant with us in winter. It breeds in France, forming its neſt of ruſhes on the borders of ponds; or ſo contrived that, being placed at the water's edge, it may riſe and fall with it. Its food conſiſts of ſmall fiſh and aquatic plants. The ſpecies is found as far north as Iceland, and to the ſouthward as the Caſpian ſea. The ſummer teal, *anas circia* of Linnæus, is ſuppoſed by ſome to be a variety of the common teal.

Carolinensis. Black and white waved; head and upper part of the neck cheſnut; throat and breaſt ſpotted with black; wing-ſpot green; line beneath the eyes, and humeral arch white. Lath. *Anas crecca* (var.), Phil. Tranſ. *American teal*, Arct. Zool.

Inhabits America from Carolina to Hudſon's bay, in the laſt of which places it breeds: moſt commonly found in woody places near ſmall ponds, and lays from five to ſeven eggs. The head is marked each ſide with a green ſtripe; the wing-coverts are brown, and the legs duſky. The female is reddiſh-brown-aſh, ſpotted with black; the wings as in the male bird.

Histrionica. Variegated with brown, white, and blue; ears, double line on the temples, collar, and pectoral bar white. Linn. *Le canardà collier*, Buff. *Harlequin duck* (male), Arct. Zool. *Anas minuta*, Linn. *Harlequin duck* (female), Lath.

Native of Europe and America, and ſubſiſts on the eggs of fiſhes, ſhell-fiſh, and aquatic inſects. They delight in ſhady places, and build their neſts on the ſhores of freſh water ſtreams; their eggs, about ten in number, are of a white colour, and reſemble thoſe of the pigeon.

Fuscescens. Browniſh; head and neck paler; wings cinereous, ſpot blue, tipped with white; tail duſky. Gmel. *Brown duck*, Arct. Zool.

The length of this ſpecies is ſixteen inches; the bill large, thick at the baſe, and blueiſh, with the tip black; breaſt pale-brown, edged with ruſt colour; legs duſky. Native of Newfoundland.

Poecilorhyncha. Black; cheeks and part of the throat cinereous; wing-ſpot green, above white, beneath bounded with white and black; ſecondary quill-feathers white. Ind. Zool. *Spotted-billed duck*, Lath.

Native of Ceylon, where the ſpecies is very common. The bill is long and black, with a red ſpot on each ſide at the baſe, and the tip white; band acroſs the eyes, and the vent black; legs yellow.

Damiatica. White; head, upper part of the neck, ſhoulders, and tip of the tail black; nape with a ferruginous lunule; wings greeniſh-black. Gmel. *Anas damiatica, roſtro apice plano lato rotundo*, Haſſelq. *Damiata duck*, Lath.

Rather

Rather larger than the mallard, and inhabits the ſhores of Egypt, thoſe eſpecially near the Mediterranean, as the bay near Damietta, and between Alexandria and Roſetta. It is conjectured to be of the ſame ſpecies as the black-headed duck of Shaw's travels, which is found in Barbary.

Discors. Wing-coverts blue; ſecondary quill-feathers green without; band on the front white. Gmel. *Querquedula americana*, Brif. *Sarcelle fouerourou*. Buff. *White-faced teal*, Arct. Zool. *White-faced duck*, Lath.

The male is of the middle ſize between the teal and wigeon, the female rather ſmaller. In the firſt, the head and neck are violet, the cap and bill black; and before the eyes on each ſide a white ſtreak; the body brown, waved with grey; wing-ſpot green, edged above with white; the legs yellow. The female has the head, neck, and body, varied with grey and brown, and appears to be the blue-winged teal of Cateſby. Theſe birds inhabit the American continent as far to the north as New York; they arrive in Carolina about Auguſt, and remain there till October, feeding in the firſt inſtance on the rice, and when that fails attack the wild oats. They frequent ponds and freſh waters; and the fleſh is fat and well flavoured. The ſpecies is found alſo in South America, at Guiana, and Cayenne. A ſuppoſed variety of this bird appears in Hudſon's Bay in June, and departs at the ſame time as the former; it builds no neſt, but forms a hollow in decayed ſtumps of trees, in which it depoſits ten ſmall whitiſh eggs; and is ſaid to feed on graſs at the bottoms of ponds. In this kind the cap and tail are black; the greater wing-coverts marked with a duſky ſpot; ſecondary quill-feathers exteriorly, with the chin and belly white.

Viduata. Brown; fore-part of the head white; legs blue. Jacq. Beytr. *Canardà, face blanche*, Buff. *Canard du Maragnon*, Buff. *Spaniſh duck*, Lath.

A beautiful ſpecies, called by the Spaniards *Vindila*; it frequents the lakes of Carthagena in America, and has a whiſtling note.

Jacquini. Cheſnut; back blackiſh; bill and legs black. Jacquin. *Jacquin's duck*, Lath.

Size of the laſt, and inhabits St. Domingo.

Dominicana. Greyiſh-aſh; face and chin white; band acroſs the eyes, with the hind-head, neck, and breaſt black. Gmel. *Canard Dominiquain du Cap de Bonne Eſperance*, Sonner. *Dominican duck*, Lath.

Inhabits the Cape of Good Hope; its bill and legs are black; and the body beneath paler. Its ſize that of the wild duck.

Autumnalis. Grey; wings, tail, and belly black; wing-ſpot tawny and white. Jacquin Beytr. *Anas fiſtularis Americana*, Brif. *Red billed whiſtling duck*, Lath.

The bill of this bird in the adult ſtate is red, with only the tip black, but in the young that part is entirely black. The ſpecies, according to Jacquin and others, is very common at New Grenada, in South America, and is frequently domeſticated in farm-yards between the tropics; it is nevertheleſs of a quarrelſome diſpoſition, and will often deſert thoſe places, and retire to the woody ſwamps. The Spaniards call it *Piſcſie* from its voice. This is rather a large bird, being about twenty-one inches in length.

Labradoria. Brown; head and neck reddiſh-white; collar and pectoral band black; ſcapular and ſecondary quill-feathers white. Gmel. *Pied duck*, Arct. Zool.

Inhabits the coaſt of Labrador, and meaſures about nineteen inches in length. The bill is orange at the baſe, the lower mandible duſky; from the crown to the nape marked with a black ſtreak; head and neck inclining to rufous; legs yellow. The female has the bill like the male; the plumage on the upper parts dirty mottled brown; on the wings a white ſpot; the legs black.

Superciliosa. Grey; eye-brows white; chin and throat dirty white; wing-ſpot green-blue, edged with black. Gmel. *Supercilious duck*, Lath.

Deſcribed from the drawings of ſir Joſeph Banks. The ſpecies inhabits New Zealand, and was found both in Charlotte ſound and Duſky bay, where it is known by the name of *He-turrera*. Its ſize is that of the mallard. The bill is lead-coloured, and the legs duſky-aſh.

Curvirostra. Black; middle tail feathers (of the male) recurvate; chin with an oval white ſpot; bill hooked. Pallas. *Curve-billed duck*, Lath.

Larger than the common wild duck, and inhabits the Netherlands. The irides are fulvous; head, neck, and rump greeniſh-black; five outer quill-feathers white; chin white; wing-ſpot deep ſhining blue.

Boschas. Cinereous; middle tail feathers (of the male) recurvate; bill ſtraight; collar white. Linn. *Anas fera*, Brif. *Canard ſauvage*, Buff. *Wild duck*, Will. Donov. Brit. Birds.

This is the origin of our common tame duck, the varieties of which are extremely numerous, ariſing from the various modes of domeſtication adopted in different countries, and the facility with which it intermixes with others of the duck tribe in general. The principal varieties of *Anas Boſchas*, enumerated by writers, are the ſix following; β. *Anas domeſtica* (tame duck) variable in colour of the plumage by culture. γ. *Boſchas major*, Brif. much larger than the tame duck, and having the back ſooty-black. δ. *Boſchas major griſea*, Brif. Size of the laſt; body tinged greyiſh. ε. *Boſchas major nævia*, Brif. Same ſize; the back ſpotted with yellowiſh. ζ. *Anas adunca*, Linn. *Hook-billed duck*, Will.

The duck in a wild ſtate is an inhabitant of Europe, Aſia, and America, frequenting watery places, and ſubſiſting chiefly on frogs, ſnails, and every kind of offal. Its neſt is uſually built near the water, or ſometimes in trees, and it has been known to depoſit its eggs in the deſerted neſt of the crow or magpie. The wild duck abounds in many of our marſhes, but no where appears in greater plenty than in Lincolnſhire, where prodigious numbers are annually taken in the decoys, and ſent to the markets. They pair in the ſpring, and lay from ten to ſixteen eggs; and the young take to the water as ſoon as hatched. They breed chiefly in the north of Europe, and are therefore found in far greater numbers in the winter ſeaſon with us than during ſummer. In France they are ſeldom ſeen, except in winter, making their firſt appearance in October, and departing in the ſpring. The means employed by different nations for the capture of the wild ducks is very diſſimilar; in England they are chiefly taken in decoys or by ſhooting; in France they are killed in vaſt numbers by being enticed within gun-ſhot likewiſe; but many are taken with hooks and lines baited with offal, and left floating on the waters they frequent. Upon the river Ganges, another method is adopted; a man wades into the water up to the chin, and having his head covered with an empty calabaſh, approaches the ducks, who being accuſtomed to ſee the calabaſhes frequently in the ſtream, remain quiet. Thus unperceived the man has time to approach the flock, and pull them by the leg under water one after the other, till he has caught whatever quantity can be conveniently carried away; with theſe he retires unſuſpected by the remaining ducks, and in like manner repeats his viſits till he has taken as many as he may think proper. Vaſt numbers of ducks are hatched by the Chineſe

from

from the eggs by artificial means, the eggs being placed in boxes of sand, and left on a hearth of brick-work, to which a proper degree of heat is communicated during the time required for hatching them.

Galericulata. Crest pendent; on each side the posterior part of the back a recurved, compressed, elevated feather. Gmel. *Querquedula sinensis*, Briss. *Kinmod suis*, Kæmpf. *Sarcelle de la Chine*, Buff. *Chinese duck*, Lath. Rather less than a wigeon, with the bill dull red; the irides chesnut: crest green and red, legs tawny; back brown, glossed with blue-green; the wing-spot blue-green, edged beneath with white; the wings brown, edged with pale grey; the web on one side of the second quill-feathers much broader than the other, and curved upwards in an elegant manner, when the wings are closed; this web is of a pale brownish red, tipped with black, and constitutes a striking character of the species. The female is like that of the summer duck, brownish, with two white bars on the wings, and the breast marked with brown spots. This is a beautiful bird, and inhabits China and Japan; at Canton they are frequently exposed for sale in cages, and are bought by Europeans as objects of curiosity; the common price is from six to ten dollars a pair. Attempts have been made to naturalize them in our climate, but with little success. The English know this species by the name of Mandarin duck.

Sponsa. Pendent crest double, varied with green, blue, and white. Linn. *Anas æstiva*, Briss. *Toxtacton Tabauhqui*, Ray. *American wood-duck*, Brown. *Summer duck*, Catesby.

This beautiful species inhabits Mexico, and some of the West India isles, migrating in the summer season to the northward. It makes its nest in the hollows of rotten trees, or between the furcated branches, whence it has received the name of tree-duck. This bird is about nineteen inches long; the bill and legs red; crest striated; chin white; neck and breast claret, the latter marked with triangular whitish spots; back brown; scapulars blue-green. The female is rather less than the male; the body brown above, beneath dirty white, and varied with triangular whitish spots.

Arborea. Brown; head sub-crested; belly spotted with white and black. Gmel. *Anas sibilaris jamaicensis*, Briss. *Siffleur à bec noir*, Buff. *Black-winged whistling duck*, Lath.

A native of Jamaica, where it is said to build in trees, and make a whistling noise. It also inhabits Guiana, where it is called *opano*. The size is smaller than that of the wild duck. Its bill is black; the crown dusky; hind head, back, and shoulders brown; temples and chin white; throat white, and, with the rufous breast, spotted with black; wings and tail dusky; legs long and lead-coloured, with the claws black.

Cristata. Crested; cinereous; throat spotted with pale straw colour; wing-speculum blue, beneath edged with white; wings and pointed tail black. Gmel. *Crested duck*, Lath.

Described from the drawings of sir Joseph Banks. The species inhabits Staaten Land, and measures in length twenty-eight inches.

Obscura. Brown, edged with yellow; wing-spot blue, with a transverse black bar; tail wedged, dusky, edged with white. Gmel. *Dusky duck*, Lath.

Length two feet; the bill, crown, primary quill-feathers, and legs, dusky. The species inhabits New York.

Islandica. Crested, black; throat, breast, and belly, white; legs saffron. Gmel. *Hrafra-ond*, Arct. Zool. *Iceland duck*, Lath.

Native of Iceland.

Novæ Seelandiæ. Black, beneath ash-colour; quill-feathers cinereous; the secondary with a white band; tail dirty-green. Gmel. *New Zealand duck*, Lath.

Inhabits Dusky bay, in New Zealand, where it is called *Hepatek*.

Rufina. Black; head, and upper part of the neck, testaceous; crown reddish, (in the male crested;) wings beneath, and at the edge, white; tail brown. Gmel. *Canard sifleur huppé*, Buff. *Red crested duck*, Lath.

Found on the borders of the Caspian sea, and in the lakes of the deserts of Tartary. The length is more than two feet; the bill red; irides brown; crest rounded; legs brown, and red in front. The female is brown, with reddish bill.

Nyraca. Olive-black; head, throat, breasts, and flanks, chesnut; belly white; rump black; vent snowy. Guldenstedt. *Olive-tufted duck*.

Inhabits the Tanais, and measures in length about sixteen inches; feeds on fish and vegetables; the flesh excellent. The female is smaller, and reddish in those parts of the plumage, which, in the male, are chesnut.

Arabica. Grey spotted; beneath, and rump whitish, with cinereous spots; wing-spot blackish, before and behind white. Forsk. *Arabian duck*.

Native of Arabia; the bill yellow, and black in the middle; legs yellowish.

Alexandrina. Bill and rump black; neck cinereous, with white semi-circles; belly whitish, and immaculate. Forsk.

Inhabits the same country as the preceding, and observed most commonly about Alexandria in Egypt.

Gattair. Fuscous; wings above black, beneath white, edged with brown; quill-feathers 4—20, white in the middle. Forsk. *Egyptian duck*.

Native of Alexandria. The bill is black beneath, above brown; chin black; belly and tail-coverts white; legs blue-ash.

Sirsæir. Bill beneath yellow; wing-spot divided obliquely, the upper half silky-green, the lower black before, and behind white. Forsk.

The bill is lead-colour; chin white; crown brown; back brown; the feathers edged with white; belly whitish; legs grey. The species inhabits Arabia.

Balbul. Bill black; wing-spot above obliquely green, beneath obliquely black. Forsk.

Native of Cahira.

Fuligula. Crest pendent; body black; belly and wing-spot white. Linn. Fn. Suec. *Anas cirrhata*, Gesn. *Tufted duck*, Donov. Brit. Birds.

Inhabits Europe, and the north of Asia. The length of this bird is sixteen inches; the bill broad, livid, and black at the tip; head greenish; shoulders blackish-brown, with pale straw-coloured dots; and dusky-blue legs. The female brownish, and without crest.

Duck's *Foot*, or *May-Apple*, in *Botany*. See Podophyllum.

Duck's *Meal*. See Lemna.

Duck's *Meat, Starry*. See Callitriche.

DUCKING, or plunging in water. Olaus Magnus tell us, this was a diversion anciently practised among the Goths, by way of exercise; but among the Celtæ and Franks it was a sort of punishment. Tacitus likewise assures us that it was executed, among the ancient Germans, on the lazy and infamous. At Marseilles and Bourbon, their men and women,

women, of ſcandalous life, are condemned to the *cale*, as they call it; that is, to be ſhut up, naked to the ſhift, in an iron cage, faſtened to the yard of a ſhallop, and ducked ſeveral times in the river. The ſame is done alſo at Thouloufe to blaſphemers.

Ducking is alſo a puniſhment for ſeamen; who are thrown into the ſea from the top of the yard of the main-maſt ſeveral times, according to the quality of their offence. Sometimes a cannon-ball is faſtened to their feet, to make the fall the more rapid.

There is alſo a kind of dry-ducking, wherein the patient is only ſuſpended by a rope, a few yards above the ſurface of the water: this is a ſpecies of ſtrapada.

The puniſhment is uſually made public by the diſcharge of a cannon.

Ducking is alſo a penalty, which veteran ſailors pretend to inflict on thoſe who, for the firſt time, paſs the tropic of Cancer, the equator, or the ſtraits of Gibraltar, in conſequence of their refuſal or incapacity to pay the uſual fine levied on this occaſion.

Ducking-*Stool*. in our *Cuſtoms*. See Cucking-*Stool*.

DUCKSTEIN, in *Geography*. is a celebrated fine pale ale brewed at Konig's Lutter, a village of Germany, in the duchy of Brunſwick Wolfenbüttel, which now conſtitutes a part of the new kingdom of Weſtphalia.

DUCTRAP. See Lincolnville.

DUCKUP, a word uſed at ſea by the ſteerſman, or him that is at the helm, when either main-ſail, fore-ſail. or ſprit-ſail, hinder his ſight, ſo that he cannot ſee to ſteer by a land-mark, or the like; for then his word is duckup the clue-lines of thoſe ſails; and as to the ſprit-ſail, when a ſhot is to be made by a chaſe-piece, and the clue of that ſail hinders his ſight, they ſay duckup the clew-lines of the ſprit-ſail; that is, hale the ſail out of the way.

DUCLER, or Duclair, in *Geography*, a ſmall town of France, in the department of the Lower Seine, chief place of a canton, in the diſtrict of Rouen, ſituated on the river Seine; 12 miles W. of Rouen. It contains 1360 inhabitants; its canton has 25 communes, and a population of 14 540 individuals, upon a territorial extent of 232½ kilometres.

DUCLOS, Charles Dineau, in *Biography*, was born, in 1705, at Dinant, in Britany. He was educated at Paris for the law; a profeſſion which he followed for a ſhort time only, when his talents and manners introduced him, with eclat, into the ſociety of men of letters. He was ſoon diſtinguiſhed as a writer, and was admitted into the academy of Inſcriptions in 1739, and into the French academy in 1747. In the latter he ſucceeded the celebrated Mirabeau as perpetual ſecretary. He was ennobled and penſioned by the king, and was appointed to the office of hiſtoriographer of France. He publiſhed works in many of the departments of literature. His novels are ſaid to be ingenious and intereſting, of which the beſt is intitled "Confeſſions du Compte ****." As an hiſtorian, he is known for a hiſtory of Lewis XI., in three volumes, 12mo. 1745, to which was added another volume, by way of ſupplement, in the following year. This is a work of conſiderable reſearch, written in a concife and elegant ſtyle. As a moral writer, he publiſhed "Conſiderations ſur les Mœurs de ce Siecle," which is much eſteemed for the truth of its maxims, and the ingenuity of its diſcuſſions. He had a conſiderable ſhare in the Dictionary of the French academy, and wrote ſome judicious remarks on the grammar of the Port Royal. He died in 1772, and ſince his death have appeared "Secret Memoirs of the reigns of Lewis XIV. and XV." in 2 vols. 8vo., which have been imputed to the pen of Duclos, and which contain many fres and curious particulars of the periods treated on. Duclos was a man of great integrity, a faithful friend, and a patron of merit. He was firmly attached to ſound morals, and abhorred the relaxation of principle which prevailed in the modern ſchool. Gen. Biog.

DUCT, or Ductus, in *Anatomy*, a name given to various tubes in the body, and chiefly to thoſe which convey fluids ſecreted in glands to their ultimate deſtination; theſe are called *Excretory* ducts.

Ductus *Adipoſi*, tubes deſcribed by ſome anatomiſts, as conveying the adipous ſubſtance, which they ſuppoſed to be ſecreted in glands. See Cellular *ſubſtance*.

Ductus *ad Naſum*, or *Naſalis*, the tube which conveys the tears from the lacrymal bag to the noſe. See Eye, and Noſe.

Ductus *Alimentarius*, or *Alimentalis*, a name ſometimes given to the whole alimentary tube, from its commencement at the mouth to the anus. See Stomach and Intestine.

Ductus *Chyliferus*, the thoracic duct. See Absorbents.

Ductus *Communis choledochus*, is that part of the hepatic duct between the junction of the cyſtic and the duodenum. It derives its name from the circumſtance of its conveying into the duodenum both the hepatic and cyſtic bile. The pancreatic duct alſo opens into it juſt before it penetrates the inteſtine. See Liver.

Ductus *Cyſticus*, the canal by which the bile paſſes to and from the gall bladder. See Liver.

Ductus *Excretorii*. See Duct.

Ductus *Galactophori*, the excretory tubes of the mammary gland. See Breast.

Ductus *Hepaticus*, the excretory duct of the liver. See Liver.

Ductus *Hepato-cyſtici*, tubes conveying the bile from the liver directly into the gall bladder. Theſe do not exiſt in the human ſubject, but are found in birds.

Ductus *Lacrymales*, the tubes which convey the fluid ſecreted in the lacrymal glands. See Eye.

Ductus *Lactiferi*; the excretory tubes of the *Breaſt*, which ſee.

Ductus *Pancreaticus*, the excretory tube of the *Pancreas*, which ſee.

Ductus *Pecqueti*, the thoracic duct, ſo called from a Frenchman, who diſcovered it. See Absorbents.

Ductus *Salivales*, the excretory ducts which convey the ſaliva into the mouth. See Deglutition.

Ductus *Stenonis*, or *Stenonianus*, the duct of the parotid gland, ſo named in honour of Steno, its diſcoverer. See Deglutition.

Ductus *Warthorei*, the duct of the ſubmaxillary gland, named after Warthore, its diſcoverer.

Ductus *Wirtſungi*, the pancreatic duct, which was found out by a German anatomiſt, Wirtſung. See Pancreas.

Ductus *Pneumaticus*, in *Ichthyology*, the name of a certain duct or canal, found in all thoſe fiſh which have an air-bladder, reaching from that bladder to the orifice of the ſtomach, or ſome other part of it. This duct is variouſly ſituated in the different kinds. Artedi Ichthyolog. See Air Bladder.

DUCTILITY, (from the Latin *ductile*,) means the property, or the capability, of becoming extended. The word *expanſibility* has been more commonly applied to denote the enlargement of ſuch bodies as conſiſt, or ſeem to conſiſt, of ſeparate parts, like the effluvia of odoriferous ſubſtances, colouring pigments, cotton, wool, &c. But the word *ductility*, denotes the enlargement of the dimenſions of ſolids, without loſing their continuity and conſiſtence. This property almoſt excluſively belongs to metallic bodies; for it can hardly be diſcerned in a few other bodies.

The methods of extending metallic bodies may be reduced to three: *viz.* by the ſtrokes of a hammer, by the more equable preſſure of flatting or rolling mills, and by drawing the metal through ſmall holes in a ſteel plate, as is practiſed in wire-drawing. And ſince the firſt of thoſe methods has been more generally and more uſually practiſed; therefore the words malleability and ductility have been indiſcriminately uſed to expreſs the ſame thing.

To theſe impreſſions certain metallic bodies yield much more readily than others, and ſome there are which will not yield at all; ſo that, when preſſed or hammered, they will rather break into fragments than expand.

Previous to the ſtatement of the various degrees of ductility, it will be neceſſary to ſay a few words with reſpect to the nature of dilatability itſelf, in order to prevent a wrong notion which unexperienced perſons are liable to adopt. When a piece of metal, in conſequence of its ductility, is ſaid to be extended; the meaning is not that the bulk of the metal is enlarged; but that one or two of its dimenſions, (*viz.* the length, the breadth, or the thickneſs,) is enlarged, whilſt one or both the others are diminiſhed. For inſtance, a cubic inch of gold is one inch long, one inch broad, and one inch thick; and the product of theſe three dimenſions, which gives the ſolidity, is one inch. Now if, by hammering, you extend the length of it, ſo as to make it two inches long, the breadth remaining the ſame, the thickneſs will be reduced to half an inch; and the product of theſe three dimenſions; *viz.* two inches, one inch, and half an inch, is equal to one inch, as before; which ſhews that the ſolid contents remain the ſame.

It muſt, however, be obſerved, that, ſtrictly ſpeaking, the bulk of a piece of metal is a little contracted by the hammering or preſſing; ſo that a ſort of concentration and hardening take place at the ſame time. In fact, the ſpecific gravity of a piece of ductile metal is greater after the hammering or preſſing than before. Both this additional hardneſs and increaſed ſpecific gravity are removed by heating the piece of metal to a certain degree.

Though we have mentioned the drawing through holes as one of the methods of extending metallic bodies; yet a neceſſary diſtinction muſt be pointed out with reſpect to this operation.—In the preſent ſtate of philoſophy, *ductility* is diſtinguiſhed from *tenacity*. The meaning of the former has already been explained; but the tenacity is meaſured by the reſiſtance which a wire of the metal oppoſes, without breaking, to the action of a certain force which draws it at one extremity, while the other extremity is fixed. Now it is upon this tenacity that the drawing of metals through holes depends. And, in fact, certain metals which ſhew under the hammer, or under the flatting mill, a much greater degree of ductility than others, are, at the ſame time, leſs capable of being drawn into fine wire, and *vice verſâ;* as will appear from the following liſts.

Of all the metallic bodies ſome are ductile, whilſt others are not, and this difference cauſed them to be diſtinguiſhed into two claſſes; calling the former metals, and the latter ſemi-metals, or imperfect metals; but the limits of theſe claſſes being very indefinite, little regard is now paid to this nominal diſtinction.

Ductile Metallic Bodies arranged in the Order of their Ductility.

Gold,	Iron,
Platina,	Tin,
Silver,	Lead.
Copper,	

Metallic Bodies arranged in the Order of their Tenacity.

Gold,	Silver,
Iron,	Tin,
Copper,	Lead.
Platina,	

For farther particulars reſpecting the tenacity of metals, ſee the articles TENACITY, and WIRE *Drawing*.

The ductility of gold exceeds that of every other metallic body, and ſince its value and its beauty have at all times encouraged the induſtry of workmen, no pains have been ſpared in endeavouring to expand the ſurface of it to the utmoſt limit of practicability; and a ſingle grain weight of gold is now commonly extended into a ſurface equal to 50 ſquare inches and upwards. Mr. Magellan ſays, that the fineſt gold leaf is extended by hammering between new ſkins, and that each troy ounce of pure gold muſt be alloyed with three grains of copper, otherwiſe it would be too ſoft to paſs over the irregularities of the ſkins. When extended to the utmoſt, 2000 leaves of ſuch gold, each containing a ſurface of 10.89 ſquare inches, weigh leſs than 384 grains; ſo that each grain weight of the metal will produce about 57 ſquare inches of gold leaf; and it is eaſily determined by calculation, that the thickneſs of ſuch gold leaf is about $\frac{1}{331500}$th of an inch. However, this is a conſiderable thickneſs, in compariſon of that of gold ſpun on ſilk in our gold thread.

To conceive this prodigious ductility, it is neceſſary to have ſome idea of the manner, wherein the wire-drawers proceed. The wire and thread we commonly call gold thread, &c. which is only ſilver wire gilt, or covered over with gold, is drawn from a large ingot of ſilver, uſually about thirty pounds weight. This they round into a cylinder, or roll, about an inch and a half in diameter, and twenty-two inches long, and cover it with the leaves prepared by the gold-beater, laying one over another, till the cover is a good deal thicker than that in our ordinary gilding; and yet, even then, it is very thin; as will be eaſily conceived from the quantity of gold that goes to gild the thirty pounds of ſilver: two ounces ordinarily do the buſineſs: and, frequently, little more than one. In effect, the full thickneſs of the gold on the ingot rarely exceeds $\frac{1}{300}$th, or $\frac{1}{300}$th part: and ſometimes not $\frac{1}{750}$th part of an inch.

But this thin coat of gold muſt be yet vaſtly thinner: the ingot is ſucceſſively drawn through the holes of ſeveral irons, each ſmaller than the other, till it be as fine, or finer, than a hair. Every new hole leſſens its diameter; but it gains in length what it loſes in thickneſs; and, of conſequence, increaſes in ſurface: yet the gold ſtill covers it; it follows the ſilver in all its extenſion, and never leaves the minuteſt part bare, not even to the microſcope. Yet, how inconceivably muſt it be attenuated while the ingot is drawn into a thread, whoſe diameter is 9000 times leſs than that of the ingot!

M. Reaumur, by exact weighing, and rigorous calculation found, that one ounce of the thread was 3232 feet long; and the whole ingot 116,3520 feet, Paris meaſure, or 96 French leagues; equal to 126,4400 Engliſh feet, or 240 miles Engliſh; an extent which far ſurpaſſes what Fa. Merſenne, Furetiere, Dr. Halley, &c. ever dreamt of.

Merſenne ſays, that half an ounce of the thread is 100 toiſes, or fathoms long; on which footing, an ounce would only be 1200 feet; whereas, M. Reaumur finds it 3232. Dr. Halley makes ſix feet of the wire one grain in weight, and one grain of the gold ninety-eight yards; and, conſequently, the ten thouſandth part of a grain, above one third of an inch. The diameter of the wire he found one 186th part of an inch; and the thickneſs of the gold one 154,500th

part of an inch. But this, too, comes ſhort of M. Reaumur; for, on this principle, the ounce of wire would only be 2680 feet.

But the ingot is not yet extended to its full length. The greateſt part of our gold thread is ſpun, or wound on ſilk, and, before they ſpin it, they flat it by paſſing it between two rolls, or wheels of exceedingly well poliſhed ſteel; which wheels, in flatting it, lengthen it by above one ſeventh. So that our 240 miles are now got to 274. The breadth, now, of theſe laminæ, or plates, M. Reaumur finds, is only one 8th of a line, or one 96th of an inch; and their thickneſs, one 3072d. The ounce of gold, then, is here extended to a ſurface of 1190 ſquare feet; whereas, the utmoſt the gold beaters can do, we have obſerved, is to extend it to 146 ſquare feet. But the gold, thus exceedingly extended, how thin muſt it be! From M. Reaumur's calculus, it is found to be one 175,000th of a line, or one 2,100,000th of an inch: which is ſcarce one 13th of the thickneſs of Dr. Halley's gold. But he adds, that this ſuppoſes the thickneſs of the gold every where equal, which is no-ways probable; for in beating the gold-leaves, whatever care they can beſtow, it is impoſſible to extend them equally. This we eaſily find, by the greater opacity of ſome parts than others; for where the leaf is thickeſt, it will gild the wire the thickeſt.

M. Reaumur, computing what the thickneſs of the gold muſt be where thinneſt, finds it only the 3,150,000th part of an inch. But what is the one 3,150,000th part of an inch? Yet this is not the utmoſt ductility of gold: for inſtead of two ounces of gold to the ingot, which we have here computed upon, a ſingle one might have been uſed; and, then, the thickneſs of the gold, in the thinneſt places, would only be the 6 300,000th part of an inch.

And yet, as thin as the plates are, they might be made twice as thin, yet ſtill be gilt; by only preſſing them more between the flatter's wheels, they are extended to double the breadth, and proportionably in length. So that their thickneſs, at laſt, will be reduced to one thirteenth, or fourteenth millionth part of an inch.

Yet, with this amazing thinneſs of the gold, it is ſtill a perfect cover for the ſilver: the beſt eye, or even the beſt microſcope, cannot diſcover the leaſt chaſm, or diſcontinuity. There is not an aperture to admit alcohol of wine, the ſubtileſt fluid in nature, or even light itſelf, unleſs it be owing to cracks occaſioned by repeated ſtrokes of the hammer. Add, that if a piece of this gold-thread, or gold-plate, be laid to diſſolve in aquafortis, the ſilver will be all excavated, or eat out, and the gold left entire, in little tubules.

It ſhould be obſerved, that gold, when it has been ſtruck for ſome time by a hammer, or violently compreſſed, as by gold wire-drawers, becomes more hard, elaſtic, and ſtiff, and leſs ductile, ſo that it is apt to be cracked or torn: the ſame thing alſo happens to the other metals by percuſſion and compreſſion. But ductility and tractability may be reſtored to metals in that ſtate, by annealing them, or making them red-hot. Gold ſeems to be more affected by percuſſion and annealing, than other metals.

Platina, ſilver, and copper, may, likewiſe, be expanded into leaves, but not nearly ſo thin as thoſe of gold.

With reſpect to the arrangement of iron and tin in the firſt of the above-ſtated liſts, we are not quite determined as to which of them the preference may be due.

Zinc has the remarkable property of being malleable, or ductile, not in the uſual temperature of the atmoſphere, but in a higher temperature. When heated to between 210° and 300° of Fahrenheit's thermometer, zinc is perfectly malleable, and may be ſtretched into wires, or into pretty thin plates. And when ſo treated, it will afterwards remain malleable. Some metallic ſubſtances do not ſuffer the ſtrokes of a hammer nearly ſo well as the more uniform preſſure of the flatting mill; and this is peculiarly the caſe with zinc.

It is not with zinc alone, but with all other ductile metals, that their ductility is greater in a certain temperature, which generally exceeds that of the atmoſphere; thus iron in a red heat is incomparably more ductile than at a lower temperature. Heat, in ſhort, tends to ſoften the metal; or, which amounts to the ſame thing, to increaſe its ductility; and as hammering or rolling hardens the metal at the ſame time that it extends it, the workmen, in the courſe of their operation, find it neceſſary to ſoften the metal by the application of heat, in order to render it capable of farther extenſion. This heating or ſoftening is, in ſome caſes, repeated ſeveral times before the work is quite finiſhed.

The alloys of two or more metallic bodies are leſs ductile, than the pure metals themſelves; yet ſuch alloys are highly uſeful in a variety of caſes, and the pure metals are often alloyed for no other purpoſe than for diminiſhing their ſoftneſs and ductility. In the coinage of moſt countries the noble metals are generally alloyed with a little copper, which increaſes their hardneſs and elaſticity.

The moſt extenſively uſeful alloy is that of copper and zinc, which forms *braſs*.—Its colour, its ductility, and its not being eaſily oxydated, have rendered it peculiarly uſeful for a variety of purpoſes, and eſpecially in watch-work, where no other metallic ſubſtance has been found nearly ſo uſeful.

Braſs, when properly made, is ductile and tenacious to a conſiderable degree. It will extend pretty well under the hammer, and it may be eaſily drawn into very fine wire. A ſlight degree of heat will, in ſome meaſure, increaſe its ductility; but when heated to about 300°, or upwards, then the ſtrokes of the hammer will reduce it to powder. It is a ſort of braſs (but the preciſe proportion of the ingredients is kept ſecret,) that is expanded into leaves like gold; and is commonly ſold under the name of *Dutch gold*.

Though tin is more ductile than zinc; yet the alloy of copper and tin is, upon the whole, leſs ductile than that of copper and zinc. Paerner ſays, that much copper and little tin form a malleable compound, as well as much tin and little copper; but that when the two metals are alloyed from eight to ten parts of copper to one of tin, then the alloys are brittle and untractable.

The alloy of lead and antimony forms the metal which is uſed for printer's types, and its ductility may be varied by varying the proportion of antimony. According to Gmelin, one part of antimony and 12 parts of lead, form a hard alloy, but capable of being beat into ſheets. One part of antimony and eight parts of lead, form a compound harder and more fuſible than lead, but malleable; and ſuch is alſo the caſe with one part of antimony and three of lead; but with a ſmaller proportion of lead the compound is too hard to bear the ſtrokes of the hammer.

An alloy of zinc and lead has, on account of its brilliancy and hardneſs, been recommended for the conſtruction of economical and other articles. When a great deal of zinc is alloyed with lead, the compound is harder than lead, but very malleable. See METALS, GOLD, &c.

DUCTILITY *of Glaſs*. We all know, that, when well penetrated with the heat of the fire, the workman can figure and manage glaſs like ſoft wax; but what is moſt remarkable, it might be drawn, or ſpun out into threads, exceedingly fine and long.

Our ordinary ſpinners do not form their threads of ſilk, flax, or the like, with half the eaſe and expedition, as the glaſs ſpinners do threads of this brittle matter. We have

ſome of them uſed in plumes for children's heads, and divers other works, much finer than any hair, and which bend and wave like it with every wind.

Nothing is more ſimple and eaſy than the method of making them: there are two workmen employed: the firſt holds one end of a piece of glaſs over the flame of a lamp; and, when the heat has ſoftened it, a ſecond operator applies a glaſs hook to the metal thus in fuſion; and, withdrawing the hook again, it brings with it a thread of glaſs, which ſtill adheres to the maſs: then, fitting his hook on the circumference of a wheel about two feet and a half in diameter, he turns the wheel as faſt as he pleaſes; which, drawing out the thread, winds it on its rim; till, after a certain number of revolutions, it is covered with a ſkain of glaſs thread.

The maſs in fuſion over the lamp diminiſhes inſenſibly; being wound, as it were, like a pelatoon, or clue of ſilk, upon the wheel; and the parts, as they recede from the flame, cooling, become more coherent to thoſe next to them; and this by degrees: the parts neareſt the fire are always the beſt coherent, and, of conſequence, muſt give way to the effort the reſt make to draw them towards the wheel.

The circumference of theſe threads is uſually a flat oval, being three or four times as broad as thick: ſome of them ſeem ſcarce bigger than the thread of a ſilk-worm, and are ſurpriſingly flexible. If the two ends of ſuch thread be knotted together, they may be drawn and bent, till the aperture, or ſpace in the middle of the knot, doth not exceed one 4th of a line, or one 48th of an inch diameter.

Hence M. Reaumur advances, that the flexibility of glaſs increaſes in proportion to the fineneſs of the threads; and that, probably, had we but the art of drawing threads as fine as a ſpider's web, we might weave ſtuffs and cloths hereof for wear. Accordingly, he made ſome experiments this way; and found he could make threads fine enough, as fine in his judgment, as any ſpider's web: but he could never make them long enough to do any thing with them.

Ductility *of Spider's Webs*. See Web.

DUD, in *Geography*, a town of Africa, in Moſambique, where the king reſides.

DUDA, a town of Lithuania, in the palatinate of Wilna; 28 miles E.N.E. of Lida.

DUDAIM, in *Botany*, (Hebr. דודאים), plants mentioned in Geneſis, chap. xxx. v. 14, 15, 16, and in Solomon's Song, chap. vii. v. 14, concerning which there have been great diſputes among the learned. The Septuagint, the Latin vulgate, and our tranſlation, underſtand the above word to mean the fruit or apples of the Mandrake, *Atropa Mandragora* of Linnæus, which is unqueſtionably the Μανδραγορας of Dioſcorides, and other ancient writers. All that can be gathered from the above chapter in Geneſis is, that the Dudaim were found in the fields during the wheat harveſt, and, either for their rarity, flavour, or ſome other quality, were greatly eſteemed by women. The ſame word in Solomon's Song expreſſes ſome fruit or flowers, that "give a ſweet ſmell," and are acceptable alſo to the male ſex. No wonder that with ſo powerful a ſtimulus to their curioſity, and ſuch light materials to guide it, critics ſhould have taken a very wide range in their inquiries. Some have taken Lilies, Roſes, Violets, Daffodils, Snowdrops, or Jaſmine for the Dudaim; others Melons, Plantain-fruits, Whortle-berries, Dwarf-brambles, the berries of *Phyſalis*, or Winter Cherry, Grapes of ſome peculiar kind, or even the ſubterraneous *Fungi* called Truffles. Some have ſuppoſed the word to mean the ingredients, whatever they might be, of a charm or philter, and hence have again recurred to the Mandrake, celebrated through all antiquity for ſuch imaginary virtues, and whoſe hiſtory is tricked out with all the traditionary nonſenſe that might confirm the report of theſe qualities. Perhaps the moſt judicious writer on the Dudaim is Liebentank, who, in 1660, after reviewing all that had previouſly been aſſerted or imagined, gave it as his opinion that nothing certain could be decided on the ſubject. His diſſertation has gone through numerous editions. Such a deciſion, however, ſeems only to have ſtimulated the ingenious to freſh inquiry. The younger Rudbeck publiſhed a profound diſſertation at Upſal in 1733, intended to refute all the foregoing opinions, and to propoſe Raſpberries as the Dudaim. His learned fellow-countryman, Olaus Celſius, in his Hierobotanicon, publiſhed in 1745, ſlightly mentioning this ſuggeſtion, contends that the object of their common inquiry could be no other than the fruit of *Oenophia* or *Napeca*, *Rhamnus* (or rather *Zizyphus*) *Spina Chriſti* of Linnæan writers. The controverſy, in ſhort, ſeemed to be arrived at this point, that as nothing could plauſibly be determined, diſtinction was to be obtained by ſome new ſuggeſtion only.

If we may offer an opinion, as we prefer truth to ſingularity or novelty, it will be in favour of the Mandrake, whoſe hiſtory is perfectly in union with the ſlight mention of the Dudaim in Geneſis, and whoſe reputed properties of exciting love and promoting conception, account equally well for the deſire of Rachel for this fruit, and for Leah's reluctance to let her partake of it. From the great ſtreſs laid on the perſon who gathered it, "*my ſon's Mandrakes*," it may be conjectured that ſome additional virtue was imparted to a plant, otherwiſe common enough, by its being gathered by a youthful or innocent perſon. Such notions frequently occur in the hiſtory of amorous incantations; for it is the policy of ſuperſtition gratuitouſly to enhance the value of ordinary or worthleſs things. Finally, the etymology of the Dudaim from דודים Dodim, loves, confirms the idea of a philter, and accords with the Mandrake. But it does not follow that the Dudaim of Solomon's Song muſt be the very ſame plant. Superſtition or taſte has fixed in every country, upon ſome flower or other with which to aſſociate ideas of affection; and the Mandrakes that "gave a ſweet ſmell" might literally mean any "fragrant flowers of love." S.

DUDDEN, in *Geography*, a river of England, which runs into the Iriſh ſea; about three miles S. from Dalton, in Lancaſhire.

DUDELDORFF, a ſmall town of France, in the department of Forêts, chief place of a canton in the diſtrict of Bittbourg, with a population of 467 individuals only: but the canton contains 7263 inhabitants, diſperſed in 16 communes, on a territorial extent of 317½ kilometres.

DUDEN, a town of Aſiatic Turkey, in the province of Caramania; 10 miles N. of Satalia.—Alſo, a river of Aſiatic Turkey, which runs into the ſea near Satalia.

DUDENHOFEN, a ſmall town of Germany, in the county of Hanau Munzenberg, which is now in the conſcription of the new kingdom of Weſtphalia.

DUDERSTADT, a ſmall town of Germany, in the lower Eichsfeld, which by the peace of Luneville was tranſferred from the elector of Mayence to the king of Pruſſia, but which the latter loſt again at the peace of Tilſit, in 1807. It is at preſent in the new kingdom of Weſtphalia.

DUDITH, Andrew, in *Biography*, was born at or very near Buda, in Hungary, in Feb. 1533. His father was a native of Hungary, and his mother, a noble Venetian, was named Sbardellat, an appellation often applied to her ſon Andrew. Scarcely had the ſubject of this article paſſed the boundary of infancy, before he exhibited a livelineſs of imagination and a brilliancy of parts, that preſaged the future great man. At an early period of life his father was killed

killed in battle with the Turks, and the youth was, by the advice of his uncle, the bishop of Watzeu, sent to Breslau for his education. At the age of eighteen he was removed to Verona for the completion of his studies. Here he acquired a high reputation for diligence and uncommon talents. He is mentioned in a letter of Paul Manutius as one of the greatest geniuses of the age. In 1554, he attached himself to the train of cardinal Pole, who was nominated papal legate to the court of England, and Dudith recommended himself by his manners and affiduity to the notice and esteem of queen Mary and her sister Elizabeth. Leaving Pole in England, he went to Paris, where he made himself acquainted with the philosophy of the times, and studied more critically the ancient languages. After this, he spent some years at Padua, and obtained the friendship of many of the first literati of the age. While he was in Italy, he translated into Latin "The Judgment of Dionysius Halicarnassensis on the History of Thucydides," and laid the foundation of other literary works. From Italy he went to France, on a mission from the grand duke of Tuscany to the celebrated Catherine de Medicis, whom he addressed in her native language with so much fluency and purity of diction, as to excite her admiration and applause. In the year 1560, he repaired to the court of Vienna, where he was shortly after appointed one of the privy councillors to the emperor Ferdinand II., and afterwards nominated to the bishopric of Tina, in Dalmatia. Two years after this he was deputed by the clergy of Hungary to be one of their representatives in the council of Trent. In this capacity, by his eloquence and judicious advice, he acquired much reputation. His talents, however, soon excited the jealousy of the papal legates, and the more so when they perceived that the powers of Dudith were likely to be employed in exposing their system. The freedom with which he discussed topics of high interest and importance was the means of getting him recalled: but when the king knew from himself what had passed, and how nobly he had acted his part, so far from censuring Dudith, he rewarded him with the bishopric of Chonat, in Hungary. The emperor next sent him as his ambassador to Poland, and on his return gave him still higher church preferment. He was a second time, under Maximilian II., sent ambassador into Poland; here he seems to have abandoned his religious opinions, and to have determined to resign all his preferment in the church of Rome. Having formed the resolution, he without hesitation made a sacrifice of his wealth, and married privately one of the maids of honour to the queen of Poland. This conduct highly exasperated the clergy with whom he had been connected, but he still retained the good-will and confidence of the emperor, who appointed him his resident in Poland, where he made an open and undisguised profession of the protestant religion. In Poland he became acquainted with the Unitarian brethren, and a convert to their faith, for which he was to the end of life a zealous advocate. In 1575 he returned, after much and indefatigable service performed for the emperor, to the court of Vienna. But on the death of his sovereign, three years after, he retired into Moravia, and from thence to Breslau, where he remained in great privacy until the death of Stephen Batori, in 1579, which gave rise to a contest for the crown of Poland: in this struggle Dudith was employed by the emperor Rudolphus II., to secure the election for his brother Maximilian. He was, however, unsuccessful, and returned to Breslau, where he died in 1589, in the sixtieth year of his age. Dudith was unquestionably one of the most considerable men of the age in which he flourished. Moreri says, "that he had been a catholic, protestant, and Socinian; and that he died without any fixed principles of religion." This is probably a calumny invented by the catholics, whose cause he not only deserted, but whose conduct he sometimes exposed. His works are many, and on various subjects of physics, poetry, and theology; in Moreri's account they are enumerated at length. His life was regular and virtuous; his manners polite and conciliating, and his benevolence warm and unconfined. As a politician he was a man of honour and integrity; and in his diplomatic character he was ardent and strenuous for the interests of the princes by whom he was employed. He was an excellent scholar, and eminently skilled in the languages; and so much an admirer of the writings of Cicero, that he is said to have copied all the works of that author thrice with his own hand. Moreri.

DUDLEY, Edmund, in *Biography*, was an eminent lawyer and statesman in the reign of Henry VII. who made himself extremely unpopular by the abuse of his legal knowledge, and oppressive measures. He, with sir Richard Empson, another great law officer of a similar characteristic complexion, contrived to obtain the monarch's favours by flattering his weakness, and promoting his avaricious views. Through the latter part of that reign, they became the instruments of regal rapacity; and assisted in filling the coffers of the treasury, by arbitrary and vexatious prosecutions of the people, upon obsolete penal statutes. On the accession of Henry VIII. they both fell into disgrace; and met with their justly deserved fate. The voice of the people for justice became extremely clamorous, and the king, to appease the menacing storm of popular discontent, now rising into turbulent rage, gave up Dudley and Empson as victims; and they were both attainted, and beheaded.

Dudley, John, duke of Northumberland, son of Edmund Dudley already mentioned, was born in 1502, and was about eight years of age at the time of his father's execution. He was very soon after this event restored in blood by act of parliament; and when able to serve his country, attended the duke of Suffolk in an expedition to France, where, on account of his gallantry, he obtained the honour of knighthood. He was afterwards patronized by cardinal Wolsey, and lord Cromwell. In 1542, he was raised to the dignity of viscount Lisle, a title which belonged to his mother in her own right, and soon after created knight of the garter. In the next year, he failed, as lord high admiral of England, with a fleet of 200 sail to the firth of Forth, where he landed a body of troops and took possession of Edinburgh. From Scotland he proceeded to assist the king at Boulogne, and very much contributed to the capture of that place, of which, as a reward for his services, he was appointed governor. In 1546, he was appointed lieutenant-general, and commander by sea, and with a very inferior force, not only frustrated an intended invasion by the French, but carried an alarm to their coasts. He was one of the commissioners who received the oath of Francis on the peace, and who made a settlement of the army accounts; for these services he was amply rewarded by grants of church lands, which relieved him from the embarrassments which his extravagance had occasioned. By the last will of Henry VIII. he was nominated one of the sixteen to whom the government of the country was committed, during the minority of Edward VI. In the year 1547, he was created earl of Warwick, with the grant of Warwick castle and manor. He continued to ascend in the scale of preferment, and was successively created lord steward of the household, earl marshal of England, and finally, in October 1551, he obtained the high title of duke of Northumberland. The duke of Somerset had long been Dudley's rival, and the jealousies fomented between these powerful noblemen, created

ated much anxiety in the breast of the young king, who, if possible, hoped to unite them, by proposing a marriage between Warwick's eldest son and Somerset's daughter, which took place. The conciliation was of short duration; the duke of Northumberland felt that he could rise no higher but by the fall of his rival. The latter was aware of his design, and urged by fears for his own safety, entered the house of Northumberland one morning, with an intent to kill him: but being received with apparent kindness, he was unequal to the execution of the bloody deed. The intention being known, Somerset was committed to the Tower, brought to trial and convicted of compassing the death of a privy counsellor. To the disgrace of the age and of his enemy the duke of Northumberland, who sat as one of his judges, he was executed Jan. 1552. He now had the full ascendancy over the mind of Edward, procured a marriage between his fourth son Guilford Dudley, and lady Jane Grey, a branch of the royal family, and then forced the young king to set aside from the succession his sisters Mary and Elizabeth, and to bequeath the crown to his daughter-in-law. This, which he hoped would raise him to the highest point of honour, caused his downfall and death. The king died in July 1553, and the duke immediately proclaimed his daughter lady Jane; but the people little approved of the succession, and an insurrection in Suffolk put a speedy end to his ambitious projects. He headed the army and set out to crush the rebellion, but during his absence from the metropolis, Mary was proclaimed queen, and at Cambridge he was glad to join in the acclamations of "long live queen Mary." This, however, did not satisfy the new government; he was almost immediately arrested, brought to London, and committed to the Tower. In the hope of pardon, or with a view of averting the wrath of the queen from his family, he conformed to the Roman catholic religion. Mercy was not among the attributes of Mary: the duke had resisted her power and insulted her authority, and she determined he should pay the penalty of his life. He submitted to his fate with composure. On his trial he requested permission to ask, if a man could be guilty of treason that obeyed orders given him by the council under the great seal; and if those involved in the same guilt with himself could sit as his judges? Being answered that the great seal of an usurper was of no authority, and that persons not lying under any sentence of attainder, were still innocent in the eye of the law, and might be admitted on any jury; he acquiesced, and pleaded guilty. He suffered, Aug. 22, 1553, in the fifty-second year of his age, leaving several children, of whom Guilford Dudley and the amiable lady Jane suffered for his guilty ambition. Biog. Brit. Hume's Hist.

Dudley, Robert, earl of Leicester, fifth son of the duke of Northumberland, was born in 1532. He was knighted at an early age, and was a gentleman of the bed chamber in the reign of Edward VI. He was of course involved in the disgrace of his father, but was in a very short time restored in blood; he even rose in favour under the reign of Mary, and was appointed to the head of the ordnance. When Elizabeth ascended the throne, honours were showered upon him with an unsparing hand; he was created master of the horse, knight of the garter, and privy counsellor; and to enable him to maintain the splendour of his station, the queen bestowed upon him grants of several manors and large estates. His known favour at court obtained for him rank and honour with the corporations and public bodies throughout the kingdom. In the year 1560 he lost his wife, and as it was known he was ambitious of being thought the suitor of the queen, he laboured under the suspicion of having been the cause of his lady's death. In 1564, he was created baron Denbigh, and earl of Leicester, and in the same year was elected chancellor of the university of Oxford. He is suspected of having insidiously urged the duke of Norfolk to that courtship of the Scottish queen, which ended in his ruin, Leicester himself being one of the peers who pronounced his condemnation in 1572. He is charged also with having married lady Douglas Howard, and refusing to acknowledge it, compelled her to marry sir Edward Stafford. With all these stains on his character, he affected extraordinary piety, and put himself at the head of the puritan party. He erected an hospital at Warwick, with a liberal endowment, and gave the mastership of it to the celebrated puritan Thomas Cartwright. In 1575, he had the honour of entertaining his sovereign at Kenelworth castle; and the sumptuous festivities on this occasion, are mentioned among the splendours of that magnificent reign. In 1578, he married the widow of Walter Devereux, earl of Essex, having been suspected of too close an intimacy with her during her late husband's life; so ill, indeed, did the public conceive of him, that it was currently reported Essex was taken off by the contrivance of the earl of Leicester. About the year 1584, the revolted states of the Low Countries offered to throw themselves on the protection and under the government of queen Elizabeth: to this she did not agree, but sent them over assistance, *viz.* 5000 foot and 1000 horse, under the command of the earl of Leicester. He was attended by many of the nobility and gentry, and sailed in December 1585 to Flushing, where he was received with the most profound respect, and by the States themselves, he was raised to the supreme executive authority, as well civil as military throughout their dominions. This increase of his power gave offence to the queen, who conceived that she should have been consulted before it had been granted by the States, or accepted by her subject. In battle, he was not remarkably successful, and in one of the skirmishes, had the misfortune to lose his nephew, the excellent sir Philip Sidney. On his return to the Hague, he was received with commiss by the States, and he thenceforth, by his affected zeal for the Protestant cause, and his pretended piety, made a party with the people, and especially with the clergy, who from their pulpits inveighed against the magistrates, and extolled the earl as the champion of true religion. On his return to England, he was favourably received by Elizabeth, who was at that time in great perplexity how to act respecting the queen of Scots. When it was debated in council, whether she should be brought to public trial, Leicester gave his opinion for private assassination, and thus strengthened the suspicions of his own criminal practices against his enemies, which will for ever adhere to his memory. In 1587, he resumed his command in the Low Countries, but with as little success as before; he was accordingly recalled, and accused of mismanagement. Being, however, supported by the queen, he was appointed by her to the office of lieutenant-general of the army, when the nation was threatened with a Spanish invasion. He died in the same year, 1588, at the age of fifty-six, leaving behind him one natural son by lady Sheffield, and was interred in a chapel of the collegiate church of Warwick, where a noble monument was erected to his memory. Biog. Brit. Hume.

Dudley, *Sir* Robert, was the natural son of the earl of Leicester already noticed in the preceding article. He was born in 1573, and educated at Christ-church college, Oxford, where he obtained great credit for his industry and talents. By the death of his father, he was left, after the decease of his uncle, the castle of Kenelworth, and the bulk of his estate. Robert was, however, of an enterprising disposition,

position, and, having married the sister of Thomas Cavendish the great navigator, he undertook a voyage of adventure and discovery. He wished to have made an expedition, at his own expence, to the south seas, which was prevented by government; but he was allowed to sail with a squadron, under his command, in 1594, to the river Oronoque; in which expedition he took and destroyed several Spanish ships. In 1596, he distinguished himself at the taking of Cadiz, and was on that occasion honoured with knighthood. After this he made an attempt to establish the legitimacy of his birth; but failing, he resolved to take up his residence abroad, and fixed upon Florence, where he assumed the title of earl of Warwick. Some time after this he received letters of recal from his sovereign, which he refused to obey, and on that account was deprived of his estate for life, by the statute of fugitives. Kenelworth castle was now vested in the crown, but as it would return to the heirs of sir Robert at his death, propositions were made to him by the prince for the purchase of it: to this he agreed, but it is probable, that he received very little, if any, of the money which was to be paid for it. Sir Robert was now anxious to return home, and to ingratiate himself with the king, he drew up an extraordinary scheme to enable him to raise money without the intervention of parliament. James did not venture upon the project, which, however, was made known, and some persons suspected to be the authors of it, were imprisoned on the suspicion. Dudley remained at Florence, and was created a duke of the holy Roman empire, upon which he assumed his grandfather's title of Northumberland. Finding no means of returning to his native country, he applied himself to various projects that might be useful to the state in which he found protection. He laid the foundation of many improvements in navigation and commerce, and particularly in pointing out a method of draining the morass between Pisa and the sea. He is said also to have been chiefly instrumental in making the port of Leghorn a free port. Between the years 1630 and 1646, he published a large work, entitled, "Del Arcano del Mare," &c. in two volumes folio. This work is full of charts, plans, &c. and is replete with projects relative to maritime affairs, which are said to display much genius, and an extensive knowledge. "It is," says the writer of the article in the Biographia Britannica, "a singular treasury of curious and important schemes, which manifestly prove the author's high capacity for the advancement of useful knowledge, no man having ever had a stronger propensity to reduce speculation to practice than he; and the success that attended his labours in this respect ought to derive an extraordinary degree of credit, to whatever he suggests as practicable: though, beyond all doubt, something of the like genius must be required, in such as attempt to make use of any of his projects, which are delivered in a manner not very intelligible to vulgar understandings." Sir Robert was attached to science in general, had some knowledge of chemistry, as it was then studied, and professed himself versed in physic. He gave his name to a medicine, which he either purchased or invented, which was long in great reputation under the name of lord Warwick's powder. When he went abroad, he took with him the daughter of sir Robert Southwell, to the prejudice of his wife, whom, with four daughters, he left at home. At Florence he lived in great state, and by the pope's dispensation he married the lady who went out with him, though his wife was still living in England. He died at his seat near Florence in 1649, leaving a numerous foreign posterity. Biog. Britan.

Dudley, in *Geography*, a market-town in the hundred of Halfshire, in the county of Worcester, is situated on the northern borders of that shire, where it joins Staffordshire, and is nearly surrounded by the latter. It consists of two parishes, and comprehends 1922 houses, and 10,107 inhabitants. The adjacent country abounds with collieries, and most of the population are engaged in the coal business, and in the making of nails, and hard-ware. At the northern extremity of the town are some considerable remains of a castle, which, according to some writers, is said to have been built by Dodo, or Duddo, a Saxon prince, whose name is perpetuated, and incorporated in that of the town. Leland states, that the castle is within the confines of Staffordshire. It stands on an elevated rock of lime-stone; and, according to Gough, commands "an extensive prospect into five shires, and part of Wales." In the reign of king Stephen it belonged to the Pagenels, from whom it descended to the family of Somerys, in the time of Henry III. and from them to the Suttons' temp. Edward II. It now belongs to viscount Dudley and Ward, who derives his title from this place. The castle sustained a siege of three weeks in the time of the civil wars, when it was much battered, and has ever since continued a ruin.

In the town are two churches, three charity schools, and several chapels for dissenters. Here are a market on Saturdays, and three annual fairs. At a short distance from the town are the ruins of a monastic building, called Dudley priory.

Dudley *and Owen Canal*, in Worcestershire, Shropshire, and Staffordshire, is about 13 miles in length; it commences in the Worcester and Birmingham canal, at Selby cut, and terminates in the old Birmingham canal at Tipton Green; it has a branch two miles in length, communicating with the Stourbridge canal at Black Delph, see Canal. It has been said, that at Wind-mill-hill colliery, to which a branch of this canal extends, a seam of coal, of the amazing thickness of 45 feet, is worked; this thickness, if correct, may probably be owing to several seams of coal, approaching so near together, as to be all worked together, although they may in reality be separated, by thin beds of shale. See Colliery.

Dudley, a town of America, in the state of Massachusetts, and county of Worcester, containing 1140 inhabitants; 18 miles southward of Worcester, and 60 S. W. of Boston.

DUDSWELL, a township in Lower Canada, about 20 miles N. E. of Ascot, having about 50 inhabitants. The river St. Francis passes through the southern part of this town in a western course, and soon after turns N.W. which course it pursues till it falls into St. Lawrence.

DUDUA, or Dudusa, in *Ancient Geography*, a town of Asia, in Galatia. Ptolemy.

DUDUM, a town of Africa, in Interior Libya, south of the river Niger. Ptolemy.

DUE Cori, *Ital. Mus.* two choruses or choirs, placed at a distance from each other, sometimes performing in four parts alternately, or antiphonally; and sometimes uniting in eight real parts. We hear of compositions in the fifteenth and sixteenth centuries, not only for eight, but 36 parts; such was a motet by Ockerheim, the master of Jorquin, as all the musical writers of the sixteenth century triumphantly tell us.

Zarlino says, that so great was the rage in his time for multiplying parts in musical compositions, that some masters, not content with three or four, which sufficed to their predecessors, had increased them to fifty; from which, he truly observes, nothing but noise and confusion could arise. However, in another part of his book, he tells us, that Adriano Willaert had invented masses *à Due Cori, over a tre*, or as-

some

ſome call them, *a Cori Spezzati*, which had an admirable effect. We know not how Ockenheim diſpoſed his parts; but they would have furniſhed nine choirs of four voices each. In the large churches of Italy, where the performers are divided into two bands, placed in oppoſite galleries, all the imitations and ſolo parts are diſtinctly heard, and when united in at leaſt eight *real* parts, completely fill the ears of the audience with all the charms of congregated ſound. We have never heard this ſpecies of compoſition attempted in our cathedrals, when a powerful band of inſtruments and additional voices are joined to the uſual choral performers. Indeed, all our chanting and common choir ſervice, derived from the ancient antiphonal ſinging, is of this kind: the performers being equally divided, and placed on each ſide the choir, form two bands, one of which is called the dean's ſide, and the other the chanters': *Decani, Cantoris;* but the number of voices in our cathedral eſtabliſhments is not ſufficient to produce the great effects which might be obtained from the united force of all the vocal and inſtrumental performers that are aſſembled upon particular occaſions, ſuch as the Feaſt of the Sons of the Clergy at St. Paul's; the Triennial Meetings of the three Choirs of Worceſter, Hereford, and Glouceſter; the Feaſt of St. Cecilia, at Saliſbury; and occaſional performance of oratorios in other cathedrals and churches of the kingdom; but above all from ſuch a ſtupendous congreſs of muſicians as has been aſſembled at Weſtminſter Abbey.

We are in poſſeſſion of a maſs compoſed by Orario Benevoli, in 24 real parts for ſix choirs, and a ſong of 40 real parts, or ten choirs, by our venerable countryman Tallis. Theſe are curioſities, harmonical phenomena. But there can be little melody in any of theſe multiplied parts; but to make them move at all without violation of rule, requires great meditation and experience.

Many of the movements in Corelli's concertos, when the Ripienos differ eſſentially from the principal parts, and many of Handel's choruſſes, are written *a Due Cori;* but their effect is loſt by the band being all crowded together in one orcheſtra. It is only in the two oppoſite galleries of a church, or other large building, that the two galleries fronting each other, ſuch as, before the fire, our beautiful Pantheon contained, that ſuch grand effects can be produced, as we have heard in the churches of Italy.

Due *Terre*, in *Geography*, a town of Naples, in the province of Bari; 6 miles S. S.W. of Bari.

DUEGNAS, or Duennas, a town of Spain, in the province of Leon, or the Piſuerga, on the frontiers of Old Caſtile; 3 leagues S. of Palencia.

DUEL, a ſingle combat, at a time and place appointed, in conſequence of a cartel, or challenge.

The word is uſually derived from *duellum*, uſed by the barbarous Latin writers, *quaſi duorum bellum.*

Duels were anciently allowed by common law, in caſes where proof could not be had. In which view, Fleta defines duel. "ſingularis pugna inter duos ad probandam veritatem litis; & qui vicit, probaſſe intelligitur." Stat. de Finib. Levat. 27 Edw. I.

This duelling was ſo general a method of terminating differences among the nobility, that even eccleſiaſtics, prieſts, and monks, were not excuſed from the ſame; only to prevent their being ſtained with blood, they obliged theſe to procure champions to fight in their ſtead; as is ſhewn at large by father Dacheri, in his Spicilegium, tom. viii.

None were excepted from theſe legal duels but women, ſick people, and cripples, and ſuch as were under twenty-one years of age, or above ſixty.

The cuſtom was, for the two champions to enter a liſt, or ſmall incloſure, appointed by the authority of the ordinary judge, not only on criminal occaſions, but on ſome civil ones, for the maintenance of their right.

The monk Sigebert even relates, that a queſtion on a point of law being preſented to the emperor Otho I. *viz.* whether repreſentation had place in direct ſucceſſion? and the doctors finding themſelves embarraſſed in the reſolution thereof, the emperor remitted the deciſion of ſo critical a point to the judgment of arms, and pitched on two bold fellows to maintain the *pro* and the *contra.* The victory fell to him who contended for repreſentation; in favour of whom a law was immediately made, which is in force to this day.

This cuſtom came originally from the northern nations; among whom it was uſual to end all their differences by arms, as we are aſſured by Paterculus. It afterwards paſſed as a law among the Germans, Danes, and Franks; eſpecially after Gondebaud, king of the Burgundians, admitted it in lieu of ſwearing. Towards the concluſion of the fifth century, M. Godeau, in his Hiſtory of the Church, VII. cent. ſays, that the Lombards firſt introduced into Italy the barbarity of ſingle combats, whence the cuſtom ſpread throughout the reſt of Europe. This mode of trial was introduced into England, among other Norman cuſtoms, by William the Conqueror; but was only uſed in three caſes, *viz.* one military, in the court-martial, or court of chivalry and honour; the ſecond, criminal, in appeals of felony; and the third, civil, upon iſſue joined in a writ of right, which was the only deciſion of ſuch writ of right after the conqueſt, till Henry II. with conſent of parliament introduced the alternative of the grand aſſize, or a peculiar ſpecies of trial by jury. See Battle.

The preparation for the combat, and the proceſs of it, are deſcribed under the article Champion. We ſhall only farther obſerve, that when the day of combat was come, they made choice of four cavaliers to guard the field; and performed divers ceremonies, prayers, oaths, &c. deſcribed by Paſquier, and other authors, and quoted by Du-Cange, who mentions an ordonnance of king Philip the Fair in 1306, preſcribing the ſeveral rules, conditions, and ceremonies to be obſerved herein.

The method of trial by duel was inſtituted as a method of conſulting Providence, to learn who was the criminal; and it was imagined, that God, thus interrogated, would not fail to declare himſelf in favour of the innocent. But it happened ſo often, that the unjuſt accuſer came off victorious, that they at length began to be convinced, they muſt not preſcribe to his wiſdom the neceſſity of interrupting the courſe of ſecond cauſes. This was giving rules to murder, and diſguiſing aſſaſſinations under method and meaſure.

Saxo Grammaticus obſerves, that as early as the year 981, the kings of Denmark had abrogated the proof by duel; and in lieu thereof, appointed the proof by red-hot iron, which was alſo annulled in its turn.

But duels were condemned before by a council held at Valentia, in 855, where the perſon who killed his enemy was excommunicated; and the perſon killed was pronounced unworthy of burial. Afterwards, the popes, Nicholas I. Celeſtine III. and Alexander III. likewiſe interpoſed; and Frederic I. and II. prohibited them in Germany; Louis VII. began to reſtrain them in France, in the year 1168; and St. Louis proceeded to aboliſh them; but his ordonnance, A.D. 1260, only took place in his own territories, and not in thoſe of his vaſſals. After his example, the counts d'Auvergne and Poictou, and ſeveral other lords, forbad them likewiſe. Philip the Fair, following the footſteps of his grandfather, St. Louis, at one time forbad all gages, or pledges of battle; and

and yet he permitted them in four cases, in the ordonnance above mentioned of the year 1306. The last duel of note was in the year 1547, before king Henry II. between Jarnac and Chastaignerie, mentioned by Thuanus, and de Serres.

In England, the trial by duel is disused; though the law on which it is founded be still in force. It appears from Madox's History of the Exchequer, that trials of this kind were so frequent in England, that fines, paid on these occasions, made no inconsiderable branch of the king's revenue, vol. i. p. 349. The last trial of this kind was appointed in the year 1631, between Donald lord Rey, or Rhee, appellant, and David Ramsey, esq. defendant, in the painted chamber at Westminster. But that quarrel terminated without bloodshed, being accommodated by Charles I.; as was also another of the same kind in 1571, by the interposition of queen Elizabeth. Another instance occurs seven years after that in 1631. Rushworth's Observations on the Statutes, &c. p. 260. See BATTLE and COMBAT.

DUEL is also used for a single combat on some private quarrel or occasion. See CHALLENGE.

The duel must be premeditated; otherwise it is only a rencounter.

The folly, or rather madness, of duelling reigned for some ages in France; where the flower of the noblesse perished thereby. It is one of the glories of Louis XIV. to have used all his power and authority for abolishing duels. The severe edicts and laws he made against duellists have, in a great measure, put a stop to the custom.

Deliberate duelling is by the law of England a species of murder; and accordingly, it charges both the crime and punishment of murder on the principals, and on their seconds also. (Blackst. Com. vol. iv. p. 199. 1 Hawk. P. C. 82.) It requires, however, such a degree of passive valour to combat the dread of even undeserved contempt, arising from the false notions of honour too generally received in Europe, that the strongest prohibitions and penalties of the law will never be entirely effectual to eradicate this unhappy custom, till a method be devised of compelling the original aggressor to make some other satisfaction to the affronted party, which the world shall esteem equally reputable, as that which is now given at the hazard of the life and fortune, as well of the person insulted, as of him who hath given the insult. To this purpose Dr. Robertson observes, that the dominion of fashion is so powerful, that neither the terror of penal laws, nor reverence for religion, has been able entirely to abolish a practice unknown among the ancients, and not justifiable by any principle of reason; though at the same time, it must be admitted, that to this absurd custom we must ascribe, in some degree, the extraordinary gentleness and complaisance of modern manners, and that respectful attention of one man to another, which, at present, render the social intercourses of life far more agreeable and decent than among the most civilized nations of antiquity. Hist. Ch. V. vol. iii. p. 16, &c. 8vo.

DUEREN, in *Geography*. See DUREN.

DUERO, DOUERO, or *Douro*, a river, which rises near Agreda in Spain, and pursuing a westerly course, passes Osma, Aranda-de-Duero, Toro, Zamora, &c. in Spain; and reaching the borders of Portugal, it passes by Miranda, where, taking a south-westerly direction, it separates the province of Tra-los-Montes from Spain, till, a little below Espadacenta, it again takes a westerly course across the kingdom of Portugal, having the provinces of Tra-los-Montes and Entre-Duero-e-Minho on the north, and Beira on the south, and discharges itself into the Atlantic, a little below Oporto.

DUEROZHOF, a town of Germany, in the duchy of Carniola; 4 miles E. of Gurckfield.

DUESME, a small town of France, in the department of the Côte d'or, on the river Seine; 12 miles S. of Chatillon.

DUET, DUO, *Ital.*, a musical composition in two parts, whether vocal or instrumental. This title is general for all music in two parts; but in speaking of a dramatic duet, in an opera, the term requires a more extended explanation.

Though many admirable theatrical duets had been composed by the Italians, before Rousseau wrote the musical articles for the Encyclopédie, or collected them into a dictionary; yet he was the first to analyse that species of composition, to point out its forms, and account for its effects. And this he has done so judiciously, and with such enlarged views, that, though long, we shall translate the chief part of his article, for the sake of its ingenuity, and the author's reasoning on the subject.

He observes, that "the rules for vocal duets, and, in general, for all music in two parts, are the most rigorous, with respect to harmony, of any musical productions. Many passages are prohibited, and many movements, which would be admitted to a greater number of parts; for there are passages and combinations, which please when accompanied by a third or fourth part, without which they would shock the ear. Besides, as only two sounds are wanted, it would be unpardonable not to choose the best. These rules were formerly more severe in chamber duets, such as those of Steffani and Clari; but in later times, they have been relaxed, since every one sets up for a composer."

The citizen of Geneva might have assigned other reasons for this relaxation, by allowing dramatic duets, where not only the harmony of two parts was to be select and polished, but generally two distinct characters to be supported; where perpetual fugue or imitation to the same words was absurd, and where a dialogue was to be preserved almost entire, and where the union of the two voices was reserved for moments of passion, expressive of joy, sorrow, or anger.

"A duet may be regarded in two lights: as a melody in two parts, such, for example, as the first movement of Pergolesi's "Stabat Mater," the most perfect and touching duo (in 1768) which ever dropt from the pen of a musician; or, as imitative and theatrical music, such as the duos in opera scenes. In both species, the duet is of all kinds of music, that which requires the most taste and selection of passages, and is the most difficult to treat without neglecting the *unity of melody*. Let me be allowed here to make a few remarks on dramatic duets, the particular difficulties of which are superadded to those of all other duets in general.

"It has been well remarked, that duets are out of nature in imitative music, where passion is to be painted: for nothing is less natural than to hear two persons talking at once during a certain time, either to say the same thing, repeat the same sentiment, or to contradict it, without ever listening or waiting for an answer; and though this may be admitted in particular cases, it certainly ought not to be suffered in a tragedy, where such indecency is neither suitable to the dignity of the personages, the interlocutors, or to the education which we may suppose them to have received. It is only, therefore, in great transports of passion that the heroic interlocutors can be supposed to interrupt each other, and speak at the same time; and even then, it is extremely ridiculous that such simultaneous discourse should be prolonged in a regular manner.

"The first means, therefore, of avoiding this absurdity, is to place those duets in lively and touching situations, where the agitation of the characters throws them into a kind of delirium,

delirium, capable of making the audience and themſelves forget thoſe theatrical decorums, which enforce illuſion in cold ſcenes, and deſtroy it in the heat of paſſion. The ſecond means is, to compoſe duets as much as poſſible in dialogue. This dialogue ſhould not be formally phraſed and divided into long periods, like recitative, but formed of interrogations, replies, and exclamations, ſhort and ſpirited, which give an opportunity for the melody to paſs rapidly from one to the other by turns, without ceaſing, to form ſuch a melody as the ear can ſeize. Another neceſſary attention is, not to take indifferently for ſubjects all the violent paſſions; but only ſuch as are ſuſceptible of a pleaſing melody, and are a little contraſted; ſo as to require a melodious accent and an agreeable harmony, in two parts. Rage and fury march too faſt to take a likeneſs: we diſtinguiſh nothing; we only hear a confuſed roar and barking, and the duo has no effect. Beſides, that perpetual repetition of abuſe and inſult belongs more to watermen and drovers than to heroes: it more reſembles the threats of bullies, who wiſh to make themſelves feared more than to hurt. But ſtill more muſt be avoided that exceſs of tenderneſs and feeling, which only talks of charms, chains, and darts; a flat and frigid jargon, with which true paſſion is totally unacquainted, and which are no more wanted for good muſic than good poetry. The inſtant of ſeparation, when one of the two lovers is dragged away to death, or flying to the arms of another;—the ſincere return of a rover;—the affecting conflict of a mother and a ſon, who wiſh to die for each other;—all theſe moments of affliction, which draw delicious tears from the ſpectators: theſe are the ſubjects for duets, when treated by the poet with that ſimplicity of language which penetrates the heart. Whoever has frequented the Lyric theatres muſt know what tenderneſs and emotion can be excited in a whole audience, by the ſingle word *addio*. But the moment the poet aims at wit, or lets any affected phraſe eſcape him, that inſtant the charm is broken, and we muſt laugh, or die with fatigue.

"Theſe obſervations regard the poet. With reſpect to the compoſer, it is his buſineſs to find a ſuitable melody to the ſubject, and diſtribute it in ſuch a manner, that each of the interlocutors, ſpeaking by turns, ſhall ſo connect the muſical phraſes, without changing the ſubject, or at leaſt the movement, that paſſing in its progreſs from one part to the other, without a junction, it ſhall ſeem as uniform as if ſung by a ſingle voice. The duets that produce the beſt effects are thoſe of voices of equal pitch, becauſe the harmony is more compreſſed. And among voices of the ſame kind, the beſt effects are produced by *ſopranos*, or treble voices, whoſe diapaſon being moſt acute renders the accents moſt diſtinct, and their tones more touching. And theſe are the only duets uſed by the Italians in their ſerious operas: and I have no doubt but that the employing *caſtrati* in male parts was originally owing to this obſervation. But though there ſhould be an equality between the two voices in a duo, and a unity of melody, it does not follow that the two parts ſhould be exactly alike in the caſt of melody; for, beſides the neceſſary diverſity of ſtyle, it ſeldom happens that the ſituation of the two characters is ſo perfectly ſimilar, that they ſhould expreſs their ſentiments in the ſame manner: ſo that the compoſer ought to vary their accents, and give to each the character which beſt ſhall paint the ſtate of their minds, eſpecially in their alternate recitative.

"When the two parts unite and ſing together, which ought to be ſeldom uſed for a ſhort period, a melody ſhould be found that admits of moving in 3ds or 6ths, in which the ſecond part has its effect without diſturbing the firſt. (See UNITY *of Melody*.) Care muſt be taken to avoid harſh diſcords, high and piercing ſounds, reſerving the *fortiſſimo* of the orcheſtra for moments of tranſport and diſorder, in which the performers ſeem "to forget themſelves," infuſe their ſufferings into the ſouls of ſpectators of ſenſibility, and make them experience the power of harmony ſoberly conducted: but theſe moments ought to be rare, ſhort, and artfully introduced. The ear and the heart muſt be prepared by a ſweet and affecting muſic for a criſis of this kind; that both may aſſiſt the compoſer and performer in raiſing ſuch emotions, which muſt be tranſient and conformable to human weakneſs: for when the agitation is too ſtrong, it cannot be durable; and whatever is out of nature never touches the heart."

He then illuſtrates his reflections by the exquiſite duet in Metaſtaſio's "Olimpiade," ſet by Pergoleſi, which has been the model of almoſt all dramatic duets ever ſince: recommending to the reader the ſeeking in the works of that firſt muſician of his time, and of our own, how ſuch a duet ſhould be treated; which, he truly ſays, is but a recapitulation of the preceding ſcene:

"Mia vita . . . . . addio.
Ne' giorni tuoi felici
Ricordati di me," &c.

The art, however, has not ſtood ſtill ſince the time when the ſweet and admirable Pergoleſi was prematurely ſnatched from the muſical world. Jomelli, Penz, Piccini, Sacchini, Anfoſſi, Traetta, Sarti, Mozart, Cimaroſa, and Paeſiello, though they have adhered to his model, have extended, refined, and poliſhed melody, invented ingenious and pictureſque accompaniments, without forgetting the poet, the actor, or dramatic effects.

Duets introduced in *intermezzi* and comic operas, turn on ſuch whimſical circumſtances, and are ſung by ſuch groteſque characters, that there is no reducing them to rule; yet the Italians, with all their good taſte in ſerious muſic, have ſo natural a tendency to buffoonery, that, in their burlettas, there is no kind of imitation which they have not tried to tune, or ſquabble which they have not painted by variety of meaſures and characteriſtic melodies. Comic duets are hardly ever ſung by two ſimilar voices, but generally by a ſoprano and tenor or baſe: "and (ſays Rouſſeau) if they have not the pathos of tragic duets, in revenge, they are ſuſceptible of the moſt piquant variety. All the ſubtilties of coquetry, all the peculiarities of the advocati, Dottori, of Pantaloon, Harlequin, Columbine, and the contraſt of all the follies of our ſex, and the artifice of the other; in ſhort, all the acceſſory ideas of which the ſubject is ſuſceptible, all concur to render theſe duos intereſting and amuſing." As a model of perfection among comic duets, he inſtances "Lo Conorco a quig l'Occhietti," in Pergoleſi's "Serva Padrona;" which, however admirable in its day, has been often far ſurpaſſed in agreeable air, unity of melody, ſimple, pure, and brilliant harmony, accent, dialogue, and taſte, by Cimaroſa, Paeſiello, and Mozart.

DUETTI DA CAMERA, ſuch as thoſe of the elder Bononcini, Steffani, Clari, Haſſe, and Handel, are almoſt all *fugati*. They uſed to be regarded, particularly thoſe of Steffani, as excellent *ſolfeggi*, by the great opera ſingers, a century ago.

DUETTINI, *Ital.*, a little duet, ſuch as thoſe of Aprili, Moſtellari, Millico, and others.

DUFF'S GROUP, in *Geography*. See DISAPPOINTMENT *Iſland*.

DUFFEL, a ſmall town of France, in the department of the two Nethes, chief place of a canton in the diſtrict of Malines, on the river Nethe; 3 miles N. of Malines, and 3 miles

3 miles S.W. of Lierre. It has a population of 2831 individuals. The canton contains 8 communes and 8579 inhabitants, upon a territorial extent of 90 kiliometres.

DU-FRESNE, Charles Du-Cange, in *Biography*, a learned Frenchman, was descended from a respectable family, and born at Amiens, in the year 1610. After having acquired the elements of polite literature in the Jesuits' college, at his native place, he studied the law at Orleans, and, in 1631, was sworn-advocate to the parliament of Paris. Having practised at the bar for some time, he declined the exercise of this profession, and returning to Amiens, devoted himself to the general study of languages and philosophy, law, physic, divinity, and history. In 1668 he again settled at Paris, and in pursuance of a proposal laid before Colbert, and approved by him, he was employed in collecting memoirs and manuscripts for compiling a history of France. His plan for the execution of this project, to which he had devoted considerable time and attention, not being approved by the minister, he relinquished this tedious and laborious undertaking; and directed his views to the completion of his glossary of low Latin, entitled, "Glossarium Mediæ et infimæ Latinitatis," which was received by the public with general commendation; and though Valesius discovered in it several mistakes, it is deemed by the learned an excellent and useful work. It was afterwards considerably enlarged; and the edition of Paris by Carpentier, in 1733, comprised 6 folio volumes, to which Carpentier has since added 4 volumes, by way of supplement. The whole has been abridged, consolidated, and improved in an edition, comprehending 6 volumes, 8vo., and published at Halle from 1772 to 1784. The next performance of Du-Fresne was a "Greek Glossary of the Middle Age," compiled mostly from MSS., little known, and comprised in 2 volumes, folio. This learned writer was the author or editor of several other works; among which we may reckon his Genealogical Chart of the Kings of France, his History of Constantinople under the Kings of France, and his editions of Cinnamus, Nicephorus, Anna Comnena, Zonaras, and the Chronicon Alexandrinum, with dissertations and notes. Du-Fresne, or as he is commonly called Du-Cange, died in 1688, leaving four children, pensioned by Louis XIV., in consideration of the father's merit.

Though the general merits and abilities of this profound and accurate etymologist have already been recorded, we here with gratitude pay tribute to his memory, for the assistance which he has frequently afforded us as musical historians, when all other resources failed. In the slow progress of the art of music from the time of Guido, whose labours were wholly devoted to the facilitating the study of canto fermo by the monks and choristers; in the glossary "De la Basse Latinité," (6 vols. folio), we find the derivation and early use of musical terms and phrases, particularly in France and neighbouring states; and there is scarcely a term connected with the music of the church, of which an early use may not be found, either in this Glossary, or in its continuation by Carpentier, 4 vols. folio.

For the history of the music of the Greek church, great information may be obtained from "Glossaire de la Langue Grec," of the middle ages, printed at Lyons, 2 vols. folio, Gr. et Lat.

DU-FRESNOY. See Fresnoy.

DUFRESNY, Charles Riviere, was born at Paris in the year 1648. He passed for the grandson of Henry IV., and was thought to have borne some resemblance to that prince. Of the place and manner of his education, little worthy of notice has come down to us. In mature life, he manifested a general taste for the arts, without having made any of them his particular study. He was a self-taught poet and painter; but especially excelled in the art of laying out gardens, a talent which gained him great credit with his sovereign Louis XIV., to whom he was a servant of the bed-chamber, and who made him also comptroller of the royal gardens. In a short time after, he applied for, and obtained a patent for the manufacture of looking-glasses. With these modes of obtaining an ample competence, he was always poor, and his circumstances so embarrassed, that he was at length obliged to sell the places and privileges which he enjoyed, to extricate himself from debt. When he quitted court, he wrote with success for the stage; and his reputation was so considerable, that he was compared by D'Alembert with Detouches, with regard to their comic talents, and declared to be the more original, free, and inventive, of the two. In 1710, he obtained the sole right of printing the "Mercure Galant," of which he profited only a short time, being obliged to sell his privilege. About the time of Law's projects under the regency, he was in a deplorable situation; but the readiness of his invention did not fail him in his exigencies: he drew up and presented a humorous petition to the regent, and obtained the extravagant supply of 200,000 livres. He was twice married, and in both instances he sought the connection to relieve his wants. He died poor, in the year 1724; and in a few years after his decease, his works were collected, and published in 6 vols. 12mo. They chiefly consist of dramatic pieces, poetry set to music, serious and comic amusements, historical anecdotes, &c. Whatever he wrote is characterized by a happy mixture of fire and delicacy, by a species of gaiety entirely his own and unstudied, and by a style which always keeps alive the attention, though no one could successfully take the author as a model. Moreri.

DUGDALE, *Sir* William, a learned antiquarian, was born at Shustoke, near Coleshill, Warwickshire, in the year 1605. His father was a country gentleman, who, after his son had received the usual elementary instructions in grammar learning, instructed him in the laws of his country, and in the principles of general history. After the death of his father he was introduced to the society of some persons conversant in antiquities, and began to make collections for a history of his native country. In 1638 he visited London, when he became acquainted with the celebrated sir Henry Spelman, by whose means, and the interest of other learned antiquaries, by whom Mr. Dugdale's talents were highly appreciated, he obtained a pursuivant's place in the Herald's office, where he came to reside in 1640. Here, and from the records in the Tower, he enjoyed ample opportunities to enlarge his collections. During the civil war he attended the king officially, and was with him at the battle of Edge Hill, and at Oxford, where he was created master of arts. In 1644 he succeeded to the place of Chester herald, and, by the king's express command, he continued at Oxford till it surrendered to the parliament's forces in 1646. He did not spend this time in vain, but employed himself most diligently in investigating all the sources of learning which the university libraries afforded. Here he chiefly collected the materials for the "Monasticon," in which he was engaged with Mr. Roger Dodsworth. To complete this great work he afterwards visited Paris, where, by the indulgence of Andrew du Chesne, and other learned men, he obtained many records relative to the priors alien in England. The first volume of the "Monasticon Anglicanum" was published in 1655. This work contains an account of all the religious houses in England from their foundation to their dissolution. The remaining volumes were published in 1661 and 1673. Two volumes of additions were printed by John Stephens in 1722

and 1723, and the whole is regarded as a valuable collection of national matter, and is now become very rare. The publication of Dugdale's part gave offence to the puritans, who imagined the author's main design was to bring back popery; it was the cause, likewise, of many law-suits, by bringing to light old deeds and other writings, or at least of pointing out where they might be found. In the year 1656, Dugdale published his "Antiquities of Warwickshire illustrated," of which a second edition was printed by Dr. Thomas in 1730. While this work was printing, Dugdale employed his leisure time in collecting materials for a history of St. Paul's cathedral in London, which he published in 1658. Upon the restoration he was advanced to the office of Norroy King at Arms. His next work was "The History of Embanking and Draining of divers Fens and Marshes, both in foreign Parts and in this Kingdom, and of the Improvements thereby." In 1677 he was advanced to the office of Garter King at Arms, to which was annexed the honour of knighthood. After this he published various other works, chiefly relating to heraldry. Besides the volumes of which he was chiefly or solely the author, he edited the second volume of "Sir Henry Spelman's Councils," and the second volume of his "Glossary." He compiled also a work, entitled "Origines Judiciales," which relates to the forms and rules of English courts of justice and the principal law offices, a work that has been recommended by bishop Nicholson as an useful introduction to the legal history of England; nor must we omit his "Baronage of England," in three volumes folio. He died at his house in Warwickshire in 1686, being in the 81st year of his age, leaving one son and a daughter; the former was in the Herald's office and was knighted; the latter married Elias Ashmole. Biog. Brit.

DUGGA, or Tugga, in *Geography*, a town of Africa, in the kingdom of Tunis; 70 miles S.W. of Tunis.

DUGHET, Gaspar, in *Biography*, a landscape painter, celebrated under the name of Gaspar Poussin.

He was born in France, A.D. 1600, and at a very early age discovered an apt genius for painting. Finding in himself a strong love for that art, he resolved to devote himself to it, and, with a view to the attainment of excellence in his profession, set forward towards Rome, where he was confident of meeting with assistance from Nicolo Poussin, who had then risen to eminence, and who had married Gaspar's sister.

On his arrival at Rome, he was at first employed merely in preparing Poussin's palette, pencils, and colours; but gradually improving himself by the instructions he derived from that great master of his art, by the sight of his works during their progress, and the opportunity of observing his method in painting them; and still more, finally, by the example of his great powers, he grew into considerable reputation as a landscape painter, and, at length, effectually established his claim to celebrity.

Whether he found himself unequal to the higher paths of art, in which Nicolo moved, or whether his good sense dictated to him the impolicy of attempting eminence in the same province with his master, he adopted a style, which though manifestly formed under the superintending genius of Poussin, neither aimed at the same species of composition, nor bore an exact resemblance in manner. The landscape of Nicolo is select, poetic, and aspires to the sublime: Gaspar, although not deficient in poetical composition, chose the task of more humble and minute attention to natural effects and natural scenes. The quiet valley, the slumbering lake, and the rich autumnal foliage of the grove; or the bleak hill, the driving shower, or eddying whirlwind, came from his hand, stamped with a characteristic impression of reality. His pencil was rich, free, and flowing. In this branch of painting, therefore, though he did not surpass, he might stand in competition with his preceptor; but here his skill terminated; in figures he was so totally incompetent, that he was frequently fain to solicit his master to paint those which he introduced into his landscapes. Whether their places were marked out by him, or chosen by Nicolo, they are always introduced with admirable taste and propriety. His scenery also is excellently chosen in point of natural beauty, as are the sites of his buildings; and those buildings are productive of the most pleasing effect by a mixture of elegance and simplicity. His grounds are agreeably broken; and the force of his figures, trees, and other objects, is so judiciously proportioned to their respective distance, as sometimes even to cause the most pleasing deception. He was exceedingly expeditious in his work: his imagination was scarcely more ready to invent than his hand was to execute; and it is confidently reported by authentic writers, that he finished a large landscape, and inserted all the requisite figures, within the compass of one day!

Gaspar had three manners in his painting, which are distinguishable without any great nicety. The first was rather dry, and the last, though agreeable, was feeble, and unequal to that of his middle time; his second manner was, by many degrees, his best, as it was at once more simple and more learned; and his colouring appears so fresh, so full of truth and nature, that no eye can behold his landscapes of that period without admiration. The works of Gaspar are deservedly esteemed in every nation where the art of painting is either cultivated or understood.

During his abode in Rome he adopted the family name of his brother-in law and benefactor, and is commonly spoken of by that only. He died in the year 1663. Partly Pilkington's Dictionary of Painters.

DUGINSKOI, in *Geography*, a cape of Russian Siberia, in the sea of Oehotskoi. N. lat. 59° 15′. E. long. 149° 14′.

DUGNY, a town of France, in the department of the Meuse and district of Verdun; three miles S. of Verdun.

DUGUET, James Joseph, in *Biography*, was born at Montbrison, near Lyons, about the year 1649. At a very early age he discovered a strong memory, and a certain quickness for imbibing instruction, which his father took great pains in cultivating. At a proper age he turned his thoughts to the study of theology, which he pursued at Saumur. In 1671, he was appointed professor of philosophy at the college of Troyes, and at the same time was requested to deliver a series of catechetical instructions to the poor; such, however, was his popularity, that persons in the higher ranks of life crowded to hear his lectures, almost to the exclusion of those for whom they were originally designed. In the year 1677 he was ordained priest, and at the same time discharged the duties of professor of theology. At this period he established his celebrated ecclesiastical conferences, which were attended by the most numerous audiences, and procured for him a high reputation for extensive knowledge, judgment, and piety. He laboured so assiduously in the various duties in which he was engaged, that his health was considerably injured, and he was obliged to apply for a relaxation from his employments. In 1685 he retired to Brussels, but finding the air of that city not congenial to his constitution, he returned to Paris, where he lived in a studious retirement, concealed from the greater part of his acquaintance. In the latter years of his life he was involved in much trouble, by the decided part which he took in the controversy between the Jesuits and Jansenists, and was obliged frequently to change his residence. He died at Paris in 1733, being in the 84th year of his age. As an author, he published commentaries or expositions on the greater part of the books of the

the Old Teſtament, beſides many practical pieces in theology and morals: alſo, "A Collection of Letters on Piety, &c.," in nine volumes 12mo. Of theſe and other pieces Moreri has given an ample account. Duguet was very highly eſteemed by his contemporaries, as well for his piety as for the excellence of his temper and the gentleneſs of his manners. What he had been in the younger part of life he continued to be in the extreme of old age: ſo excellent is the advice, "Train up a child in the way he ſhould go, and he will not depart from it when he is old." His writings, which are little known here, are by his countrymen highly applauded for perſpicuity, purity, and elegance. Moreri.

DUHAM, in *Geography*, a town of Bohemia, in the circle of Boleſlaw; 20 miles W. N. W. from Jung Buntzlau.

DUHOKUNDA, a town of Africa, in the kingdom of Jemarrow.

DU JARDIN, in *Biography*. See Jardin.

DUIDA, in *Geography*, a mountain of South America, in the range of Parima, in which is a volcano. N. lat. 3° 13′.

DUILLIUS, C., in *Biography*, the firſt Roman who obtained a conſiderable naval victory, was conſul in the year 260 B. C. After his colleague, Cn. Corn. Scipio, had been taken at ſea by the Carthaginians in the firſt Punic war, he proceeded, with a newly-built Roman fleet, to Sicily in queſt of the enemy, and, by means of a *corvus*, was enabled to grapple with the enemy's veſſels as they approached, and thus to convert the combat into a ſort of land fight. By this unexpected manœuvre he took 80, and deſtroyed 13 ſhips of the Punic fleet, and obtained, as a reward, a triumph. A naval column was erected in the forum to perpetuate the event, which was ſtanding in Pliny's time, and was found again, with its inſcription, in the year 1560. The ſenate likewiſe rewarded his valour by permitting him to have muſic playing and torches lighted, to attend him when he returned from any evening entertainment. Medals were ſtruck in commemoration of the victory. Cic. De Senectute.

DVINA, in *Geography*, a river of Ruſſia, called "Sievernaia Dvina," the Northern Dvina, which name it aſſumes on its junction with the two rivers, the Sookhona and the Youga, that ariſe in the government of Vologda. This junction is formed at the city of Uſtiug, whence the Dvina takes a north-weſtward courſe, and at Archangel falls into the White ſea, after having divided itſelf into two conſiderable arms. In its courſe it receives ſome pretty large rivers, and ſeveral leſſer ſtreams; ſuch as, on the right, the Luſa, the Vichegda, and the Pinega; and, to the left, the Vaga, the Yemza, &c. The merchant veſſels run into the eaſtern arm of the Dvina, on which the fort Novaia Dvinka is built; but, at firſt, the weſtern, where ſtands the monaſtery Korelſkoi Monaſtir, was the moſt frequented; but this is no longer paſſable. In general the ſhoals increaſe from year to year in both, and ſuch large ſhips cannot now run in as formerly. The Dvina has the honour of having given reception, in 1553, to the firſt Engliſh ſhip that ever came to Ruſſia. This river flows moſtly through a ſwampy and woody region; it is navigable from Uſtiug, and tolerably abounds with fiſh.

Dvina. See Duna.

DUINGEN, Duin, or *Dudingen*, in *Geography*, a town of Germany, in the circle of Lower Saxony, and principality of Calenberg; 18 miles S.E. of Hameln.

DUINO, Doino, or *Tybein*, a ſea-port town of Germany, in the duchy of Carniola; 8 miles N.W. of Trieſte, and 174 S S.W. of Vienna. N. lat. 45° 55′. E. long. 14° 46′.

DUISBURG, or Duisbourg, in Latin *Duiſburgum*, *Duiziburgum*, and *Tuiſcoburgum*, a town of Germany, in the grand duchy of Berg, which, ſince the acceſſion of the grand duke, Joachim Murat, to the throne of Naples, has been annexed to the French empire. It is ſuppoſed to derive its name from the Tuiſcones, and to be the Diſpargum, or Duiſparcum, in which the Frankiſh king Clodio, ſurnamed Long-haired, reſided.

Duiſburg is ſituated on the eaſtern ſhore of the Rhine. It was formerly a free imperial and Hanſeatic city, under the protection of the dukes of Limburg and counts of Berg. In 1290, it was mortgaged to Theodore VIII., count of Cleves, and in 1347 to John, duke of Cleves. In 1805, it was ceded, along with the duchy of Cleves, by the king of Pruſſia, to the grand duke of Berg.

An univerſity was founded at Duiſburg for Proteſtants in the year 1655, but it was never very flouriſhing under the Pruſſian dominion, Halle and Franckfort on the Oder being generally preferred. In 1800, Duiſburg had but 12 profeſſors and 39 ſtudents. Murat, as grand duke of Berg, attempted to reſtore the univerſity of Duiſburg to its ancient importance. He increaſed the number of profeſſors to 18, *viz.* 6 profeſſors of philoſophy, 3 of Calviniſt, 2 of Roman Catholic, and 1 of Lutheran theology; 3 of phyſic, and 3 of law. Count Bork of Hüth was its curator. Its revenue was 20.000 dollars.

Duiſburg has two very fine churches, and three monaſteries. Its principal manufactures are thoſe of hardware and woollen cloth.

Gerard Mercator, one of the moſt illuſtrious geographers of the 16th century, is buried at Duiſburg.

Duisburg, Peter de, in *Biography*, a native of the duchy of Cleves, and a prieſt of the Teutonic order in Pruſſia, flouriſhed in the early part of the 14th century. He wrote a chronicle of Pruſſia in Latin, from the year 1226 to 1325, which was continued, by an anonymous writer, to 1426. It was tranſlated into German verſe by N. Jroſchinus and Wigandus, brothers of the ſame order to which Duiſburg belonged. The original was edited, in 1679, by the learned Hartknock, who ſubjoined to it nineteen diſſertations, which throw great light upon the hiſtory of Pruſſia. Moreri.

DUITZ, or Duytz, in *Geography*, a town of Germany, in the kingdom of Weſtphalia, and duchy of Berg, on the eaſt ſide of the Rhine, oppoſite to Cologn, chiefly inhabited by Jews, who are not permitted to dwell in Cologn, or even to enter that city, without permiſſion.

DUIVEN, or Duv'n, John, in *Biography*, a portrait painter, born at Goude, in Holland; a diſciple of Walter Crabeth; died in 1640.

DUKANA, in *Geography*, a river of Ruſſian Siberia, which, united with the Ancha, forms the Juna.

DUKE, Dux, a ſovereign prince, without the title, or quality of king. Such are the duke of Lorraine, duke of Holſtein, &c.

The word is borrowed from the modern Greeks, who call *doucas* what the Latins call *dux*.

There are alſo two ſovereigns, who bear the title of grand-duke; as, the grand-duke of Tuſcany, and the grand duke of Muſcovy, now called the *czar*, or emperor of Ruſſia; the heir of the throne of Ruſſia is now called grand-duke of Ruſſia. The emperor of Germany is arch-duke of Auſtria. The king of Poland aſſumes the title of grand-duke of Lithuania.

Duke, *Dux*, is alſo a title of honour, or nobility, the next below princes.

The dukedom, or dignity of duke, is a Roman dignity, denominated *a ducendo*, leading or commanding. Accordingly, the firſt dukes, *duces*, were the *ductores excercituum*, commanders of armies. Under the late emperors, the governors

vernors of provinces, in war-time, were intitled *duces*. In after-times, the same denomination was also given to the governors of provinces, in time of peace. The first governor under the name of duke, was a duke of the Marchia Rhætica, or Grisons, whereof mention is made in Cassiodorus; and there were afterwards thirteen dukes in the eastern empire, and twelve in the western. The Goths and Vandals, upon their over-running the provinces of the western empire, abolished the Roman dignities wherever they settled. But the Franks, &c. to please the Gauls, who had long been used to that form of government, made it a point of politics, not to change any thing therein; and, accordingly, they divided all Gaul into duchies and counties; and gave the names sometimes of dukes, and sometimes of counts, *comites*, to the governors thereof.

In England, during the Saxons' time, Camden observes, the officers and commanders of armies were called dukes, *duces*, after the ancient Roman manner, without any addition. After the Conqueror came in, the title lay dormant, till the reign of Edward III, who created his son Edward, first called the Black Prince, duke of Cornwall, which hath ever since been the peculiar inheritance of the king's eldest son during the life of his father, so that he is *dux natus, non creatus*. After whom, there were more made, in such manner as that their titles descended to their posterity. They were created with much solemnity, "per cincturam gladii, cappæque, circuli aurei in capite impositionem." However, in the reign of queen Elizabeth, A. D. 1572, the whole order became utterly extinct; but it was revived about fifty years afterwards, by her successor, in the person of George Villiers, duke of Buckingham.

Though the French retained the names and form of the ducal government, yet, under their second race of kings, there were scarcely any such things as dukes; but all the great lords were called *counts, peers*, or *barons*; excepting, however, the dukes of Burgundy and Aquitain; and the duke of France, which was a dignity Hugh Capet himself held, corresponding to the modern dignity of maitre de palais, or the king's lieutenant.

By the weakness of the kings, the dukes, or governors, sometimes made themselves sovereigns of the provinces trusted to their administration. This change happened chiefly about the time of Hugh Capet; when the great lords began to dismember the kingdom, so that the prince found more competitors among them than subjects. It was even with a great deal of difficulty they could be brought to own him their superior, or to hold of him by faith and homage.

By degrees, partly by force, and partly by marriages, those provinces, both duchies and counties, which had been rent from the crown, were again united to it. But the title duke was no longer given to the governors of provinces. From that time duke became a mere title of dignity, annexed to a person, and his heirs male, without giving him any domain, territory, or jurisdiction over the place whereof he is duke. All the advantages thereof now consist in the name, and the precedence it gives.

The dukes of our days retain nothing of their ancient splendour, but the coronet on their escutcheon; which is the only mark of their departed sovereignty. They are created by patent, cincture of the sword, mantle of state, imposition of a cap, and coronet of gold on the head, and a verge of gold in their hand.

The eldest sons of dukes are, by the courtesy of England, styled *marquisses*, though they are usually distinguished by their fathers' second title, whether it be that of marquis, or earl; and the younger sons, *lords*, with the addition of their Christian name, as lord James, lord Thomas, &c. and they take place of viscounts, though not so privileged by the laws of the land. The title of duke is the next dignity to the prince of Wales.

A duke has the title of *grace*; and being writ to, he is styled, in the herald's language, *most high, potent*, and *noble prince*. Dukes of the blood royal are styled *most high, most mighty*, and *illustrious princes*.

Duke, among Hebrew grammarians, is an appellation given to a species of accents, answering to our comma. See Accent.

Duke-Duke, a quality given in Spain to a grandee of the house of Sylva, on account of his having several duchies, from the uniting of two considerable houses in his person. Don Roderigo de Sylva, eldest son of Don Ruy Gomez de Sylva, and heir of his duchies and principalities, married the eldest daughter of the duke de l'Infantado; in virtue of which marriage, the present duke de Pastrana, who is descended therefrom, and is grand-son of Don Roderigo de Sylva, has added to his other great titles, that of duke-duke, to distinguish himself from the other dukes, some whereof may enjoy several duchies, but none so considerable ones, nor the titles of such eminent families.

Duke's *County*, in *Geography*, a county in the state of Massachusetts, N. America, comprehending the islands of Martha's Vineyard, Chabaquiddick, Noman's and Elizabeth's, and situated in the S.E. coast of the state. The number of inhabitants is 3118, who send three representatives, and, in conjunction with the island of Nantucket, one senator to the general court. The chief town is Edgarton.

Duke *of Gloucester Island*, an island in the South Pacific ocean. S. lat. 19° 11'. W. long. 140° 11'.

DUKEE, or Duki, a town of Asia, in the country of Candahar, in the road from Candahar to Moultan; 185 miles S.E. of Candahar.

DUKLA, a town of Poland, in the palatinate of Sandomirz; 60 miles S.S.W. of Sandomirz.

DUKORTCHINA, a town of Russia, and one of the 12 districts of the government of Smolensko, seated on the Dnieper.

DUKOVA, a town of Lithuania, in the province of Minsk; 16 miles S.E. of Minsk.

DULAS, a river of Wales, in the county of Carmarthen, partly separating this county from that of Glamorgan, which runs into the sea, about four miles S.E. of Kidwelly. —Also, a river of Wales, in the county of Carmarthen, which runs into the Towy, about 1½ mile S.S.W. of Llangattock.—Also, a river of Wales, in the county of Brecon, which runs into the Wye, near Hay.—Also, a river of Wales, in the county of Radnor, which runs into the Ithon, near Llanbeder.—Also, a river of Wales, in the county of Montgomery, which runs into the Severn, near Llanidlos. —Also, a river of Wales, in the isle of Anglesea, which runs into the Irish sea, forming a bay and harbour at its mouth, with a village of the same name; 10 miles N.W. of Beaumaris.

DULCIANA, in *Music*, a very pleasing solo stop in the organ, brought hither by Snetzler. It has since been very successfully imitated by Green, Grey, and others. It is a very long and narrow pipe, in unison with the open diapason; is as sweet as a reed-stop, and seldom wants tuning.

DULCIFICATION, in *Chemistry*, is an old term not very accurately defined, but is generally meant to signify the rendering mild, or lessening the corrosive quality of acids or alkalies, by any combination which is not supposed actually to neutralize them. The term, however, is incorrect, and should be disused.

DULCIGNO,

DULCIGNO, in *Geography*, a town of European Turkey, in the province of Albania, on the coast of the Adriatic, containing about 7000 or 8000 inhabitants. The harbour serves as a retreat for corsairs; 15 miles S.W. of Scutari. N. lat. 42° 23′. E. long. 18° 56′.

DULCIMER, a musical instrument in a triangular form, strung with about 50 wire strings, resting on a bridge at each end; the acute gradually shortening to about 18 inches, and the grave lengthening to about 36; it is struck with a small iron rod in each hand. The base strings are doubled in unison, and its tone is not disagreeable. When played on, it is laid on a table before the performer, who with the small iron rods strikes it with more or less force, as light and shade may be wanting. The instrument has not the honour to be admitted into concerts, and is seldom used, except at puppet-shews, and by itinerant musicians.

DULCINISTS, in *Ecclesiastical History*. See Apostolici.

DULCINO, in the *Italian Music*, a wind instrument, otherwise called *quart fagotto*. It serves for tenor to the hautboy, and is no more than a little bassoon. Bross. Dict. Mus. in voc.

DULCINUS, in *Biography*, a leader of a religious sect, was a native of Novara, in the duchy of Milan. The sect, sometimes denominated Dulcinists, and sometimes the "sect of the apostles," was founded by Gerard Sagarelli, who was burnt alive, for his heresy, as it is called by Moreri, at Parma, in the year 1300. According to the learned Mosheim, the Dulcinists aimed at introducing among Christians the simplicity of the primitive times, especially the manner of life that was observed by the apostles, as nearly as could be collected from their writings. On the death of the founder, Dulcinus boldly headed the sect, and avowed his faith in the predictions of Sagarelli, *viz.* that the church of Rome would speedily be destroyed, and that a pure system of religion would be built on its ruins. That he believed what he asserted is evident from the means which he took of defending himself and followers against their enemies and persecutors. For two years the Dulcinists, by force of arms, maintained their ground against the supporters of the papal interests; which terminated, however, in the overthrow and capture of their leader, after he had signalized himself in several obstinate and well contested battles. His life was the forfeit of his heroism and honesty. Moreri. Mosheim.

DULCIS Assa, or *Asa*. See Asa.

DULEDGE, in *Gunnery*, a peg of wood which joins the ends of the six fellows, which form the round of the wheel of a gun carriage; and the joint is strengthened on the outside of the wheel by a strong plate of iron, called the duledge plate.

DULEEK in *Geography*, a small town in the county of Meath, province of Leinster, Ireland, situated on the Nanny Water. It is of little importance, but is a thoroughfare to the northern parts. According to a MS. at Cambridge, the first church in Ireland that was built of stones, was erected there. It is twenty-one miles north from Dublin, and four south from Drogheda.

DULGIBINI, in *Ancient Geography*, a people of Germany, so called by Tacitus, and supposed to be a colony of Cherusci, whose chief habitation was the town of Ascalingium, now Lingen, upon the Ems. Ptolemy denominates them *Dulgumini*.

DULIA, Δουλεια, *Service*. See Worship, Latria, and Hyperdulia.

DULICHIUM, in *Geography*, one of the islands called Echinades, situated W. of Greece in the Ionian sea. It was also called Dolicha, and so distinguished by M. D'Anville, who supposed it to have been near Cephallenia, and called it Ithaca. Its name is now Theaki, or Little Cefalenia.

DULKAK, among Arabian writers, a fabulous seamonster in form of a man, riding on an ostrich, which is said to attack ships, and fight with the men on board. Hosm. Lex. in voc.

DULKEN, or Dulcken, in *Geography*, a town of Germany, in the kingdom of Westphalia, and duchy of Juliers: 20 miles N.N.W. of Juliers.

DULLAERT, Heyman, or Herman, in *Biography*, painter of history and portraits, born at Rotterdam in 1636. He was a disciple of Rembrandt, whom he imitated so successfully, that one of his pictures, representing Mars in armour, was sold at Amsterdam at a public sale, in 1696, for a work of that great master. He is praised by Houbraken for the beauty of his colouring, and freedom of pencil. He is said to have been also well skilled in music. He died in 1684. Vie des Peintres Flamands, &c.

DULMA, a Turkish dish, made of any vegetable, as cucumbers, onions, cabbage leaves, &c. stuffed with forced meat Pococke's Egypt, p. 183.

DULMAN, or Dulmen, in *Geography*, a small town of Germany, formerly in the bishopric of Munster, in Westphalia, but at present in the kingdom of Westphalia; 22 miles S.W. of Munster.

DULNESS *of* Hearing. See Hearing.

DULOPOLIS, in *Ancient Geography*, a *town of slaves*, a town of Africa, in Libya.

DULVERTON, in *Geography*, a market town and parish in the hundred of Williton Freemannon, in the county of Somerset. It stands in a narrow valley, near the banks of the river Ex, which divides the parish, and also separates the counties of Devon and Somerset, at this place. The town consists of two streets, both of which are paved, and in the principal one is the market-house, a commodious building, and the butchers' shambles. Here is a weekly market on Saturday, and, what is rather unusual, the poor have the rents and tolls of the market distributed among them annually. The town consists of 195 houses and 1049 inhabitants: most of these are occupied in the manufacture of coarse woollen cloths and blanketings.

It appears from some records that the town was occupied by the West Saxon kings, and was possessed by the crown when the Domesday book was composed.

About one mile south of the town is Combe, an ancient seat of the Sydenham family, who purchased it in the time of queen Elizabeth. Half a mile south-east of Dulverton is Pixton, a pleasant seat of lady Acland. Collinson's History of Somersetshire, vol. iii.

DULWICH, a hamlet in the parish of Camberwell, in the county of Surry, is noted for a large *college* which was founded here in 1614, by Edward Alleyn, an actor of some professional reputation in the reigns of Elizabeth and James I. The building was erected after a design by Inigo Jones, and contains a chapel, masters' apartments, and chambers for the poor men, women, and children belonging to the foundation. This provided for a master, who must always be of the name of Alleyn or Allen, and who is lord of the manor wherein the building is situated; for six poor men, six women, and twelve boys. The latter, at proper age, are either sent to the university, or put out apprentices. The original revenues have been enlarged by subsequent donations, particularly in 1686, by Mr. Cartwright, a comedian and bookseller, who bequeathed all his library and pictures, with 400*l.* in cash, to the college. In 1750 lady Falkland left a bequest

bequeſt of 300*l.* Dulwich was formerly celebrated for its mineral waters, but theſe have either ſubſided or loſt their medicinal qualities. "Lyſon's Environs of London."

DUM *non ſuis compos mentis*, in *Law*, a writ that lies for one, who alienes any lands or tenements while not of ſound memory or judgment, in order to recover the ſame from the alienee, againſt whom the writ is taken. See LUNATIC.

DUM *fuit infra ætatem*, a writ which lies for him, who, before he came to full age, made a feoffment of his land, to recover it again of the vendee. Fitz. Nat. Br. fol. 102. See INFANT.

DUMA, in *Ancient Geography*, a large village of Paleſtine, in the ſouthern part of the tribe of Juda, upon the confines of the territory of the town of Eleutheropolis, according to Euſebius and Jerome.

DUMA, in *Geography*, a town of Arabia, in Neged, in a hilly country called Jot al Siran, between mount Schamer and Sham, or Syria.—Alſo, a town of Germany, in the kingdom of Weſtphalia, on a river of the ſame name, which ſoon after runs into the Wipper; 14 miles S.S.E. of Duſſeldorp.

DUMANDRE, ANTHONY, in *Biography*, ſculptor. He was born of a good family in Lorrain, and ſerved as a cadet in the army of Louis XIV. in the regiment of Picardy, together with his brother Hubert, with whom he alſo went afterwards to Paris, to ſtudy ſculpture, and thence into Spain, by the invitation of Philip V. His principal works are in the royal gardens of St. Ildefonſo, at Madrid, and at Aranjuez. On the eſtabliſhment of the academy of fine arts of San Fernando, at Madrid, in 1752, he was appointed directoſ. He died in 1761. Diccionario Hiſtorico de las Bellas Artes en Eſpana.

DUMANDRE, HUBERT, ſculptor and architect; the brother of Anthony Dumandre, laſt mentioned, whom he accompanied into Spain. Many works in the gardens of St. Ildefonſo are by him, as is alſo the ſepulchre of Philip V. in the collegiate church of the ſame place. He died at Madrid in 1781, at the age of 80. Diccionario Hiſtorico de las Bellas Artes en Eſpana.

DUMARING, in *Geography*, a town of the iſland of Borneo, on the eaſt coaſt. N. lat. 2° 10′. E. long. 117° 30′.

DUMATHA, in *Ancient Geography*, a town of Arabia, called by Ptolemy Dumætha, and placed in Arabia Petræa.

DUMB CANE, in *Botany*. See ARUM *Seguinum*, n. 26.

DUMBARTON, in *Geography*, the county town of Dumbartonſhire, or as it was anciently called, the Sheriffdom of Lenox, in the weſt of Scotland. The town of Dumbarton is ſituated at the confluence of the Leven with the Clyde, in N. lat 56°. W. long. 4° 32′.

When Britain was under the Roman government, this town formed the extreme poſt regularly occupied by the Roman legions to the weſtward: and the remains of the celebrated wall, built to prevent the inroads of the northern inhabitants, and ſtretching from Dumbarton acroſs the country towards Aberdeen, upon the eaſt coaſt, are ſtill to be ſeen on the chain of mountains near Dumbarton. The town is not of great extent, but well built of free-ſtone, and the principal ſtreet is in the form of a crescent, extending nearly from eaſt to weſt, along the north bank of the river Leven, which ſerves as a harbour to the town, and where veſſels of upwards of 200 tons burthen can diſcharge and receive their cargoes. The caſtle of Dumbarton is built upon an inſulated rock, about three quarters of a mile from the town, and is ſtill kept as a fortreſs, although in the modern art of war, it is not probable that it could reſiſt a ſiege of even twenty-four hours. In former times, however, it was conſidered a place of conſiderable importance, and before the improvements which have taken place within the laſt two centuries, would probably be deemed impregnable. A ſingular ſtory of its being taken by ſurpriſe is recorded; when the officer who commanded the party, which conſiſted only of one hundred men, after fixing the ſcaling ladders, which were placed in the middle of the night to the ſteepeſt part of the rock, aſcended laſt, one of his ſoldiers being ſeized with a giddineſs, either from terror or fatigue, became unable to proceed when far up the ladders. With an aſtoniſhing preſence of mind he was lashed to the ladder, until his comrades had effected their enterpriſe, when he was relieved without ſuſtaining any injury after the fort had ſurrendered. In the preſent ſtate of this country it is uſeful as a depot of arms, and is generally garriſoned either by detachments from the veteran battalions, or by ſkeleton regiments ſent home to recruit. It is well ſupplied with water, and the barracks are pleaſantly ſituated and commodious.

The town of Dumbarton is governed by a provoſt, magiſtrates, and common council conſiſting of fifteen members. It returns a member to parliament in conjunction with the city of Glaſgow, and borough towns of Renfrew and Rutherglen. The preſent member is Archibald Campbell, of Blythſwood, eſq. Formerly the noble family of Argyle was ſuppoſed to poſſeſs conſiderable influence in directing the affairs of this borough; and the preſent duke, when marquis of Lorne, and afterwards his brother, lord John Campbell, filled the office of provoſt or chief magiſtrate. This influence is now ſuppoſed to be upon the decline, and the direction of the borough is placed in other hands.

The trade of Dumbarton is not very extenſive; there are, however, very large manufactories of glaſs in the town, and very extenſive print fields upon both ſides of the Leven in the vicinity, which muſt circulate a large ſum of money annually in wages. A great deal of grain alſo is frequently imported from the north of Ireland, for the ſupply of the weſtern counties of Scotland.

The river Leven, although only about ſix miles in length from Lochlomond to its confluence with the Clyde, is deep and rapid. The water emptied from the lake is very pure and ſoft, and is uncommonly well calculated for bleaching, dyeing, printing, and other chemical operations. The Leven abounds with very fine ſalmons, the fiſhery of which is the property of the corporation of Dumbarton, and of ſir James Colquhoun of Luſs, bart. and yields to the proprietors a conſiderable annual revenue. The trout alſo are uncommonly fine and large.

The county of Dumbarton is bounded on the ſouth by the river Clyde, which divides it from Renfrewſhire, on the weſt by Loch Long, an arm of the friſh of Clyde, which extends about twenty-four miles, and forms the diviſion between Dumbartonſhire and Argyleſhire, and on the eaſt and north, by the counties of Renfrew, Lanark, Sterling, and Perth.

This county is neither very extenſive nor populous. By the account taken under the authority of the act of parliament, 1801, it is eſtimated to contain 1346 ſquare miles, and 20,710 inhabitants. The valued Scotch rental of the county, as fixed at the union, is 158,627 pounds Scots, of the value of twenty-pence ſterling each; and the real annual rent in ſterling money is computed at 109,700*l.* The laſt is probably too low at the preſent day, as the arable lands in this, as in moſt other counties, have riſen amazingly at the expiration of the reſpective leaſes, and even the moor and paſture grounds being much higher now than formerly. The population of the town of Dumbarton is eſtimated at 1850.

A great part of the lands of Dumbartonſhire are moor-

ſh and mountainous, but it alſo contains much good arable land, particularly in the eaſtern part, near Kilſyth, along the bank of the Clyde, and on the banks of Lochlomond. In theſe places, when the ſeaſon is favourable, the crops, if not ſo luxuriant as in ſome other parts of the iſland, are generally good and early; the agriculture has moſt rapidly improved of late years, and is now almoſt univerſally conducted in a judicious and induſtrious manner. The potatoes of moſt parts of Dumbartonſhire are particularly admired for their ſuperior quality. The eaſtern part of the county is plentifully ſupplied with coal and lime, but in the weſtern part, the exertions made to procure theſe valuable minerals have not hitherto been ſo ſucceſsful. The navigation of the Clyde, however, by affording water carriage at an eaſy rate, in a great meaſure counteracts this inconveniency.

The chief natural curioſity of Dumbartonſhire is Lochlomond, the beauty of which has been ſo univerſally admired, and made ſo often the ſubject of deſcriptive writing, that it ſeems unneceſſary to ſay much of it. Its length is about 24 miles, its greateſt breadth about 7 or 8 miles, and beſides the purenets and tranſparency of the water, the richly wooded iſlands with which it abounds, the romantic grandeur of the ſurrounding ſcenery, and the delightful ſeats and villas with which its banks are covered, form an aſſemblage of picturesque beauty rarely equalled.

The county of Dumbarton returns one member to parliament; the preſent member is Henry Glaſsford, eſq. of Dugaldſton. The electors are, as in the other counties of Scotland, freeholders; holding from the crown lands of the value of 400 pounds Scotch of valued rent or upwards. The number of thoſe qualified ſeldom much exceeds 30.

The chief landed proprietors are, the dukes of Montroſe and Argyle, lords Elphinſtone (lieutenant for the county,) Blantyre, and John Campbell, ſirs James Colquhoun of Luſs, and Charles Edmonſtone of Duntreath, Meſſrs. Ferguſon of Raith, Denniſtown of Colgrain, Buchanan of Ardenconnell, Buchanan of Auchintorlie, Hamilton of Barns, Buchanan of Ardoch, Glaſsford of Dugaldſton, Smollet of Bonhill, Graham of Gartmore, Creſs of Auchintoſhan, the Right Hon. Hay Campbell of Succoth, late lord preſident of the Court of Seſſion, and Archibald Colquhoun of Killermont, lord advocate of Scotland, general Giles of Gileſton, Aiſton of Weſterton, Ewing of Keppoch, Colquhoun of Camſtradden, Colquhoun of Garſcadden, and ſome others.

DUMBLANE, or Dunblane, a pariſh and town of Perthſhire in Scotland. The town appears to have originated from a cell of Culdees, which was eſtabliſhed here at an early period: ſubſequently a biſhop's ſee and cathedral were fixed and erected in this place. Of the latter, ſome remains ſtill ſtand to ſhew the ſite and ſtyle of the building. It ſtood on an eminence, cloſe to the river Allan, and was founded by king David in 1142. It is now unroofed and verging to decay; yet is venerably grand in its ruins. The choir is ſtill kept in repair, and uſed as the parochial church. The town contained, by the late population return, 493 houſes, and 2619 inhabitants. The pariſh extends about nine miles in length and ſix in breadth. Near Kippencroſs in this vicinity is a plane tree, one of the largeſt in Scotland; its girth being 72 feet. A few miles from Dumblane is Sheriff Muir, a place rendered famous by the battle fought in November 1715, between the royal forces under the duke of Argyle, and the rebel army, commanded by the earl of Marr.

DUMBNESS, in *Pathology*, *mutitas* of the noſologiſts, an inability of ſpeech, or of uttering articulate ſounds.

The power of ſpeech may be loſt, in conſequence of a palſy of the tongue and other organs connected with the modulation of the voice; or of a loſs of the tongue from cancerous ulceration, or from a wound. But in the condition, which is generally underſtood by the appellation of dumbneſs, the organs of the voice are not imperfect; the phyſical defect being altogether confined to the organs of hearing. Perſons in this condition, therefore, are *dumb*, only becauſe they are *deaf*; or, in other words, they are incapable of uſing language, the ſounds of which they have never been able to hear, and conſequently never could attempt to imitate. Thoſe who are born deaf, or become ſo from diſeaſe in early infancy, are, therefore, the only ſubjects of this unfortunate privation. See Deafness.

Of the two moſt important channels of knowledge, the ſenſes of ſight and hearing, a deprivation of the latter would ſeem, perhaps on a ſlight view, to be a leſs fatal impediment to the acquiſition of information, than the former; but when it is conſidered, that a want of the ſenſe of hearing involves with it the loſs of the principal medium of mental intercourſe, language, it becomes evident that the bar to intellectual improvement is by ſuch a deprivation doubly augmented. Hence a general opinion has prevailed, in all ages, that the deaf and dumb were cut off by nature from the acquiſition of knowledge, and they have therefore generally been abandoned to a ſtate of mental deſtitution, for which no remedy was believed to be diſcoverable.

> " Nec ratione ullâ docere, ſuadereque ſurdis
> Quid facto eſſet opus."
>
> Lucret.

> " T' inſtruct the deaf no art could ever reach,
> No care improve them, and no wiſdom teach."

It has been proved, however, by the attempts of ſeveral individuals, at different periods, in modern times, that this opinion is erroneous; and that it has either ariſen from a ſuperficial or miſtaken view of the means by which the mind acquires the knowledge of language, and of abſtract or general ideas, when the ſenſes are perfect; or from a conviction of the difficulties attending any attempt to imitate the ſame proceſs, when one ſenſe is ſhut up. It was from the latter conſideration probably, that Dr. Johnſon was induced to call the education of the deaf and dumb "a philoſophical curioſity."

The earlieſt eſſay at the education of theſe unfortunate beings appears to have been made in Spain, by Peter Ponce, a Benedictine monk, towards the end of the ſixteenth century, which was attended with ſucceſs, according to the authority of Valleſius (de ſacrâ philoſophiâ) and Antonio Perez. A countryman of his, Bonnet, ſecretary to the conſtable of Caſtile, whoſe younger brother had loſt the ſenſe of hearing when two years old, undertook a ſimilar taſk, and publiſhed a ſyſtem, which he formed on the occaſion, in 1620, and which he dedicated to Philip III. under the title of "Reduction de las letras, y arte para enſenar à trablar los mudns." The tuition of the deaf was ſubſequently treated of by Helmont, a German, in a very ingenious publication, entitled "Alphabeti verè naturalis Hebraici breviſſima Delineatio," printed at Salſburgh, in 1657; in which the author mentions the trial of his ſkill upon one pupil only, who became maſter of his vernacular tongue very expeditiouſly, and acquired the Hebrew of himſelf. But a more general reputation for this ſort of inſtruction was obtained by Amman, a Swiſs phyſician, ſettled in Holland, about 1690, in conſequence of his ſucceſs with the only daughter of Peter Kolard, a beautiful girl, born deaf. He publiſhed a ſmall treatiſe upon the ſubject in Latin, under the title of "Surdus loquens," in 1692; an enlarged edition of which appeared in 1700, with the title of "Diſſertatio de loquelâ."

About the same time our countryman Dr. Wallis, a man of extensive science and great acuteness, was led to pronounce, on speculation, the practicability of teaching the deaf to speak, and was prevailed upon, some years afterwards, to verify his theory in the tuition of Mr. Whalley, a young gentleman of Northampton. He fully succeeded in this essay, and also with a son of admiral Popham, and was afterwards employed in the instruction of other deaf and dumb pupils, but without teaching them to speak. He published an account of his "method of instructing persons Deaf and Dumb," in the Philosophical Transactions for the year 1698. Dr. Holder engaged in the same sort of tuition about the same period, but with less extensive practice and reputation than Wallis; and printed his "Elements of Speech," relating to this subject, in 1669.

Dalgarno, one of the schemers of an universal language, employed his pen next upon the tuition of the deaf and dumb, led to the subject not by practical instruction but philosophical disquisition: he examined the topic in an acute and learned performance, entitled "Didascalocophus, or the Deaf and Dumb Man's Tutor." The subject was also treated in a more general manner, as a speculative inquiry in a volume, with the title of "Philocophus, or the Deaf and Dumb Man's Friend," by a physician of the name of Bulwer, in 1648; and in "A Treatise concerning those that are born Deaf and Dumb," by George Sibscote, in 1670.

In more recent times this art has been successfully and extensively exercised by Father Vannin and Monf. Perreize, in Paris; by Mr. Heinich, in Leipsic; by Mr. Baker, in London; by Mr. Braidwood, in Edinburgh; by the Abbé de l'Epée; and at present by the Abbé Sicard, his successor, in Paris; and by Mr. Watson, formerly the assistant to Mr. Braidwood, now teacher in the asylum, for the support and education of the deaf and dumb children of the poor, instituted in London in 1792, as before mentioned. See DEAFNESS.

Although the attempts to lay down systems, and to inculcate the facility of educating the deaf and dumb have been numerous; yet so limited has been the circulation of these writings, (owing, perhaps, in a great degree to the general incredulity as to the practicability of the schemes,) that each of the earlier writers considers himself as original on the subject, being ignorant that his work had been preceded by others of a similar nature. Mr. Braidwood never published any account of his method of instruction: but the benevolent Abbé de l'Epée, and his successor, the Abbé Sicard, have given the world an ample account of their systems. The work of the former was translated into English in 1801, under the title of, "The Method of educating the Deaf and Dumb, confirmed by long experience, by the Abbé de l'Epée;" the volume of the latter, entitled, "Cours d'Instruction d'un sourd-muet de naissance, pour servir a l'Education des sourds-muets, &c., avec Figures et Tableaux, par Rochambroise Sicard," was printed at Paris in the year 1800.

The different teachers of the deaf and dumb have had two ends in view: the one was to teach the use of written language, and, through that medium, to enlighten the mind with various species of knowledge, and also to enable their pupils to converse by means of writing, or other symbols; and the other was to instruct them in the actual exercise of the organs of articulation, or to converse by speaking. Dr. Wallis, it would seem, succeeded in teaching the latter to his two first pupils; but, probably, for the same reason which has induced the Abbé Sicard to relinquish the task; *viz.* that the benefit to the deaf is by no means proportionate to the labour of acquiring *utterance*, he seems to have confined himself afterwards to the instruction of the mind. Mr. Braidwood, of Edinburgh, however, appears to have carried the difficult and laborious acquirement of *speech* in his pupils to a considerable degree of perfection, and to have enabled them to answer orally the oral propositions of others, which they discerned with surprising readiness, by watching the motions of the organs of speech of those with whom they conversed. But as they were unable, from the want of hearing, to modulate the voice, or correct the articulation nicely, their utterance is said to have been indistinct and discordant, and not always intelligible, like the first words of the infant, to those unaccustomed to hear it; and, in like manner, their understanding of the language of others, not habituated to their strongly marked motions of the tongue, lips, &c. was necessarily imperfect.

Mr. Braidwood is said to have been very desirous of transmitting his art to posterity, but alleged, that he could not communicate it so fully in writing as to enable any other person to teach it. The following imperfect outline of his method has been given by an eye witness of his instructions: His first step was to teach the pupil to pronounce the simple sounds of the vowels and consonants. He pronounced the sound of *a* slowly, pointing out the figure of the letter at the same time, and making his pupil observe the motion of his mouth and throat: he then put his finger into the pupil's mouth, depressed or elevated the tongue, and made him keep the parts in that position: then he took hold of the outside of the wind-pipe, and gave it some kind of squeeze, which it is impossible to describe: all the while he was pronouncing *a* the pupil was anxiously imitating him, but at first seemed not to understand what he would have him to do. In this manner he proceeded till the pupil had learned to pronounce the sounds of the letters. He then went on in the same manner to join a vowel and a consonant, till at length the pupil was enabled both to speak and to read. We have the authority of Mr. Pennant for stating, that Mr. Braidwood's pupils were not only taught the *pronunciation*, but perfectly to understand the *meaning* of what they read. Of this he mentions a striking example, in a young lady of about 13 years of age, who had been some time under the care of Mr Braidwood. "She readily apprehended all I said," he observes, "and returned me answers with the utmost facility. She read, she wrote well: her reading was not by rote; she could clothe the same thoughts in a new set of words, and never vary from the original sense." But we are not informed of the method or the nature of the signs by which the signification and construction of language were rendered intelligible to Mr. Braidwood's pupils.

The abbé de l'Epée, despising the secrecy and quackery of Heinich and Perreize, and not seeing the difficulty of exposition which occurred to Mr. Braidwood, published a minute account of his principles and practice in the tuition of the deaf and dumb; of which we shall endeavour to sketch the outline. The purport of such instruction, he observes, is to introduce into the minds of the pupils by *the eye*, what has been introduced into our own by *the ear;* that is, to teach by the use of visible signs or symbols, instead of audible ones. It is obvious that there is no natural connection between articulate sounds, and the ideas which they are employed to express; nor between the same ideas, and the written characters that are used to represent them. The variety of languages, as well as of alphabetical, cypheral, and symbolical writing, incontestibly proves the truth of this position. Both words and written characters are, therefore, arbitrary representatives of the objects of our senses, and of the ideas of the mind, agreed upon by national compact; and they convey no idea to those in whose mind they have not been associated, by habit, with the objects which they have been

been assumed to represent. Hence, to a person unacquainted with any language, or set of representative signs of ideas, it is as easy to teach one language, or one mode of writing, as another; and a written language may be taught, independently of an oral one, and *vice versâ*, by either of which the faculties of the mind may be fully exercised, and the stores of human knowledge laid open to its acquisition.

Now all language is taught, in the first instance, by sensible signs, with which the oral sound of the word is accompanied by the teacher. Thus a child learns to connect the idea of a well-known fruit, with the sound of the word *apple*, because he hears that word repeated when the fruit is shewn to him: and in the same manner he learns to associate particular words with every other object of the senses, by the habitual conjunction of the audible with the visible sign. Afterwards in learning to read or write, he acquires a similar habit of associating the appearance of certain visible signs or letters, with the same objects, or their oral representative signs; so that when the objects themselves are absent, the ideas of them may be recalled to his mind either by the *visible* signs, in written language, or their *audible* signs, in oral language.

It is clear, then, that although the deaf are excluded from receiving ideas by audible signs, yet it is as possible to instruct them by written characters, always accompanied by some sensible signs, as to instruct those who can hear, by words delivered orally, along with signs or gestures indicative of their signification. This, it is true, is a task of infinitely more labour than oral instruction, in which two senses combine to strengthen the association of words with things. But when it is recollected, how the acuteness of any one sense is increased, when the privation of another causes it to be greatly exercised, part of the difficulty will disappear: and experience has now amply demonstrated the practicability of the scheme. "I soon saw," says the abbé de l'Epée, "that a deaf and dumb person, under the guidance of a good master, is an attentive *spectator* who acquaints himself with the number and arrangement of the letters of a word presented to him, and that he retains them better than other children, to whom they are not yet become familiar by daily reiterated use."

The first part of the abbé's plan of tuition, then, consisted in instructing the deaf and dumb, by writing and the intervention of methodical signs, in various departments of knowledge. It was some time before he thought of attempting, what Amman had effected in Holland, Bonnet in Spain, and Wallis in England; namely, to make his pupils *speak*. This was first suggested to him by the work of Bonnet, before mentioned; and it is an enterprize, he says, that does not require great talents, but much patience. We shall first briefly shew his method of teaching written language, with a knowledge of its signification and grammatical construction; and afterwards his mode of teaching articulation, or speech.

In learning our native language, as we have already stated, a sign of the hand or the eye was the sole means by which we were taught to unite the idea of the objects with the sounds (their names) that struck our ear. Whenever we heard those sounds, the same ideas arose in our minds, because we recollected the signs made to us when they were pronounced. Exactly similar are the measures adopted with the deaf and dumb by the abbé de l'Epée. He commences with teaching them a *manual alphabet*, such as boys at school make use of to hold conversation at one end of a form with their companions at the other. Here the visible figure of the fingers, in different positions, is substituted for the audible sounds, which we connect with written letters in ordinary tuition: and the various figures of these letters strike forcibly the eyes of the deaf and dumb persons, who no more confound them, than we confound the various sounds that strike our ears.

He next writes in large characters, with a white crayon upon a black table, these two words, *the door*, and shews them the door. They immediately apply their manual alphabet five or six times to each of the letters composing the word *door*, (*i. e.* they spell it with their fingers,) and impress on their memory the number of letters, and the arrangement of them: this done, they efface the word, and taking the crayon themselves, write it down in characters, no matter whether well or ill formed; afterwards they will write it as often as you shew them the same object.

The same course is pursued with respect to every object pointed out to them, the name being previously written down. And experience has demonstrated, that a deaf and dumb person, possessing any mental powers, will acquire by this method upwards of eighty words in less than three days: in a very short time, therefore, the pupil will obtain a knowledge of all the words which express the different parts of our frame, from head to foot, as well as of those that express the various objects that surround us, if properly pointed out to him, as we write their names on the table, or on cards put into his hands.

The abbé begins early with verbs and little phrases, and not, as is usual, with the declension of nouns and pronouns, because it is more amusing to the pupils, and furnishes better means of developing their faculties. The first or second day he guides their hands, or writes for them the present tense of the indicative of the verb, *to carry*.

"Several deaf and dumb persons being round a table," he says, "I place my new scholar on my right hand; I put the fore-finger of my left hand on the word *I*, and explain it by signs in this manner: shewing myself with the fore-finger of my right, I give two or three gentle taps on my breast. I then lay my left fore-finger on the word *carry*, and taking up a large quarto volume, I carry it under my arm, on my shoulder, on my head, and on my back, walking all the while with the mien of a person bearing a load. None of these motions escape his observations.

"I return to the table; and in order to explain the second person, I lay my fore-finger on the word *thou*, and carrying my right hand to my pupil's breast, I give him a few gentle taps, making him notice that I look at him, and that he is likewise to look at me. I next lay my finger on the word *carriest*, the second person, and having delivered him the quarto volume, I make signs for him to perform what he has just seen me perform: he laughs, takes the volume, and executes his commission very well."

In this ingenious and patient manner the tutor goes through the various persons, singular and plural, both to the instruction and amusement of his pupils. Nevertheless, a small difficulty occurs in the outset. "The pupil, having his left fore-finger upon *I*, carries his right to my breast, thinking that my name was *I*, as he had seen me several times designate myself by that word." This the abbé ingeniously explains, by letting him see that every individual of the group denominates himself *I*. By following out the same plan with different words, the pupil will understand in a day or two every phrase composed of only one of the six persons of the present of a verb transitive with its objective, such as these: "I draw the table; thou draggest the chair; he offers an arm chair; you push the door; they shut the window:" because all these words express actions, of which the signs are caught in an instant; and because the eyes of the spectators testify that these operations are performed.

The abbé then proceeds with the articles, cases, numbers,

and genders of nouns, furnishing the pupil with signs which distinguish each of these properties that apply to nouns. Thus he is informed, by writing on the table, that *the*, *of*, *of the*, connect words as our joints do our bones: after this, the right fore-finger two or three times bent in the form of a book becomes the systematical sign for an article; and other signs are used for the cases, genders, &c.

"Names of qualities, as *good*, *great*, *wise*, *learned*," says the abbé, "infer necessarily some noun substantive, expressed or understood, to which they are applied: but if we consider the qualities only which are expressed, without reference to any noun substantive, then these qualities being subject to have other qualities applied to them, become themselves nouns substantive, as *goodness*, *greatness*, *wisdom*, *learning*. Our mode of expressing this sort of adjective is the following: if we would dictate the word greatness, for instance, we make the sign for *great*, which is an adjective; then we subjoin the sign for a substantive, which announces that this adjective is *substantified*, or made a substantive, and can itself receive other adjectives. I give several examples, after which my pupil will commit no mistake, either in reading a book, or in writing as we dictate to him."

In this manner the pupil is instructed in the various parts of grammar, in the "whole metaphysic of verbs," their numbers, tenses, and modes, in conjunctions, prepositions, &c. by a series of visible *signs*, not more arbitrary than the articulate and audible signs of speech. And the abbé has convinced many academicians and learned men, that the deaf and dumb are by these means rendered capable of understanding the grammatical difference of every word in the construction of language. He then proceeds to shew, 1, the fecundity of methodical signs arising out of the sign for the infinitive of the verb; and, 2, that there is no metaphysical idea, of which a very clear explanation may not be given by means of analysis, and the help of methodical signs.

In illustration of the first of these propositions, he observes that "the same operation or disposition of the mind, of the heart, of the body, &c. can be expressed by a verb, by a noun substantive, by a noun adjective, and sometimes by an adverb. Since the operation or disposition is the same, there must necessarily be the same radical sign, to which are joined other signs, to indicate, in verbs, the difference of their persons, their numbers, tenses, and modes; in nouns, whether substantive or adjective, their cases, numbers, and genders; and to characterize nouns adjective made substantive or adverbial.

"This radical sign is the sign for the infinitive of the verb. I take, for example, the verb *to love*, in all its parts, whether active or passive, with all the words derived from or related to it, such as *friendship*, *love*, *loved*, *lovely*, *loveliness*, *friend*, *lovelily*, *friendly*, *friendlily*, *lover*, *amateur*, &c. All these words have the same radical sign, that of the infinitive *to love*. It is executed by looking at the object in question, and pressing the right hand strongly upon the mouth, while the left is laid upon the heart; then carrying the right with fresh vivacity to the heart, conjointly with the left, and concluding with the sign for the infinitive. The pupil to whom I am dictating a lesson or a letter, must not mistake in the choice of any one of these words, which are upwards of two hundred and forty in number, comprising all persons, numbers, tenses, and modes of the verb active and passive; the cases, numbers, and genders of the nouns substantive and adjective, and the adverbs.

"If a part of a verb is to be dictated, I first make the sign for the personal pronoun, which carries along with it that for number; then the radical sign; and according to what is requisite, the signs for tense and mode.

"If I want to dictate *friendship*, I make the radical sign, accompanied by the sign for substantive, which will be enough to make it understood that such is the noun substantive I require.

"If *love* is the noun I want, I make the same signs as for friendship, only giving a greater degree of vivacity to my action on the mouth and on the heart, because love is more ardent than friendship.

"The word *beloved* is an adjective, agreeing both to masculine and feminine: the sign for adjective subjoined to the radical sign will suffice.

"Is *amiable* the word? I make the radical sign, then the sign for an adjective, but of one terminating in *able* formed from a verb: to this I must subjoin the sign for possible, or for necessary, as before laid down."

This exemplification is equally applicable to the infinitives of all verbs, and to the words derived from or related to them.

In illustration of the other proposition, the abbé remarks, that there is nothing which cannot be clearly signified by words; and that there is no word in any language, of which the signification may not become intelligible, by analysis, in using other words to a necessary extent: that is, every word signifies something, and is capable of being explained. "The procedure is the same with the deaf and dumb. We continue writing till we attain words, comprehended by signs, which illustrate what was obscure. Instances of being forced to have recourse to a second operation are rare; if they were frequent, it would prove that my ideas were not very clear, and that my expressions were ill chosen." In order to illustrate this point, he gives the following example.

There is perhaps no word more difficult to explain by signs than this, *I believe*. I effect the explanation of it in the following manner: having written upon the table *I believe*, I draw four lines in different directions, thus:

I believe
- I say *yes* with the mind. I think *yes*.
- I say *yes* with the heart. I love to think *yes*.
- I say *yes* with the mouth.
- I do not see with my eyes.

Which signifies, my mind consents, my heart adheres, my mouth professes, but I do not see with my eyes. I then take up what is written upon these four lines, and carry it to the word I believe, to make it understood that the whole is there comprised.

"If, after this explication, I have occasion to dictate the word, *I believe*, by methodical signs, I first make the sign for the singular of the personal pronoun, as I have shewn in its place: I next put my right forefinger to my forehead, the concave part of it being deemed the seat of the mind, that is, the faculty of thinking, and I make the sign for *yes*: after that, I make the same sign for *yes*, putting my finger to that part, which is commonly considered as the seat of the heart, in the mental economy, that is, our faculty of loving, (we have several times explained that these two faculties are spiritual, and occupy no space in reality:) I proceed to make the same sign for *yes* upon my mouth, moving my lips: lastly, I put my hand upon my eyes, and, making the sign for *no*, shew I do not see. There only remains the sign for the present to be made, and then I write down, *I believe*; but when written, it is better understood by my pupils than by the generality of those who hear. It is perhaps superfluous to repeat, that all these signs are executed in the twinkling of an eye."

In

In three ſeparate chapters, the Abbé explains, how ſpiritual operations, which are the objects of logic, may be explained to the deaf and dumb, how they are inſtructed in the firſt truths of religion; and how they may be initiated even into the myſteries of our religion, by the uſe of theſe methodical ſigns. In a word, by theſe means he enables the mind to develope its powers, and to enter into even the more abſtruſe operations of intellect, into grammatical, logical, and metaphyſical reſearch.

To a perſon unaccuſtomed to reflect on the ſources and means of improving the underſtanding, and not aware, that there is no actual connection in nature, between articulate ſounds and the ideas which they repreſent, or that viſible as well as audible ſigns, being alike arbitrary, may be equally aſſociated with ideas, by habit, this method of tuition may appear altogether fanciful and impracticable. But experience has demonſtrated its practical utility. M. Linguet, a member of the Royal Academy, having aſſerted that perſons thus inſtructed could be conſidered as little more than *automata*, was invited by the Abbé de l'Epée to be preſent at his leſſons. M. Linguet complied with the invitation, and the Abbé having deſired him to fix upon ſome abſtract term, which he would by ſigns communicate to his pupils, he choſe the word, *unintelligibility;* which, to his aſtoniſhment, was almoſt inſtantly written by one of them. The Abbé informed him, that to communicate this word, he had uſed five ſigns, which, though ſcarcely perceivable by him, were immediately and diſtinctly apprehended by his ſcholar. The firſt of theſe ſigns indicated an internal action; the ſecond repreſented the act of a mind that reads internally, or, in other words, comprehends what is propoſed to it; a third ſignified that ſuch a diſpoſition is poſſible; theſe, taken together, form the word *intelligible:* a fourth ſign transforms the adjective into a ſubſtantive; and a fifth, expreſſing negation, completes the word required. M. Linguet afterwards propoſed this queſtion, "What do you comprehend by metaphyſical ideas?" which being committed to writing, a young lady immediately anſwered on paper in the following terms: "I underſtand the ideas of things which are independent of our ſenſes, which make no impreſſion on our ſenſes, which cannot be perceived by our ſenſes."

On reading this account of a human being, raiſed from a ſtate of mental vacuity, little elevated above the brute, to a condition of high intellectual cultivation, and to the enjoyment of the beſt faculties and feelings of our nature, we cannot refuſe our aſſent to the ſplendid eulogy of the dramatic poet (M. Bouilly) in his "Comparative Eſtimate of Worth."

"*Science* would decide for D'Alembert, and *nature* ſay Buffon; *wit* and *taſte* preſent Voltaire, and *ſentiment* plead for Rouſſeau; but *genius* and *humanity* cry out for De l'Epée, and him I call the *beſt* and *greateſt of all*." Dram. of "Deaf and Dumb."

It remains that we ſay a few words reſpecting the method employed by the Abbé de l'Epée, in teaching articulation and utterance to his deaf and dumb pupils. The principle on which this inſtruction is conducted, is, the obſervation on the part of the pupils of the different poſitions and motions of the tongue, lips, &c. in the ſpeaker, which are connected in his mind with the words uttered, by ſeeing them written down at the ſame time on the table: the Abbé began his attempts to make a deaf and dumb perſon pronounce, by cauſing him to waſh his hands thoroughly clean. This done, the Abbé traced an *a* upon the table, and taking his pupil's hand, introduced it into his mouth, as far as the ſecond articulation; he then pronounced ſtrongly *a*, making the ſcholar obſerve, that his tongue lay ſtill, without riſing to touch his finger; he next follows the ſame courſe, pronouncing *e*. After theſe two operations, he put his finger into the pupil's mouth, making him underſtand that he is to do with his tongue, what the Abbé had done with his. The pronunciation of *a* is commonly effected without difficulty: that of *e* alſo ſucceeds for the moſt part; but the mechaniſm of it ſometimes requires two or three explanations. He proceeds in a ſimilar way with the remaining vowels; and then to the ſimple combinations of a conſonant with each, as *pa, pe, pi*, &c. firſt writing each ſyllable, and then teaching the pupil to obſerve and to imitate the movement and mechaniſm of the organs of articulation.

It is unneceſſary to detail the varieties of this proceſs through the different combinations of vowels and conſonants.

The principle is obvious. It ſometimes happens, however, in the firſt leſſons, that the pupils, having diſpoſed their organs for the pronunciation of a particular letter, remain, nevertheleſs, without utterance, becauſe they make no internal motion to expel air from the lungs. The Abbé pointed out the difference in the ſtate of his organs, when he did and did not utter ſound, by placing the pupil's hand upon his throat, by making him feel the concuſſion of air on the back of his hand, &c.; and if all this proved unſucceſsful, a pretty ſharp ſqueeze of the little finger would draw ſound from him by way of lamentation.

In the commencement of this kind of inſtruction, it is neceſſary, 1ſt, for the deaf and dumb ſcholar to be directly facing his teacher, in order that he may loſe none of the impreſſions given by the different modifications of the organs of ſpeech in the labial alphabet; 2dly, for the teacher to render theſe modifications as ſtrong as poſſible, that they may be the more perceptible; 3dly, for his mouth to be ſufficiently open, to leave the different movements of the tongue viſible; 4thly, for a ſlight pauſe to be made between the ſyllables of each word that the pupil is to write or pronounce. There is no neceſſity for the leaſt emiſſion of voice.

The deaf and dumb acquire very early a facility in comprehending the words uttered, from obſerving the motions of the ſpeaker's mouth, lips, and tongue; and "being, moreover, to the full as curious as other folks to know what is ſaid," the Abbé obſerves, "eſpecially if they ſuppoſe themſelves, or any thing intereſting to them, the ſubject, they devour us with their eyes, (an expreſſion hardly metaphorical here,) and, if not prevented by the precaution of turning from them to ſpeak, eaſily diſcover all we ſay. This is a poſitive fact, evidenced every day in the three houſes which are receptacles for theſe children, inſomuch that I always think it expedient to hint to perſons honouring us with viſits, to be cautious of uttering any thing before them not proper for them to underſtand. I confeſs, indeed, that they conjecture more than they diſtinctly perceive, when pains have not been taken to teach them the art of writing, ſolely by inſpection of the movement of the lips, without the help of any ſign.

"Before I had to inſtruct the multitude of deaf and dumb that have been ſucceſſively preſſed upon me," the Abbé adds, "my own application to the rules here laid down proved ſo effective, as to enable Lewis Francis Gabriel de Clement de la Prejade to pronounce, in public, a Latin diſcourſe of five pages and a half; and, in the enſuing year, to lay down a definition of philoſophy, detail proofs of its accuracy, and defend it in regular diſputation, anſwering, in all ſcholaſtic forms, the objections offered againſt it by Francis Elizabeth John de Didier, one of his fellow ſtudents: (the arguments were communicated.) I alſo enabled another deaf and dumb

dumb ſcholar to repeat aloud to his miſtreſs the twenty-eight chapters of the goſpel according to St. Matthew, and to recite the morning ſervice along with her every Sunday. Theſe two examples muſt be ſufficient."

But this is impracticable, he ſays, where there is a number of ſcholars to inſtruct: and the Abbé Sicard, his ſucceſſor, for the reaſon already ſtated, has ceaſed to teach articulation, contenting himſelf with the inſtruction by writing and ſigns.

DUMDAH, in *Geography*, a town of Hindooſtan, in the Ruttunpour country; 66 miles W. of Ruttunpour, and 112 E. of Nagpour.

DUMEE, Guillaume, in *Biography*, a French painter, who was one of thoſe who aſſiſted in executing the works in the Louvre, in the latter part of the 16th century.

DUMEIDSJ, in *Geography*, a town of Arabia, in the country of Yemen; 36 miles N.N.E. of Chamir.

DUMFRIES, a town in the ſouth of Scotland, ſituated on the river Nith, not far from where that river falls into the Solway frith. The town of Dumfries is airy and well built, and the country round it fertile and well cultivated. Upon the Nith are many beautiful and picturesque views, and many elegant manſions, the chief of which, perhaps, is the caſtle of Drumlanrig, the ſeat of the duke of Queenſbury. Dumfries, although not properly a commercial or manufacturing town, poſſeſſes ſome coaſting trade with the weſtern ports of Scotland, and thoſe ſituated in the north-weſt part of England. In general, its principal traffic conſiſts in articles of proviſion, and thoſe of common uſe, with which the inhabitants of the town and cultivators of the ſoil, reciprocally ſupply each other for mutual accommodation. Many woods in the neighbourhood of Dumfries have been felled of late, (chiefly thoſe of his grace of Queenſbury,) and this has occaſioned a conſiderable trade in timber. But this ſeems rather a tranſient than a permanent traffic.

Dumfries is governed like the other royal boroughs of Scotland, and along with the boroughs of Sanquhar, Annan, Lochmaben, and Kircudbright, returns a member to parliament. The preſent is ſir J. S. H. Maxwell, bart. For Dumfrieſhire, the member is the Hon. W. J. Hope.

Dumfrieſhire is fertile in the ſouth, and towards its northern extremity, which is barren and mountainous, abounds in iron ſtone and lead ore.

Dumfries, a port of entry, and poſt town of America, in Virginia, and chief town of Prince William county. It lies on the north ſide of Quamtico creek, 4 miles above its entrance into the Potowmack, and 10 miles from Colcheſter. Its public edifices are an epiſcopal church, a court-houſe, and a gaol; diſtant 23 miles N. by E. from Frederickſburg, and 185 S.W from Philadelphia.

DUMFRIESHIRE, a county of Scotland, ſituated on the ſouthern border of that province, where it unites with England: and is environed with the ſhires of Kircudbright, and Ayr to the weſt, Lanark, Peebles, and Selkirk to the north; Roxborough to the eaſt, and Cumberland and Solway-frith to the ſouth. This area of land meaſures about 60 miles from N.W. to S.E., and 30 in a tranverſe direction. It comprehends three diſtricts, or ſtewartries, *viz.* Annandale, Eſhdale, or Wauchopedale, and Nithſdale, which diviſions derive their reſpective names from the principal rivers in each. The chief part of this county is mountainous, particularly near the middle, and on its eaſtern borders, where the eminences are lofty, and aſſume a barren, ſterile appearance. They are moſtly covered with wild heath, and abound with game. Numerous flocks of ſheep and black cattle feed on them. The vallies are, however, fertile and pleaſant, and in theſe the chief towns, villages, and ſeats are ſituated.

In ancient times, this diſtrict is ſaid to have been inhabited by a tribe of the Cimbri, called *Selgovæ*, who were found here by the Romans when they eſtabliſhed the province of Valentia, which extended from Adrian's wall, between the rivers Tyne and Solway, to the wall of Antoninus, between the rivers Clyde and Forth. After the departure of the Romans, a new kingdom was eſtabliſhed by Ida, and the Angles in 547, and extended its government over the ſouthern and weſtern parts of Valentia. About the beginning of the ninth century, this was ſubjugated by the Picts and Scots, who eſtabliſhed themſelves here for a conſiderable length of time. Hence they made frequent irruptions into England. The ſituation of this county, on the immediate borders of each, rendered it a ſcene of perpetual hoſtility in the wars between the two kingdoms, and in the "Border Hiſtory," we find, that the inhabitants of this county and of Cumberland were ſubjected to repeated depredations, maſſacres, and all the horrors of ſavage cruelty, by their neighbouring enemies. See "Beauties of England," vol. iii. in the General Hiſtory of Cumberland, and more fully in Ridpath's "Border Hiſtory." In the notes to Walter Scott's poems are many particulars relating to theſe deplorable conflicts.

This county contains four royal boroughs, Dumfries, Annan, Sanquhar, and Lochmaben, ſeveral ſmall towns and villages, and is divided into 42 parochial diſtricts, containing in all 52,329 inhabitants. Dumfrieſhire contains many elegant ſeats, of which Drumlanrig, the ſeat of the duke of Queenſbury, is the chief: Comlongan-caſtle, the ſeat of the earl of Mansfield; Barjarg, the reſidence of Mr. Hunter; and Amisfield, the ſeat of the earl of Wemyſs; are alſo fine manſions. Few counties in Scotland poſſeſs more valuable, or more numerous minerals than Dumfrieſhire. The hills, which border on Clydeſdale, contain valuable lead mines, ſome of which are very rich in ſilver; and many other parts of the county poſſeſs mines of the ſame metal. Coal and lime-ſtone are found in ſeveral pariſhes: excellent free-ſtone is alſo abundant. In the pariſhes of Penpont, Kirkmichael, and Canoby, are indications of iron; in Langholm copper is wrought; and in Weſterkirk, on the eſtate of ſir James Johnſtone, a valuable mine of antimony has been lately diſcovered. Much of the lime-ſtone receives a poliſh equal to the fineſt marble, and many of the ſprings contain a ſmall quantity of lime, giving them a petrifying quality. Beſides the mineral ſprings of Moffat and Hartfell Spaw, there are many wells, which contain metallic or mineral impregnation. The rivers abound with trout and ſalmon, and on the ſhores of the Solway Frith the polype or animal flower is frequently found. In addition to the animals common to other parts of Scotland, it may be mentioned, that at Drumlanrig are ſtill to be ſeen a few of the wild cattle which anciently inhabited the woods of Scotland. Sinclair's Statiſtical Account of Scotland.

DUMME, a river of Germany, in the circle of Upper Saxony, and marquiſate of Brandenburg, which runs into the Jetze at Wuſtro.

DUMMER, a townſhip of America uninhabited, in Grafton county, New Hampſhire, incorporated in 1773, S.W. of lake Umbagog, on the waters of Upper Amonooſuck.

Dummer See, *the*, or *Dummer Lake*, is a lake of Germany, in the former biſhopric of Munſter, which at preſent conſtitutes a part of the new kingdom of Weſtphalia. It is five miles in length, and two miles and a half in breadth, and adjoins the county of Dipholtz, and the former biſhopric of Oſnabruck.

DUMMERSTOWN, a township of America, in Windham county, Vermont, N. of Brattleborough, containing 1692 inhabitants.

DUMMOODA, a river of Hindoostan, which runs into the Hooglv; 28 miles below Calcutta.

DUMNA, in *Ancient Geography*, an island placed by Ptolemy and Pliny in the northern ocean. Ortelius conjectures, that it is either the present isle of Hoy, or that of Ways.

DUMNII. See DAMNII.

DUMNONII. See DAMNONII.

DUMONT, JOHN, in *Biography*, baron Carleseroon, an historical and political writer, flourished at the end of the 17th and beginning of the 18th centuries. After various changes in life, in France and in Holland, he became historiographer to his imperial majesty. He died about the year 1726. His principal works are, "Memoires Politiques pour servir a l'Inteiligence de la Paix de Ryswick," 4 tom. 12mo. "Voyages en France," &c. 4 tom. 12mo. "Corps universal diplomatique du Droit des Gens," 8 tom. folio. This contains all the treaties of alliance, peace, and commerce, from the peace of Munster to 1709. "Lettres Historique depuis 1652," jusqu'en 1710.

DUMONT, N., a French painter of some merit; surnamed *the Roman*. He died at Paris, in a very advanced age, in 1781.

DUMOSÆ, in *Botany*, the nineteenth natural order in the Philosophia Botanica of Linnæus, and the forty-third of the Prelections. In the Philosophia Botanica it consists of the following genera, Viburnum, Tinus, Opulus, Sambucus, Rondeletia, Bellonia, Maurocenia, Cassine, Rhus, Cotinus, Celastrus, Euonymus, Ilex, Tomex, Prinos, Callicarpa, Lawsonia. In the synoptic table of the Prelections, p. 499, the genera stand thus. Sideroxylon, * Bumelia *Swartz*, Rhamnus, Phylica, Ceanothus, Büttneria, Chrysophyllum, Achras, Prinos, Ilex, Callicarpa, Euonymus, * Rochefortia *Swartz*, Celastrus, Cassine, Viburnum? β. Sambucus? γ. Rhus, Schinus, Fagara. Those marked with an asterisk are inserted by the editor Dr. Gifeke. The rest agree with Gen. Plant. except that Büttneria is added and Tomex omitted. By comparing these two lists we find a strong confirmation of Linnæus's own declaration in Gen. Plant. that he was not satisfied with this order, and that it required further examination. The name was taken from *dumus*, a thicket, because the plants are chiefly shrubs, or low bushy trees, such as form thickets. They are generally of a purgative, dangerous, or highly virulent nature, particularly some species of Rhus. The order having been confessedly left in so uncertain a state by its author, it is in vain to seek for any technical characters by which to define it, and unnecessary to shew how ill, in some points, it is assorted.

DUN, in *Geography*, a small town or France, in the department of the Creuse, chief place of a canton, in the district of Guéret, with a population of 1057 individuals; its canton has a territorial extent of 295 kiliometres, 13 communes, and 13,176 inhabitants.—Also, a small town of France, in the department of the Meuse, chief place of a canton, in the district of Montmedy, situated on the river Meuse, 9 miles S. of Stenay. It has only 988 inhabitants; but its canton contains 18 communes, and a population of 8388 individuals upon a territorial extent of 192½ kiliometres.

DUN *sur Auron*, a small town of France, in the department of the Cher, called, till the year 1792, Dun le Roi, Dunum Regis. It is the chief place of a canton, in the district of St. Amand, on the river Auron, 21 miles S.E. of Bourges, 30 miles S.W. of Nevers, and 192 miles S. of Paris. The number of its inhabitants amounts to 2710; its canton has an extent of 305 kiliometres, and 13 communes, with a population of 7868 individuals.

DUN, in the *Manege*, a colour partaking of brown and black.

DUNA, in *Geography*, a river of Russia, named "Sapadnaia Dvina," and by the Lithuanians Daugava, derives its origin from a lake in the government of Tver, at Biala, not far from the sources of the Volga, pursues its course through this and the government of Pscove, constitutes the boundary between the government of Polotzk and Riga, the republic of Poland, and the duchy of Courland, and falls not far from Riga, at Dunamunde, into the Baltic. In its course, it receives several smaller rivers, as the Toroptzn, the Evest, the Oger, and the Yagel, and from Courland the Bulder-Aa. The Duna is navigable through its whole course from the uppermost regions, facilitating the commerce from several governments, and from Poland and Courland, to an uncommon degree. It has, however, one inconvenience, that near Dunamunde, it has many shoals, which increase every year, and vary their positions, and those occasion much difficulty in the navigation. Besides, in the Dunaburg circle there are several falls, the shooting of which is attended with great difficulty and danger. Of these falls some reckon as many as fourteen. The constant defection of the water in summer renders the voyage still more difficult and dangerous, and on the early access of autumnal frosts utterly impossible. At Riga, the Duna is 900 paces broad. Here annually, in April, a bridge of pontoons is thrown across it, and fastened by poles, except the part that opens to let the ships go through, which is fixed to anchors. In November the river is generally covered with ice, which, in March or April, again breaks up. The frost not unfrequently makes the river passable on foot in the space of 48 hours. The bridge is then taken away, and safely laid by in a small arm of the river, called the "Soedgraben." Through the whole summer, the great number of ships of all nations, that lie close to the bridge on both sides, exhibits a fine sight. The Duna is the port of Riga. In the spring season the ice, which drives hither from Lithuania, stops the current about the town and towards the sea; and the outlet being thus stopped, and the accumulation continually augmenting, the most destructive inundations occur. The salmon of the Duna are the best and dearest in Livonia. This river has, in general, a sandy and clayey shore, and a discoloured water.

DUNABURG, or DUNEBURG, a small town of that part of Poland which fell to the share of Russia, at the final partition of Poland in 1795. It was one of the principal places in the Livonian palatinate, called, in the Polish language, Woiewodztwo Inflantskie. The provincial diets used to be held in this town.

DUNAMASE, in the Queen's county, Ireland, about four miles from Maryborough, forms a very conspicuous object from a great distance. Its name, which imports *the fort of the plain*, evinces it to have been considered and used as a place of strength in the earliest ages: the plain is what is called *the great heath*, nearly surrounding it. This rock is an elliptical cone, and inaccessible on all sides, except to the east, which, in its improved state, was defended by the Barbican. D. Ledwich gives two plates, and a minute description of this place, in his "Antiquities of Ireland," for the purpose of illustrating the fortification of that day. It was for a long time a great check on the Irish, but from the time of Edward II. when lord Mortimer resided there, to the final subjugation of Ireland, it was often dismantled

mantled and rebuilt. It was effectually deſtroyed by colonels Hewſon and Reynolds in 1650, and has continued in ruins ſince that time. Ledwich.

DUNAMUNDE, a ſmall town of Ruſſia, in the government of Riga, about 10 miles from that place, at the mouth of the river Duna, with a ſtrong caſtle, where the ſhips, which come from the Baltic into the river, pay a toll. It was taken by the Ruſſians from the Swedes in 1710.

DUNAN Point, a cape on the S.W. coaſt of the iſland of Skye. N. lat. 57° 3′. Long. 3° 5′. W. of Edinburgh.

DUNANE, in the Queen's county, province of Leinſter, Ireland, a place where there is an extenſive colliery, the coals of which are preferred to thoſe of Caſtle-comer. The coal is of the kind called Kilkenny coal, the *coal-glance* of Jameſon. Dunane is amongſt the Sliebh-margy mountains, about 6 miles weſt from Carlow, and about 40 miles S. W. from Dublin. Beaufort.

DUNAVEZ, or Dunavitz, *Dunavetz*, *Dunajetz*, a ſmall town of Auſtria, on the limits of Gallicia and Hungary, ſituated on the river Dunavetz, which flows from the Carpathian mountains into the Viſtula. It is on the road from Preſburg to the famous ſalt mines of Wieliczka in Gallicia, and it is the largeſt town in that part of the country. Articles of every kind are expoſed in the ſtreet for ſale on Sundays, and give it the appearance of a fair.

DUNAX, in *Ancient Geography*, a mountain of Thrace, according to Strabo; called Donuca by Livy; it is the moſt elevated part of mount Rhodope.

DUNBAR, William, in *Biography*, an eminent Scottiſh poet, was born, according to Mr. Warton, in 1470, but according to Mr. Pinkerton, in 1465, at Salton, a village on the coaſt of the Forth in Eaſt Lothian. He entered as a travelling noviciate of the Franciſcan order; but he afterwards became diſſatisfied with this condition, and relinquiſhing it, ſettled in Scotland about the year 1490. Here he acquired celebrity as a poet; but he does not appear to have gained any benefice, though he ſeems to have deſired it. The courſe of his life, which is unknown, was terminated in the year 1530. His poetical pieces were numerous; they were partly ſerious and partly comic, and manifeſt readineſs of invention, great energy, and richneſs of deſcription. One of his chief poems is the "Triſtle and Roſe," which is a kind of viſion, abounding in imagery, and written on occaſion of the marriage of James IV. of Scotland with Margaret, daughter of Henry VII. of England. His "Golden Terge," is a moral allegory, exhibiting the ſhield of reaſon reſiſting the attacks of the amorous paſſion. One of his large pieces is the "Dance," which is a viſion of heaven and hell in a comic ſtyle. Many more of his pieces are printed in the collection of ancient Scottiſh poems, by ſir David Dalrymple, in 1770. Dunbar is ſaid to have derived his poetic taſte from the works of Chaucer, Gower, and Lydgate, but to have improved upon their manner. His language is the Scots dialect of thoſe times, much reſembling the Engliſh. Biog. Brit.

Dunbar, in *Geography*, a pariſh and royal borough in the county of Haddington or Eaſt-Lothian, Scotland. The former comprehends an area of about nine miles in length from E. to W. by two miles from N. to S. The ground riſes gradually from the ſea coaſt, and the land is eſteemed ſome of the moſt fertile in Scotland, which induced Mr. Pennant to call this diſtrict the Northamptonſhire of North-Britain. It is well cultivated, and produces large crops of wheat, barley, and beans; with ſmaller crops of oats, clover, rye-graſs, turnips, and potatoes. Two large roperies are eſtabliſhed on the coaſt. This pariſh is famous from containing the encampment which was occupied by general Leſlie and the Scots army, who were defeated by Cromwell.

The borough is ſeated on a rock near the ſea, which here forms a ſmall bay or harbour. The eaſt pier of this was begun during the protectorſhip of Oliver Cromwell, who gave 300*l* towards defraying the expence. Since that time it has been much improved; it is ſafe but ſmall, and its entrance narrow. It is defended by a battery of 12 guns. The chief trade of this place is the exportation of corn, of which there are on an average about 10,000 quarters annually ſhipped off. Here is a ſmall dry-dock; and ſeveral fiſhing boats are annually fitted out from this town. Attached to the port are 18 veſſels of 2180 tons burthen employed in the coaſting trade, beſides 12 fiſhing boats.

The ruins of the caſtle are ſtill conſiderable. It ſtands on an elevated rock impending over the ſea. It has been a fort of great ſtrength, and the ſcene of many important tranſactions. "In 1567 it was in the poſſeſſion," ſays Pennant, "of the infamous earl Bothwell, who here committed the ſimulated outrage on the perſon of the fair Mary Stuart. Here alſo the earl retreated after being given up by his miſtreſs at the capitulation of Carberry-hill." Edward II. took ſhelter within its walls in his flight from Bannockburn. In 1336, it was moſt courageouſly defended by Agnes, counteſs of March; who in the abſence of her huſband was beſieged by lord Monteagle and his troops, but they were obliged to raiſe the ſiege and leave the country. Here are ſtill preſerved ſome of the famous Scotch pikes, ſix ells long.

Between the harbour and caſtle, is a ſurpriſing ſtratum of ſtone, which, in ſome reſpects, reſembles that called the Giant's-cauſeway in Ireland. It conſiſts of great columns of red grit, either triangular, quadrangular, pentangular, or hexangular: their diameter from one to two feet, their length, at low water, thirty feet, and they dip, or incline a little to the ſouth. They are jointed, but not ſo regularly, or ſo plainly, as thoſe of the Giant's cauſeway. This range of columns faces the north and extends about two hundred yards in front. The breadth is inconſiderable; the reſt of the rock conſiſts of ſhapeleſs maſſes of the ſame ſort of ſtone irregularly divided by thick ſepta.

Beneath the caſtle is a vaſt cavern, partly natural and partly artificial; and near it are two "natural arches through which the tide flowed."

Dunbar is now a reſpectable, well built town, and is ſupplied with good water conveyed in pipes from ſprings about two miles diſtant. The borough is governed by a provoſt, three bailiffs, a dean of guild, treaſurer, and 15 counſellors. It joins with Haddington, North-Berwick, Lauder, and Jedburg, in ſending one member to parliament. It is nearly equidiſtant from Edinburgh and Berwick; being 27 miles from each. In the town are two convents; one for Mathurines, and the other for Carmelites. In the church is a magnificent monument, to the memory of ſir George Hume, earl of Dunbar, "the worthieſt and beſt Scotch miniſter of James VI." He died Jan. 29, 1610. Sinclair's Statiſtical account of Scotland, and Pennant's Tour in Scotland, vol. i.

DUNBARTON, a townſhip of America, in Hillſborough county, New Hampſhire, incorporated in 1765, and containing 1222 inhabitants; nine miles S. of Concord, and 36 W. of Portſmouth.

DUNBEATH, a river of Scotland, in the county of Caithneſs, which runs into the German ocean, eight miles N.E. from the end of Caithneſs.

DUNCAN, Daniel, in *Biography*, an eminent phyſician, born at Montauban, in Languedoc, in 1649, was the ſon of Dr. Peter Duncan, profeſſor of phyſic in that city, and grandſon

grandſon to William Duncan, an Engliſh gentleman, of Scottiſh original, who removed from London to the ſouth of France about the beginning of the 17th century. Having loſt both his parents in his early infancy, he was taken under the protection of his mother's brother, Mr. Daniel Paul, a counſellor of the parliament of Thouloufe, though a firm and profeſſed Proteſtant. Inſtructed in the firſt elements of grammar, polite literature, and philoſophy at Puy Lauren, where the univerſity of Montauban then ſubſiſted, he was removed by his uncle to Montpellier, and placed under the immediate inſtruction of Dr. Charles Barbeyrac, whoſe phyſical lectures and practice were in high reputation. Under this excellent maſter, who diſtinguiſhed him by his eſteem and friendſhip, he purſued his ſtudies for eight years, and at the age of 24 he was admitted to the degree of M. D. in that univerſity. He afterwards reſided ſeven years at Paris; and here he publiſhed his firſt work, upon the principle of motion in the conſtituent parts of animal bodies, entitled, "Explication Nouvelle et Mechanique des Actions Animales," Paris 1678. In the following year he viſited London, for the purpoſe of tranſacting ſome family concerns, and of obtaining information concerning the effects of the plague in London, in 1665. He alſo availed himſelf of this opportunity for collecting vouchers to the reſpectable rank which his family had borne in Scotland and in England; with a view of juſtifying his claim to the letters of nobleſſe, which had been conceded to him in France, at a time, *viz.* in 1677, when, by favour of the great Colbert, he was appointed phyſician general to the army before St. Omer's, commanded by the duke of Orleans. During his ſtay of two years in London, he printed a Latin edition of his "Theory of the Principle of Motion in Animal Bodies." His inclination to ſettle in London was diverted by a ſummons which he received from Paris in 1681, to attend his patron Colbert, whoſe health waa then beginning to decline. He does not ſeem, however, to have entertained a very high opinion of the mode in which the practice of medicine was then conducted in London; as we may conclude from a MS. upon "the prevailing abuſes in the eſtabliſhed practice of Phyſicians and Apothecaries in different parts of the World." Soon after his return to France, he publiſhed in three parts a popular work, entitled "Chymie Naturelle, ou Explication Chymique et Mechanique de la Nourriture de l'Animal," a ſecond edition of which appeared at Paris in 1687. In this year he publiſhed alſo his "Hiſtoire de l'Animal, ou la Connoiſſance du Corps; animé par la Mechanique et par la Chymie." Upon the death of Colbert, in 1683, he left Paris, and went to Montauban, in order to ſettle his affairs, and to prepare for taking up his final abode in England. His friends, however, prevailed upon him to continue in his native city. But the perſecution which raged againſt the Proteſtants with great violence in 1690, obliged him to retire firſt to Geneva, and afterwards to ſettle for about eight or nine years at Berne, where his medical practice was conſiderable, and where he had the charge of a profeſſorſhip of anatomy and chemiſtry. In 1699 he was ſent for to Caſſel by Philip, landgrave of Heſſe, and remained as his domeſtic phyſician for three years. Under the hoſpitable roof of this prince, he wrote his treatiſe upon the "Abuſe of hot Liquor," with a particular view to the caſe of the princeſs of Heſſe, who had indulged in the exceſſive uſe of tea, coffee, and chocolate, and who was then in ſo feeble a ſtate as to incline to a conſumption. Although he condemned exceſs, he allowed the prudent uſe of them, particularly to perſons of a phlegmatic conſtitution. This work, which was at firſt circulated in MS., was afterwards, by the perſuaſion of his friend Dr. Boerhaave, printed firſt in French, under the title of "Avis ſalutaire à tout le Monde, contre l'Abus des Liqueurs chaudes, et particulierement du Caffé, du Chocolat, et du Thé," Rotterd. 1705. In the following year it was printed in Engliſh, at London. During his abode at Caſſel he contributed to the relief of thoſe Proteſtants, who were obliged to abandon France on account of the perſecution they ſuffered, and to ſeek an aſylum in Brandenburgh. The fame of his liberality reached the court of Berlin, and he was invited thither by the reigning prince; but though he met with great encouragement as profeſſor of phyſic and phyſician to the royal houſehold, a regard to his health and to economy obliged him to remove, in 1703, to the Hague. He continued here about 12 years, during which period he was induced by Dr. Boerhaave, to publiſh a Latin improved edition of his Natural Chemiſtry, entitled "Chymiæ Naturalis Specimen, quo planè patet nullum in Chymicis officinis proceſſum fieri, cui ſimilis, aut analogus in Animalis Corpore non fiat." Amſtel. 1707. At this time he commenced a correſpondence with Dr. Mead, on a variety of ſubjects immediately connected with his profeſſion. In 1714 he accompliſhed the purpoſe which he had always in contemplation, of ſettling in London: but juſt before he left the Hague, he ſuſtained a ſtroke of the palſy, which alarmed his friends, though it was attended with no permanent injury to himſelf. As it had been his declared intention, if providence extended his life to the age of 70, to devote the remainder of his days to the gratuitous ſervice of thoſe who ſought his advice, he attained that age in 1719, and fulfilled his intention during the laſt 16 years of his life. To the rich who conſulted him, from whom he peremptorily refuſed to take a fee, he uſed to ſay with a ſmile, "The poor are my only paymaſters now; they are the beſt I ever had; their payments are placed in a government fund that can never fail; my ſecurity is the only KING that can do no wrong;" alluding to the loſs he ſuſtained in 1721, of a third part of his property by the South-ſea ſcheme. He left behind him a great number of MSS., moſtly phyſical, ſome upon religious ſubjects, and one containing many curious anecdotes of the hiſtory of his own times. Among his phyſical MSS. the moſt conſiderable is a Latin treatiſe upon contagious diſtempers, to which is prefixed a very ample diſſertation upon the plague, &c. which appears to have been written in the year 1679. Dr. Duncan was in his converſation eaſy, cheerful, and intereſting; in his diſpoſition ingenuous and benevolent; and in his religious profeſſion, a ſincere Chriſtian and a zealous proteſtant. He died at London, April 30, 1735, aged 86. His only ſon, the Rev. Dr. Daniel Duncan, was the author of ſome religious tracts, and died in June, 1761, leaving behind him two ſons, both clergymen; one of whom, *viz.* Dr. John Duncan, has "ſuſtained the honour of his family, in the reſpectability of his character, in the liberality of his mind, and in his ingenious and valuable publications, both as a poet and divine." Biog. Brit.

DUNCAN, WILLIAM, was born at Aberdeen in the year 1717, where he received the greater part of his education. When he had finiſhed the ordinary courſe of philoſophy and mathematics, he was admitted to the degree of M. A. He now ſtudied very diligently theology under the profeſſors at Aberdeen, with a view, probably, of engaging in the Chriſtian miniſtry, which, upon more mature deliberation, he afterward thought proper to abandon. He then removed to London, and was employed in many literary undertakings, particularly in tranſlations from the French language. He is ſuppoſed likewiſe to have had a large ſhare in the tranſlation of Horace, which was publiſhed under the name of Watſon. His talents as a tranſlator were

highly appreciated; and the expectation of the public was fully anſwered in his verſion of the Select Orations of Cicero accompanied with notes. He next publiſhed "The Elements of Logic," which have obtained a high reputation, and which were originally written for Dodſley's Preceptor, publiſhed in 1748. In the year 1752 he publiſhed a tranſlation of Cæſar's Commentaries, which was at firſt given to the public in the folio ſize, but has ſince appeared in 8vo. This work is at once faithful and elegant, and is rendered more valuable by an introductory treatiſe on the Roman art of war. About the ſame time Mr. Duncan was appointed by the king profeſſor of philoſophy in the Mariſchal college of Aberdeen. The duties of this office were confined chiefly to the illuſtration of the principles of natural and experimental philoſophy. In this department, though not the favourite purſuit of his life, he highly diſtinguiſhed himſelf. The labour was, however, more than adequate to his ſtrength, and he began rapidly to decline in health. He died in 1760, in the forty-third year of his age; leaving behind him an excellent character as a man of learning, and exemplary in all the duties of life. Biog. Brit.

Duncan's *Bay*, in *Geography*, a bay on the N. coaſt of the iſland of Jamaica. N. lat. 18° 31′. W. long. 77° 31′.

DUNCANNON, a fort in the county of Wexford, near the entrance of Waterford harbour, and 20 miles ſouth from New Roſs. It is at preſent uſed as a barrack.

DUNCANSBOROUGH, a townſhip of America, in Orleans county, Vermont, on the weſt ſide of lake Memphremagog, containing 50 inhabitants.

DUNCANSBY Head, a cape of Scotland, at the N.E. extremity of Great Britain, in the county of Caithneſs. N. lat. 58° 33′. E. long. 0° 19′.

DUNCARD's Bottom, a tract of fine lands in America, on the E. ſide of Cheat river, in Virginia, about 22 miles from its mouth, and 49 W.S.W. from fort Cumberland.

DUNCHURCH. See Dimchurch.

DUNCOMBE, William, in *Biography*, was born in London in the year 1690. After the uſual ſchool education, he was entered at the age of ſixteen as a clerk in the navy office. His taſte for polite literature was firſt known to the public by the appearance of a tranſlation of an Ode of Horace. He next publiſhed a verſion of the "Carmen Seculare," which was ſoon followed by one of "Racine's Athaliah." In 1725, he quitted the navy-office, and devoted himſelf wholly to a life of literary leiſure. In the following year, he married the ſiſter of Mr. Hughes, the poet, and ſpent the remainder of a long life in virtuous and innocent purſuits, and in friendly intercourſe with ſome of the moſt reſpectable characters, among whom were the earl of Cork and archbiſhop Herring. He died in 1769. His principal works were the tragedy of "Brutus" altered from Voltaire: and with the aſſiſtance of his ſon, an entire verſion of Horace, with notes, in two volumes, but which came out in 1764 in four volumes, 12mo. Biog. Brit.

Duncombe. John, ſon of the preceding, was born in 1729; and at the age of ſixteen entered himſelf at Corpus Chriſti College, Cambridge, where he was diſtinguiſhed by the regularity of his conduct, and by his great proficiency in polite literature. He became fellow of his college, and afterwards took orders, and obtained valuable preferments in the church. He was a good poet, and was the author of many pieces which have appeared in the collections of Dodſley, Pearch, and Nichols, and ſome in a ſeparate form. Of theſe the beſt known is "The Feminead," a commemoration of feminine excellence. He furniſhed papers and eſſays, in a variety of periodical publications. He publiſhed three Sermons, and ſome antiquarian papers in the Bibliotheca Topographica, and was editor of "Sir Hugh's Correſpondence;" "The earl of Cork's Letters from Italy;" and "Archbiſhop Herring's Letters." He died in 1788. Biog. Brit.

DUNDALK, in *Geography*, a market and poſt town of the county of Louth, in Ireland. It is a large ancient and thriving town, with a wide ſtreet, nearly a mile long, and a good market houſe. It is alſo the county town. In the reign of Edward II. it was, for a ſhort time, the reſidence of Edward Bruce, who was there crowned king of Ireland. It is advantageouſly ſituated for an extenſive inland trade; and the port is very ſafe for ſhipping. The only cambrick manufacture in Ireland is carried on in this town. It returns one member to the Imperial parliament. Dundalk is on the great northern road, 40½ miles N. of Dublin. Long. 6° 23′ W. Lat. 53° 59′ N.

DUNDAS, a county of Upper Canada, bounded on the E. by the county of Stormont, on the S. by the river St. Lawrence, and on the W. by the eaſternmoſt boundary line of the late townſhip of Edwardſburgh, running N. 24° until it interſects the Ottawa, or Grand river; thence deſcending that river till it meets the north-weſternmoſt boundary of the county of Stormont. This county comprehends all the iſlands near it in the river St. Lawrence. The boundaries were ſettled by proclamation July the 26th, 1792. It ſends one repreſentative to the provincial parliament. Morſe.

DUNDEE, a town in the county of Forfar or Angus, ſituated on the north bank of the Tay, not far from its confluence with the German ocean. The town of Dundee is well built, and, like moſt other Scotch towns, chiefly of freeſtone; it alſo contains ſome handſome public buildings. The etymology of its name has been ſaid to be taken from the Latin words *donum Dei*, an appellation ſaid to have been given by a brother of William I. of Scotland to a church which he erected here upon his return from a cruſade. But this ſeems at leaſt very doubtful, for the Roman names of many towns in Britain, occupied by their legions, while in poſſeſſion of the iſland, terminate in *dunum*, and to this day, whether derived from this ſource or not, the ſyllable *dun*, with which ſo many of the names of the Scottiſh towns commence, means in the Gaelic a fort, caſtle, or town. The diſtinction between theſe, in rude times, was probably not much attended to, as all the towns, during the prevalence of the feudal ſyſtem, were more or leſs fortified. The caſtle of Dunglaſs in Dumbartonſhire, which is generally ſuppoſed to have formed the laſt Roman poſt at the weſtern extremity of the wall of Adrian, ſignifies the *grey caſtle*, and from analogy it is not unreaſonable to ſuppoſe that the fort, town, or caſtle of the Tay, may have been the original meaning of the word Dundee, more eſpecially as the letter D is generally ſounded by the Highlanders, as well as the Germans, like that which the Engliſh give to the letter T. Indeed one of the Roman names of this town is ſaid to have been Tawdunum.

The harbour of Dundee is very good, and capable of containing a great number of veſſels, and a conſiderable tonnage belongs to the town. But Dundee cannot properly be conſidered, either at preſent, or likely to become, an extenſive commercial place. Although the ſituation of the Tay is favourable for the trade of the Baltic and northern part of Europe, it is by no means ſo for that of America, or the Weſt Indies. Beſides this, it has few articles of manufacture to export, excepting ſail-cloth and the coarſe linens, known by the name of Oſnaburghs, and theſe articles are manufactured in the very countries to which it is moſt contiguous. Many of the Oſnaburghs manufactured in Dundee are indeed exported to the Weſt Indies for the purpoſe of

of cloathing the negroes; but these, instead of being directly sent, are generally sold to the merchants of London, Liverpool, and Glasgow, who are more immediately interested in supplying these colonies.

Hence the ships which have traded from Dundee to the Baltic, have been generally sent for the purpose of importing flax and hemp for the use of their manufacture, and as the country produces nothing which she can export in exchange for those articles, the ships have most commonly been cleared out in ballast, and the returning cargoes paid for by bills on London. A considerable number of vessels, however, are employed in the coasting trade, and five or six ships are annually dispatched to the Greenland whale fishery. The salmon fishery in the river Tay forms a considerable trade to Dundee. These fish were formerly caught by the hauling net, or *seine*, considerably farther up the river, and nearer to the town of Perth than Dundee, but they are now intercepted in their passage up by large nets fixed to stakes in convenient situations, and sent to London packed in ice, excepting in very hot weather, when they are pickled to preserve them.

It has been already stated, that the chief manufacture of Dundee consists of coarse linen goods, as sail-cloth, Osnaburghs, and pack sheet for cotton wool, and other purposes. The sail cloth made at Dundee is chiefly sold by government contracts for the supply of the navy, those for the merchant service being mostly made in England. Hence this branch of their trade has flourished chiefly in time of war, and during long intervals of peace has frequently experienced a total stagnation. The Osnaburghs are a species of coarse linen manufactured in imitation of those made in Germany, and this trade is encouraged, and indeed supported by government, partly by heavy duties on the German linens imported into the British colonies, but chiefly by a bounty of three halfpence *per* yard. As the cloth, which is about 25 inches broad, does not exceed sixpence *per* yard, average value, the bounty may be estimated from 25 to 30 *per cent. ad valorem.*

How far such a premium may be right, or wrong, cannot be discussed in this article, and, indeed, it cannot be decided by any power, except the legislature of the united kingdom.

The soil between Dundee and Perth, known by the name of the Carse, or Kerse, of Gowrie, has always been esteemed the most fertile in Scotland. The remarks of an intelligent correspondent will convey an idea of that recent improvement, which fortunately prevails every where in this island. "Agriculture has improved, in a prodigious degree, within these few years, in this neighbourhood. Heavy wheat-crops are now raised upon soils, and in situations which our forefathers thought scarcely fit for any thing. Considerable quantities of wheat and barley are now sent, coast-ways, to England. Rents, as the leases expire, are doubled, or trebled."

The town of Dundee is governed by a provost, baillies, and council, like the other royal boroughs in Scotland, and, in conjunction with Forfar, St. Andrew's, Cupar (of Fife), and Perth, returns a member to parliament. The present member for the boroughs is sir David Wedderburn, and for the county of Forfar is the Hon. William Maule of Paumu, brother to the earl of Dalhousie.

The population of Dundee, taken under the authority of the act of 1801, is estimated at 22,500.

Dundee formerly gave the title of viscount to the unfortunate and accomplished nobleman who fell at the battle of Killecrankie, in 1689. Since his death the title has not been revived.

DUNDIVER, in *Ornithology*, the name of a water-fowl, esteemed a distinct species of bird, not only by the vulgar, but by the generality of authors; but supposed by others to be the female merganser, or goosander, a species of the *Mergus;* which see.

DUNDRUM, in *Geography*, a village of the county of Down, province of Ulster, Ireland, that gives name to a very extensive bay, which is, however, shallow and accessible only to small vessels. The outer bay abounds with seatrouts and lobsters, and other species of white and shell fish, which afford employment to a number of boats. Dundrum is a small pleasant village, prospering by this fishery. Above the village are the ruins of an old castle, once a strong hold of considerable importance. It is 68 miles north from Dublin.

DUNDUKOVA, a settlement of Russian Siberia, in the government of Tobolsk; 300 miles N.N E. of Turuchansk. N lat. 70° 16′. E. long. 95° 14°.

DUNES, a small town of France, in the department of Lot and Garonne; three miles from the Gironne, between the rivers Giers and Baise.

DUNFANAGHY, a small post-town in the county of Donegal, province of Ulster, Ireland. It is not far from the promontory of Hornhead; 133 miles N.W. from Dublin.

DUNFERMLINE, a town in the western part of Fifeshire, and formerly a place where the parliament of Scotland occasionally met, previous to the union. The town of Dunfermline is pleasantly situated on the ridge of a hill, and many parts of it command an extensive view of the frith of Forth. The passage from Edinburgh, and the eastern district of Scotland, is the Queen's-Ferry, from which it is about six miles distant. The town of Queen's-Ferry is situated on the southern bank of the Forth, and on the Fifeshire side is a small village, called the North Queen's-Ferry, chiefly inhabited by ferry-men, who ply between the two shores, which are much frequented, being the most ready access between the northern and southern districts of Scotland upon the eastern coast. The shores of the Forth present the appearance of two bold promontories, at the Queen's-Ferry, and the passage is about two miles, although the Forth is much broader farther up, opposite to the sea-port town of Borrowstonefs, and even at Grange-mouth, where the great canal connecting the Forth and Clyde begins, and terminates at Bowling bay, in the county of Dumbarton. The narrow passage at the Queen's-Ferry occasions a considerable current, by the flux and reflux of the tide, which is increased by a small island, called Inch-Garvie, situated in the middle of the channel. Upon this island are the ruins of an ancient castle, and it has been lately fortified, and batteries of cannon have been placed upon it, as a defence for the upper part of the Forth. The fares for the passage at the Queen's-Ferry are regulated by the magistrates, like those of the watermen upon the Thames.

Dunfermline was anciently a residence of the kings of Scotland. The abbey church is still preserved in such order, as to serve for a place of public worship. The palace has been long in ruins; and a few years ago a part of it fell, by which several horses, stalled in a stable built contiguous to the wall of the palace, were killed, but fortunately, as it occurred during the night, no other accident happened.

The church and palace are said to have been built by Malcon Canmore.

The county of Fife, contiguous to Dunfermline, is generally fertile, the soil being a rich clay; and the agriculture has rapidly improved of late. Coals are found in great abundance in the immediate vicinity. Of these, the works of sir John Henderson, of Fordell, bart. are, perhaps, the most extensive. A very curious colliery has lately been

executed by ſir Robert Preſton, of Valley-field, bart. The mine is ſituated on a ſmall iſland in the Forth, near the village of Torryburn, about four miles weſt from Dunfermline. The iſland was frequently covered by the tide at high water; but ſir Robert, having formed an embankment, at an immenſe expence, and erected a ſteam-engine to draw the water, actually ſucceeded in ſinking a pit and procuring coal. The ſituation of the iſland certainly affords every convenience for loading coal, but the quality is ſaid not to be equal to that of many of the neighbouring proprietors. The coal trade here is a matter of conſiderable importance, as many of the northern parts of Scotland, where coal has not been found, are ſupplied either from hence, or from Newcaſtle-upon-Tyne.

The country is alſo plentifully ſupplied with lime, from the works of the earl of Elgin, at Charleſtown, and other lime-works. A conſiderable quantity of lime is alſo carried coaſt ways, to ſupply the north-eaſt coaſt of Scotland, from Charleſtown.

The chief manufacture at Dunfermline is that of table-linen, although many weavers are alſo employed in the cotton-manufacture. The latter are chiefly employed by the manufacturers of Gloſgow; though that city, by the way of Sterling, is about 50 miles diſtant from Dunfermline.

The damaſk and diaper manufactures have proved very productive ſources of wealth to this town, and the numerous villas, with which its environs are adorned, afford a pleaſing proof of the ſkill of its artizans, and the ſucceſs of their employers.

Dunfermline, like the other royal burghs of Scotland, is governed by a provoſt, magiſtrates, and town-council, and returns a member to parliament, in conjunction with Sterling, Culroſs, Inverkeithing, and the Queen's-Ferry. The election for theſe boroughs has of late been frequently very hotly conteſted. The preſent member is major-general Campbell, of Mouzie. The member for the county of Fife is lieutenant general Wemyſs, of Wemyſs caſtle.

Not far from Dunfermline are the extenſive diſtilleries of Kennet-Pans and Kinbagie, which are ſaid to pay an annual exciſe duty of not leſs than half a million ſterling.

The population, under the act of 1801, is taken at 5192.

The title of earl of Dunfermline periſhed in the attainder, ſubſequent to the rebellion in 1715, and has ſince been extinct.

DUNG, in *Agriculture*, &c. All kinds of dung contain ſome matter, which, when mixed with the ſoil, ferments therein, and, by that fermentation, diſſolves the texture of the earth, and divides and crumbles its particles very much. This is the real uſe of dung in agriculture; for, as to the pure earthy part of it, the quantity is ſo very ſmall, that after a perfect putrefaction, it bears an extremely inconſiderable proportion to that of the earth it is intended to manure.

The fermenting quality of dung has been ſuppoſed to be principally owing to the ſalt it contains; and yet thoſe, or any other ſalts, applied immediately to the roots of plants, always deſtroy them. This proves that the buſineſs of the dung is not to nouriſh, but to divide and ſeparate the terreſtrial matter, which is to afford the nouriſhment to vegetables through the mouths of their roots. And the acrimony of the ſalts of dung is ſo great, that the niceſt managers of vegetables we have, the floriſts, have wholly baniſhed the uſe of it from their gardens. The uſe of dung ſhould be alſo forbid in kitchen-gardens; for it is poſſible to ſucceed full as well without it; and it gives an ill taſte to all the roots and plants that are to ſtand in the earth, in which it is an ingredient. The water of a cabbage raiſed in a garden manured with dung, if boiled, is of an intolerable ſtink; but this is not ſo much owing to the nature of the plant, as of the manure uſed to it; for a field cabbage being boiled, the water has ſcarce any ſmell, and what it has, is not diſagreeable.

It is alſo a well-known fact in the country, that a carrot raiſed in a garden has nothing of that ſweet flavour, that ſuch as grow in the fields have; but inſtead of this natural reliſh, the garden one has a compound taſte, in which the matter of the manure has no ſmall ſhare. And there is the ſame ſort of difference in the taſte of all roots nouriſhed with ſuch different diet. Dung not only ſpoils the flavour of the eſculent vegetables, but it ſpoils the drinkables into the original compoſition of which it enters: they are obliged to uſe dung to the poor vineyards of Languedoc; and the conſequence is, that the wine is nauſeous. The poor, who only raiſe a few vines for the wine they drink themſelves, and cannot be at the expence of this manure, have the leſs of it, but then it is better, by many degrees, than the other; and it is a general obſervation, which the French expreſs in theſe words, that the poor people's wine in Languedoc is the beſt, becauſe they carry no dung into their vineyards. (Tull's Horſehoeing Huſbandry, p. 20.) Another diſadvantage attending the uſe of dung is, that it gives riſe to worms. It is for this reaſon, that garden carrots are generally worm-eaten, and field carrots ſound; and the ſame obſervation will hold good in other vegetables, in the field and in the garden. Vegetable and animal dung are, in fact, only the putrefaction of earth, after it has been altered, by paſſing through vegetable or animal veſſels. Vegetable dung, unleſs the vegetable be buried alive in the ſoil, makes a much leſs ferment in it than animal dung does: but the dung, or putrid matter of vegetables, is much more eligible and wholeſome for the eſculent roots and plants than that of animals is. Venomous animals are found to be very fond of dung, and are brought into gardens by the ſmell of the dung uſed in them as manure. The ſnakes uſually frequent dung-hills, and lay their eggs in them; and gardens, where dung is much uſed, are always frequented by toads; whereas the fields where roots are planted, are much leſs infeſted by them.

However unneceſſary and prejudicial dung is in gardens, it is, however, very neceſſary in the corn-fields; and little can be done without it in the old method of huſbandry. Dung is not ſo injurious in fields as in gardens, becauſe it is uſed in much ſmaller quantities in proportion to the quantity of ſoil; and cabbages, turnips, potatoes, and other things growing in fields, and intended only for the food of cattle, will not be injured by dung, tillage, and hoeing all together; for the crops will by this means be the greater, and the cattle will like the food never the worſe. Dung is very beneficial in giving very large crops of wheat; and it is found by experience, that the country farmer, at a diſtance from a large town, can never have ſo good crops by all his tillage, as thoſe who live in the neighbourhood of cities, where dung is produced in great plenty, and eaſily had. The dung uſed in fields, beſides its diſſolving and dividing virtue, is of great uſe in the warmth its fermenting gives to the young plants of the corn in their weakeſt ſtate, and in the moſt ſevere ſeaſons; the laſting of this ferment is not eaſily determined, becauſe the degrees of heat are very difficult to be judged of when they become ſmall.

The farmers uſually underſtand by the term dung, not only the excrements of animals, with the litter, but every thing that will ferment with the earth; ſuch as the green ſtalks and leaves of plants buried under ground, and the like, and every thing they add to it, except fire.

The uſes of the dungs of ſeveral animals are ſufficiently proved every day. They are uſed to repair the decays of exhauſted and worn-out land, and to cure the ſeveral defects

fects in different natural bad ſoils; the faults of which are as different as the nature of the different dungs uſed to improve them. Some land is too cold, moiſt, and heavy; and the other too light, and dry; and to improve and meliorate theſe, we have ſome dung hot, and light, as ſheep's, horſe's, pigeon's, &c. and other fat and cooling, as that of oxen, hogs, &c. There are two remarkable qualities in dung; the one is to produce a ſenſible heat, capable of bringing about great efforts; the other is to fatten the ſoil, and render it more fertile. The firſt of theſe is ſeldom found in any but the dung of horſes or mules; the great effects of which, when newly made, and a little moiſt, are ſeen in the kitchen-garden, where it invigorates, and gives a new life to every thing, ſupplying the place of the ſun; and to this, in a great degree, we owe all the vegetable delicacies of the ſpring. Beſides, horſe dung is the richeſt of all improvements that can be had in any quantity for poor hungry lands; yet, when either too new, or when uſed alone, it is very prejudicial to ſome lands; and if ſpread too thin on dry lands in ſummer, it becomes of very little ſervice; the ſun ſoon exhaling all its riches, and leaving it little more than a heap of ſtubble or dry thatch. Horſe dung is always beſt for cold lands, and cow dung for hot ones; but being mixed together, they make a very good manure for moſt ſorts of ſoils, and for ſome they are very properly mixed with mud.

Sheep's dung, and deer's dung, differ very little in their quality, and are eſteemed by ſome the beſt of all dung for cold clays; for this purpoſe ſome recommend the beating them to powder, and ſpreading them thin over the autumn or ſpring crops, at about four or five loads to an acre, after the ſame manner as aſhes, malt-duſt, &c are ſtrewed. And in Flanders, and ſome other places, they houſe their ſheep at night in places ſpread with clean ſand, laid about five or ſix inches thick, which being laid on freſh every night, is cleared out once a week, and with the dung and urine of the ſheep, is a very rich manure, and ſells at a very conſiderable price. It is principally uſed for ſtubborn lands; but Mr. Quinteny is of opinion, that it is the beſt of all manure for land in general.

Hog's dung is by many recommended as the fatteſt and richeſt of all dung; and is found, by experience, to be better than any other kind for fruit trees, apples, pears, and the like. It is alſo a very rich dung for graſs, and is ſaid to do as much good in one load, as any other dung whatever in two.

The dung of pigeons, hens, and geeſe, are great improvers of meadow and corn land. That of pigeons is unqueſtionably the richeſt that can be laid on corn land; but before it is uſed, it ought to be expoſed for ſome time out of the dove-houſe to the open air, to take off its fiery heat. It is in general very proper for cold clay lands; but then it always ſhould be well dried before it is laid on, becauſe it is apt to clod in the wet. It is beſt alſo to mix it with ſome dry earth, to break its parts that it may be ſpread the more regularly; and it is in itſelf ſo very rich and hot, as to bear ſuch an admixture without greatly impoveriſhing it. This dung is alſo by ſome recommended as better than any other for aſparagus and ſtrawberries, and for the propagation and culture of the tender garden-flowers. The dung of pigeons is alſo particularly recommended by M. Gentil for thoſe trees whoſe leaves are apt to turn yellow, if they grow in cold ſoils; but for this uſe, it ſhould firſt lie three years in a dung-hill, and then be applied ſparingly in autumn, laying about an inch thickneſs of it at the root of the tree, and ſuffering it to remain there till the March following.

The dung of poultry being hot, and full of ſalts, tends much to facilitate vegetation, and is abundantly quicker in its operation than the dung of animals which feed on the leaves of plants. It is an obſervation of ſir Hugh Plat, that one load of grains will enrich ground more than ten loads of common dung; and it is eaſy to infer from hence, that the ſame grain muſt needs be of greatly more virtue, when it has paſſed through an animal body. Human dung is ſo a great improver of all cold and ſour lands, but ſucceeds beſt when mixt with other dungs or earths, to give it a fermentation.

But for all ſtubborn clayey ſoils, there is no manure ſo good as the cleanſing of London ſtreets; the parts of tough land will be more expeditiouſly ſeparated by this than by any other compoſt; and where it is to be bad, it is of the greateſt value both for field and garden land. Miller's Gard. Dict.

Dung *Drag*, is a ſort of crooked fork with only two lines or teeth, which is often employed in ſetting out dung in heaps, upon land for drawing out of the cart.

Dung, *Gooſe*. This is a very valuable manure, and as uſeful to the farmer as pigeon's dung, or that of any other fowl. The ancients thought otherwiſe, and condemned it as prejudicial both to corn and graſs; and many are of the ſame opinion ſtill, but without any foundation in fact. Indeed, where corn is high, and when graſs is ready to be mown, theſe birds, if they get among it, will do great damage, by treading it down with their broad feet; but their dung, inſtead of being hurtful to the land, does it great ſervice. Near Sutton, in Nottinghamſhire, there is a barren piece of land given by the town for a gooſe-paſture; the geeſe have been kept in it many years, and their dung has ſo enriched it, that it is one of the moſt fruitful pieces of ground in the whole county. There has been an opinion alſo, that cattle feeding on graſs, where theſe creatures had much dunged the ground, would ſuffer by it; but it appears from trial, that cattle are moſt fond of all of thoſe parts of paſtures where the geeſe have dunged moſt, and that they ſuffer no alteration by it, except the growing fat upon it. The dung of fowls in general is very enriching to land; and Fowley Iſland, in Lancaſhire, a place ſo called from the abundance of wild fowl continually found on it, is ſo enriched with their dung, that it fattens ſheep in a ſurpriſing manner. See Compost and Manuring.

Dung-*meers*, or *dung-hills*, in *Huſbandry*, places where ſoils and dungs are mixed and digeſted together. For this purpoſe, it is uſual to dig a pit ſufficient to hold the ſtock of ſoil the huſbandman is capable of making, and to prepare it at the bottom with ſtone and clay, that it may hold the water and moiſture of the dung; and it ſhould be ſo ſituated that the drips of houſes or barns may run into it. Into this pit they caſt refuſe fodder, litter, dung, weeds, &c., where they lie and rot together till the farmer has occaſion for it. Where ſuch a pit is wanting, it is neceſſary to cover the dung with turf, or other ſtuff, to prevent the ſun and wind from drawing off its virtues. Compoſt dung-hills, which are formed by a mixture of earth with dung, lime, and other manure, are made with leaſt expence on the field for which they are intended.

Dung-*worms*, a ſpecies of fly-worms, of a ſhort and ſomewhat flat body, found in great plenty among the cow-dung in the months of September and October. Theſe have all their metamorphoſes into the fly ſtate performed within a ſhell of their own ſkin.

The fly produced from this worm is one of Reaumur's firſt claſs of the two-winged flies; it has a trunk with lips, and has no teeth; it is of the claſs of thoſe with the ellipſoid bodies; but its body is remarkable long for one of thoſe, and is compoſed of ſix rings: its head is very round, and nearly

nearly of a ſpherical form, and is large in proportion to its body; it has antennæ of the lenticular or battledore form; its reticular eyes are of a deep cheſnut brown, and its three ſmall eyes are placed in the common manner. Its corſelet is of a fine gilded green; and its back is not eaſily to be deſcribed as to colour, for it is changeable, and ſeems compoſed of a violet colour, and of a deeper and a paler copper colour. The under part, or belly, is of a pale yellow, and the legs and balancers of a yet paler yellow. Reaumur's Hiſt. Inſects, vol. iv. p. 350.

DUNGA, in *Ancient Geography*, a town of India, aſſigned by Ptolemy to the Ariaces Sadmorum.

DUNGALA. See Dongola.

DUNGANNON, a market and poſt-town of the county of Tyrone, province of Ulſter, Ireland. It is an ancient borough, and has a barrack for a troop of horſe. It was formerly the chief ſeat of the O'Neils, kings of Ulſter, and was accordingly the ſcene of many warlike tranſactions, being repeatedly diſmantled and repaired. At a later period, it was made remarkable by the aſſembly of the Ulſter delegates from the volunteers in 1782. This body correſponded with the duke of Richmond, lord Effingham, Dr. Price, and other friends of parliamentary reform, and in conſequence of the reſolutions they entered into, and the diſcuſſion thus occaſioned, a meeting of delegates, from every part of Ireland, met in Dublin, and brought the meaſure before parliament, but without ſucceſs. Dungannon has a good linen market, and in its neighbourhood are good collieries, from which is a canal to the Blackwater. Dungannon is 73 miles N. by W. from Dublin, and 10 weſt from Armagh. Beaufort Wilſon's Directory.

DUNGARVAN, a market, poſt, and ſea-port town of the county of Waterford, in the province of Munſter, Ireland. This is an old town, the ſtreets of which are narrow and dirty, but it is pleaſantly ſituated, the ſea flowing up to the old walls. On the north ſide is a quay, ſufficiently capacious for the loading and diſcharging of ſmall veſſels. Forty or fifty coaſting boats belong to this place, which are principally employed in the fiſhery, which is one of the moſt extenſive in the kingdom. The inhabitants are celebrated as excellent curers of hake. The duke of Devonſhire, who, as heir of the oldeſt branch of the Boyle family, is the chief proprietor, is taking meaſures to improve it, by building ſeveral new houſes; and a bridge is alſo to be built over the arm of the ſea, which ſeparates it from the part of the country towards the city of Waterford, and which has hitherto been croſſed by a ferry, or, at low water, by a ford. Here are a good market and ſeſſion-houſe, and a barrack for two companies, ſituated within the walls of an ancient caſtle, now in ruins, which was built by king John, and afterwards repaired and poſſeſſed by the Deſmond family. There are ruins of an Auguſtinian priory on the other ſide of the water, oppoſite to the town. Dungarvan is much frequented in the ſummer ſeaſon for the purpoſe of ſea bathing. It is a borough which returns a member to the imperial parliament, and is 100 miles S. by W. from Dublin. Long. 7° 39′ W. Lat. 52° 5′ N.

DUNGENESS Point, a cape in the eaſtern entrance of the ſtraits of Magellan. S. lat. 52° 28′. W. long. 68° 28′.

Dungeness, a cape of England, on the coaſt of Kent, in the Engliſh channel. N. lat. 50° 52′ 20″. E. long. 0° 50′ 45″.

DUNGEON, Donjon, in *Fortification*, the higheſt rampart of a caſtle built after the ancient mode, ſerving as a watch-tower, or place of obſervation; and alſo for the retreat of a garriſon, in caſe of neceſſity, ſo that they may capitulate with greater advantage.

The word comes from the French *donjon*, which ſignifies the ſame, and which Faucet derives from *domicilium*, becauſe the dungeon, being the ſtrongeſt part of the caſtle, was uſually the lord's apartment. Menage derives it from *dominione*, or *dominionus*, which in ſome ancient writings we find uſed in the ſame ſenſe. Du Cange derives the appellation from *duno aut colle ædificatum*, *dun* in Celtic denoting hill, which the barbarous writers have altered into *dunjo*, *dungeo*, *dongio*, *dangio*, *domgio*, and *domnio*.

In ſome caſtles, as that of Vincennes, &c. the donjon ſerves as a priſon for perſons they would have the moſt ſecurely kept; whence the general uſe of our word dungeon for a dark cloſe priſon under ground.

DUNGING, in *Dyeing*. See Rinsing.

DUNGIVEN, in *Geography*, is a market and poſt town in the county of Londonderry, province of Ulſter, Ireland, on the road from Armagh to Londonderry, at the foot of the Cairntogher mountains; 99 miles N. by W. from Dublin, and 16 from Londonderry.

DUNGLO, in the county of Donegal, province of Ulſter, Ireland, is a ſmall village on the weſtern coaſt oppoſite to the iſle of Arrán, which is of no ſmall relative importance on account of its ſituation. It is on an arm of the ſea, and is the place from which the inhabitants of the iſlands are ſupplied with all neceſſaries. It has a pariſh church, a mill, &c. It is 135 miles N. W. from Dublin, and 36 W. from Liſford.

DUNI, Egidio Rimualdo, in *Biography*, a natural, graceful, and facile Italian compoſer, long ſettled in France. He was one of the firſt who a little reconciled the French to Italian melody at the comic opera, by applying it to French words, previous to the arrival and ſubſequent feuds concerning the merit of Gluck and Piccini.

Duni was born near Ottranto, in the kingdom of Naples, 1709: his father was a maeſtro di cappella, and had ſix ſons and three daughters. At nine years old he was ſent, much againſt his will, to a conſervatrio at Naples, where he ſtudied under the celebrated Durante.

It will appear, in the article Pergolesi, that Duni engaged at Rome to compoſe the opera of Nero, had great ſucceſs, while the Olimpiade of Pergoleſi was almoſt hiſſed. This ſucceſs by no means flattered the vanity of the young Duni, who, aſhamed of his victory, ſaid to Pergoleſi: "O my friend! *neſciunt qui faciunt!*"

Intruſted with an intereſting negociation at Vienna, by cardinal C...., Duni availed himſelf of this opportunity of diſplaying his talents, and acquired ſome reputation there. On his return to Naples, he was nominated by the king maeſtro di cappella to the church of St. Nicolo di Bari. Some years after his return to Naples he compoſed an opera for S. Carlo, which had great ſucceſs. He compoſed one likewiſe for Venice, and went again to Paris in 1733 to ſeek relief for perpetual palpitation, with which he was tormented; when he became ſo pleaſed with France, that he reſolved to ſpend there the reſt of his days; he however went into England to compoſe ſome operas requeſted of him, (rather ſongs, we never heard of his operas in England,) but he was in ſo bad a ſtate of health, that the Engliſh phyſicians adviſed him to go to Holland, in order to conſult Boerhaave.

The new regimen which he preſcribed to him was to ride every day, and in a few years he found himſelf quite recovered; but, ſoon after, he was in ſo perilous a ſituation that he loſt his health for ever.

Having returned to Italy to viſit his mother, whom he tenderly loved, he was attacked by robbers near Milan, and upon the point of being murdered. The revolution in his health, occaſioned by this fright, renewed the hæmorrhage

to

to which he was subject, and the constant suffering with which he was afflicted to the end of his days.

While marshal Richelereu commanded at Genoa, Duni, in spite of his sufferings, composed an opera, which was so fortunate as to please the French, Italians, and Spaniards, who engaged him to compose another, which was equally successful. This good fortune occasioned his being noticed by the infant, Don Philip, who carried him to Parma, and appointed him music-master to princess Elizabeth, his daughter, first wife of the emperor Joseph. It was at Parma that he first composed to French words, and he succeeded so well there that they sent him, from Paris, the comic opera "Le Peintre Amoureux" to set.

The education of the princess being finished, he obtained leave to go to Paris, and retired thither on a pension, where he was present at the successful performance of his drama, "The Amorous Painter," in 1757, which finally determined him to remain in France.

He resided at Paris till 1775, when a malignant fever bereaved his wife and son of a kind husband and affectionate father.

Duni composed for the theatre Italian at Paris, besides "The Amorous Painter," in 1757; "The Irresolute Widow," in 1758; "La Fille Malgardée," in 1759; "Nina & Lindor," in 1761, and "L'Isle des Foux;" in 1762, "Le Milicien;" in 1763, "Les Chasseurs & La Laitiere," "Le Rendezvous;" in 1765, "L'Ecoli de la Jeunisse," "La Fée Urgelle;" in 1766, "La Clochette;" in 1768, "Les Moisonnuers, les Sabots;" in 1770, "Thémire;" and, the same year, "L'Heureuse Espiéglerie." All these had a certain degree of success, and many of them remained several years in favour. Laborde.

DUNIUM, in *Ancient Geography*, a town of Britain, belonging to the Durotriges, supposed by Camden to have stood where DORCHESTER now stands. Mr. Baxter places it on the summit of an adjacent hill, where are a ditch and bulwarks, now called Maiden castle; while Mr. Horsley thinks it was situated at Eggerton hill.

DUNK, in *Geography*, an island on the N.E. coast of New Holland, which forms a boundary of Rockingham bay, and lies so near the shore as not to be easily distinguished from it. S. lat. 17° 20′. E. long. 145° 30′.

DUNKARD'S TOWN. See EPHRATA.

DUNKELD, a small town in the county of Perth, Scotland, has been a place of great note in the annals of Scottish history, and is now noted for the salubrity of its climate, and the picturesque features of the neighbourhood. The latter have been greatly improved by the numerous plantations raised by the duke of Athol, who has a seat in the town. This town is said to have been the capital of ancient Caledonia; and about the dawn of Christianity, a Pictish king made it the seat of religion, by establishing a monastery of Culdees. This was converted by king David I., A. D. 1130, into a bishopric, and was then ranked the first in Scotland. The cathedral, though formerly a large handsome building, is much dilapidated; but its choir is used as the parish church. It was erected in 1350 by bishop Sinclair, whose corpse was interred within its walls. On the north side of the choir is the chapter-house, built by bishop Lauder in 1469; the vault of which is now used for interment of the Athol family. At the west end of the north aisle is a very elegant tower, which has a crack from top to bottom, nearly two inches wide.

The poet Gray visited this place in 1766, and has given an interesting description of the scenery, &c. in a letter to the earl of Oxford. (See his works published by Mason.) In the town are two tan-yards, two distilleries, and four linen manufactories. Dunkeld is 15 miles N.W. of Perth, and contains 1016 inhabitants. It is seated on the north side of the river Tay the banks of which are bold, rocky, and romantic. Near the duke's seat is a fine cascade, called the *Rumbling brigg*, which falls about 150 feet. Sinclair's Statistical Account of Scotland.

DUNKELSPUHL. See DINKELSBUHL.

DUNKERS, or TUNKERS, in *Ecclesiastical History*, a religious sect at Ephrata or Dunker-town, near Lancaster, in Pennsylvania, which took their rise about the year 1719, and consisting mostly of Germans. They sprung from about 20 families, who in that year landed in Philadelphia, and dispersed themselves through various parts of Pennsylvania. They are of the denomination, called General Baptists, and maintain the doctrine of general redemption. Besides the congregation at Ephrata, there were, in 1770, 14 others in various parts of Pennsylvania, and some in Maryland. The whole number, exclusively of the latter, amounted to upwards of 2000 persons. Their name is said to be derived from their mode of baptizing new converts, which is by dipping, after the manner of the Baptists. Others say, the appellation of *Tunkers* is derived from *tunken*, to put a morsel in sauce, and was first applied to this sect by way of derision. Their habit is a kind of long coat or tunic, made of linen, for the summer, and woollen for the winter, reaching down to the heels, with a sash or girdle round the waist; and a cap, or hood, hanging from the shoulders, resembling the dress of the Dominican friars. The men shave neither the head nor beard. The men and women have distinct habitations and governments: they have for this purpose erected two wooden buildings; in each of which there is a banqueting-room, and an apartment for public worship; so that they never meet together even at their devotions. They live chiefly on roots and vegetables, and eat no flesh, except on occasion of their love-feasts, when the brethren and sisters dine together. The Dunkers allow of no intercourse between the brethren and sisters, not even by marriage; a regulation not very favourable to their subsistence and increase: and if any break through this restraint, and marry, they are removed from communion with the unmarried, to a place about a mile distant, called Mount Sion. The principal tenet is said to be, that future happiness is only to be obtained by penance and mortification in this life; and that, as Jesus Christ, by his meritorious sufferings, became the Redeemer of mankind in general, so each individual of the human race, by a life of abstinence and restraint, may work out his own salvation.

DUNKESFIELD, in *Geography*, a small town of the kingdom of Wirtemberg, on the river Wernitz; 45 miles S.W. of Nuremberg; with a thriving manufacture of woollen cloth and hardware.

DUNKIRK, or DUNQUERQUE, in Flemish and English *Dunkirk*, in Latin *Dunikerka*, *Dunkerka*, *Dunckerca*, in German *Dunkirch*, a considerable maritime town of France, in the department of the North, chief place of a canton, in the district of Bergues; 18 miles N.E. of Gravelines, 30 miles N.E. of Calais, 27 miles S.W. of Ostend, and 227 miles, or 316 kiliometres, N. of Paris. E. long. 2° 7′. N. lat. 51° 2′ 4″. The temperature of Dunkirk, on a mean of 10 years, as given by Pere la Cotte (Meteorol. p. 360.), was 54° 9′. It was originally a hamlet of a few fishermen's huts: but a church having been built, as it is said, by St. Eloi, who first preached Christianity among the inhabitants of Flanders, on the Sand-hills, Dunes, Downs, in its neighbourhood, the place increased and derived its name from the situation

ſituation of its church, Dunkirk, the church on the Downs.

In the tenth century, Baldwin earl of Flanders ſurrounded Dunkirk with a wall. Being commodiouſly ſituated for trade, it engaged in a profitable commerce, which ſoon enabled it to build even ſhips of war. In the twelfth century, Dunkirk fitted out a ſmall fleet againſt the Norman pirates, who infeſted the Channel and the North ſea: the ſervices which this fleet rendered were conſidered ſo important, that Philip earl of Flanders granted the town ſeveral privileges.

In the thirteenth century, Dunkirk was ſold to Godfrey of Condé, biſhop of Cambray, who enlarged the town and improved the harbour. His heirs reſtored Dunkirk, in the year 1288, to Guy earl of Flanders; whoſe ſon, Robert de Béthune, diſmembered it from the earldom of Flanders, and in the year 1320, conferred it as a particular lordſhip on his ſon Robert de Caſſel. The latter built, in 1322, a caſtle for the defence of the town; but this caſtle was afterwards demoliſhed, during a rebellion of the Flemiſh people. In the year 1343, Jolanda, daughter of Robert de Caſſel, brought Dunkirk as her marriage portion to her huſband, Henry IV. count of Bar. It devolved, in 1395, to her couſin, Robert of Bar, earl of Marle, who, in the year 1420, raiſed round the town a ſtrong wall; the remains of which are reported to be ſtill traced on the ſide next the harbour.

In 1435, Dunkirk came by marriage from the houſe of Bar to that of Luxembourg; and in 1487, from the latter to the houſe of Bourbon, on the marriage of Mary of Luxembourg with Francis of Bourbon, count of Vendôme. But Dunkirk being only a fief, the ſovereignty of which belonged to the houſe of Auſtria, the emperor Charles V. erected a ſtrong caſtle, in the year 1538, for the defence of the harbour.

The French, under marſhal de Thermes, took Dunkirk by ſtorm in 1558; but it was ſoon retaken by the Spaniards. At the peace of Cateau-Cambréſis, Anthony of Bourbon, king of Navarre, couſin and heir to Mary of Luxembourg, obtained Dunkirk, and ſome other places, as a fief, of Philip II. king of Spain and earl of Flanders. The town was rebuilt, and improved in wealth, chiefly by fitting out privateers againſt the Dutch. The fortifications of the harbour were ſtrengthened, 15 ſhips of war built, and a canal of communication opened with the town of Bergues.

This ſtate of proſperity ſuffered, however, ſome interruption, from frequent diſturbances in the Netherlands. In 1646, Dunkirk was beſieged and taken by the French, under the prince of Condé. In 1652, it was retaken by the archduke Leopold, governor of the Netherlands.

In 1655, the alliance of England and France induced the inhabitants of Dunkirk to fit out privateers againſt both theſe powers: but the French, aſſiſted by Cromwell, attacked and took Dunkirk, which was put into the hands of the Engliſh, to recompenſe them for the loſs of 250 ſhips, that had been carried into Dunkirk by its privateers during the war.

The Engliſh immediately improved the fortifications of Dunkirk, and ſtrengthened it by the addition of a citadel; but they did not keep poſſeſſion of it above four years.

In 1662, Charles II. of England, two years after his unexpected reſtoration to the throne of his father, not conſidering the value of ſuch an acquiſition to his country, or unable to judge of its importance, ſold Dunkirk to France for the paltry ſum of five millions of French livres, or about 209,000*l.* ſterling. On the 29th of November, 1662, the comte d'Eſtrades, in the name of Louis XIV., took poſſeſſion of the town, and of the villages in its diſtrict, viz. Mardyk, Great and Little Saintes, Arenbout's Chapel, Coudekerk, Teteghem, Uxem, Ghyveld, Leſſerinchouke, and Zuytcote.

Under the ſuperintendance of the celebrated Vauban, Dunkirk was rendered an almoſt impregnable fortreſs. The harbour was improved with two jetties, and defended by two caſtles, le Chateau Verd and le Chateau de bonne Eſpérance. Other fortifications were ſucceſſively added. In 1689, the fort called Cornichon, or Batterie de Revers, and ſome other works, were finiſhed; and in 1701, the whole was completed by the erection of fort Blanc. Every ſhip that entered the harbour had to paſs between theſe forts; and at the entrance of the baſon was a ſluice of 45 feet in width, that the ſhips within might conſtantly be afloat.

Thus protected and ſtrengthened, Dunkirk enjoyed again a moſt flouriſhing trade. In 1706, it contained 1639 houſes, and 14,274 inhabitants. During the war which terminated in the peace of Utrecht, its privateers took 1614 Engliſh prizes, valued at 1,334,375*l.* ſterling. This loſs was of ſuch a magnitude, that England would not conſent to enter into any treaty with France, unleſs it ſhould contain, as one of its principal ſtipulations, that the fortifications, harbour, baſon, ſluices, and canal of Dunkirk were to be immediately deſtroyed, demoliſhed, and filled up, at the expence of France; and that the latter power ſhould ſolemnly engage never to attempt the repairing of thoſe works. In conſequence of this declaration, a clauſe to this effect was inſerted in one of the articles of the treaty of Utrecht, which was ſigned on the 28th of April, 1713.

But the demolition of the forts and harbour of Dunkirk did not take place before the month of September, 1713, when two Engliſh commiſſaries, colonels Armſtrong and Clayton, were ſent from England to Dunkirk, to watch over the execution of the treaty. They witneſſed the deſtruction of the fortifications, the levelling of the jetties with the ſtrand, the filling up of the harbour and canal, and the building of a large dam or bar acroſs the entrance of the baſon. Yet all this was no ſooner accompliſhed, than Louis XIV. conſtructed a new canal at Mardyk, by which the harbour was rendered nearly as commodious as it had been before.

However, in the year 1717, France was once more compelled, by a treaty concluded at the Hague between England, Holland, and France, to render the new canal of Mardyk unſerviceable; and it was expreſsly ſtipulated, that no harbour, ſluice, or baſon, ſhould ever be made either at Mardyk or Dunkirk, or within two French leagues round the town. But in 1720, a violent ſtorm, during which the ſea broke up the bar built acroſs the old harbour, reſtored its uſe in ſome degree. This advantage was improved upon by Louis XV. in the year 1740, whilſt England was engaged in a war with Spain. The jetties were rebuilt, and new forts erected in the place of thoſe which had been deſtroyed in 1713.

In the mean time, Louis XV. joined the Spaniards; and at the concluſion of the war with England, it was for the third time agreed upon, in the treaty of Aix la Chapelle, ſigned in 1748, that all the works near Dunkirk towards the ſea ſhould be deſtroyed. France, however, not only never completed this demolition, but even commenced ſome new works under-hand, notwithſtanding the repeated remonſtrances of the Engliſh court. At the beginning of the ſeven years' war, Dunkirk was in as good a ſtate of defence towards the ſea as it had been at any time during the war, which was concluded by the treaty of Aix la Chapelle.

The ſame ſtipulations were renewed at the peace of Paris,

in

in 1762, but with no better effect. The trade of Dunkirk continued to flourish: its principal commerce, during the interval of peace from 1762 till the beginning of the American war, was with England, Ireland, and Scotland, Spain, Portugal, Sweden, Holland, and Denmark. In 1766, Dunkirk had 46 ships, or a tonnage of 2300 tons in the herring fishery. In 1767, it had in all 170 merchant vessels, manned by 2348 sailors; and besides its own vessels, there entered the harbour of Dunkirk,

	228	French ships
	176	English
	115	Dutch
	34	Swedish and Danish
	21	Spanish
	8	Hambro' vessels, and
	300	Smugglers
In all	882	Vessels.

And during the American war, it fitted out several privateers. Before the French revolution of 1789, Dunkirk had also five ships in the slave trade. It is the native city of the famous Jean Bart.

In the year 1801, or rather during the short suspension of hostilities which took place between England and France, in consequence of the peace of Amiens, Dunkirk had 20 ships in the trade with America and the French colonies. In ancient times, it had been in alliance with the Hanseatic towns, and its commerce in French wines and brandies was always considerable. It has been rated at 12,328 hogsheads of wine, and 8580 pipes of brandy annually. From the year 1170 till 1794, or, more exactly, till the seventh Ventose of the third year of the French republic, Dunkirk had been a free port.

The road of Dunkirk lies at the distance of 1½ mile northwards of the town, within the Brak, a sand-bank which extends parallel to the shore near 5 miles in length, and has from three fathoms to one foot of water at low water. There is a safe anchorage about three-fourths of a mile N.N.E. from the jetty, in six or eight fathoms of good clay ground, mixed with sand. The tide at Dunkirk rises 12 feet.

Dunkirk is one of the six maritime districts into which all France is divided. It superintends all the ports and coasts of the Channel and North sea, from the last Dutch port to Dunkirk included. As chief place of this maritime district, Dunkirk has a maritime prefect, who superintends the maritime quarters of Antwerp, Malines, Brussels, Gand, l'Ecluse, le Sas de Gand, Ostend, Bruges, and Nieuport; each of which has its subdivisions, called syndicates.

With respect to the temperature of Dunkirk, its greatest heat commonly is 23° 2′, the least 6° 6′; medium 8° 7′. The highest elevation of the mercury in the barometer is 28 inches 8.3 lines, the lowest 27 inches 1.4 lines; medium 28 inches 1.1 line. There are annually 126 rainy days, and the prevailing wind is the south-east wind.

The whole population of Dunkirk amounts to 21,158 individuals: but the town is divided into two parts, East and West, each of which is a separate canton; the former having 9792 inhabitants, and comprising 6 communes, with a population of 13,761 individuals; the latter having 11,366 inhabitants, and containing 5 communes, with a population of 13,742 individuals. The two cantons together have a territorial extent of 155 kiliometres.

Considered as a town, there is nothing particularly remarkable at Dunkirk, excepting the quay, the principal street, the roperies, and the sailors' barracks. The houses have only one or two stories; the lower classes live in cellars, which opening into the street, are rather a nuisance: however, it is asserted, that these vaults are not unhealthy, being dug in a very dry sand.

The principal manufactures of Dunkirk are those of tobacco, starch, glass, and leather, besides several rope-walks, distilleries, and sugar-houses. Herbin. Statistique de la France.

Dunkirk, a post-town of America, in King and Queen county, Virginia; 116 miles from Washington.

DUNLAVIN, a market town of the county of Wicklow, Ireland, on the road from Bleasington to Timolin, in which are a good inn, a handsome market-house, &c. It is 10 miles S. from Naas, and about 22 S. by W. from Dublin.

DUNLEER, a market and post-town of the county of Louth, Ireland, on the great northern road from Dublin. It is 30 miles N. from Dublin, and 7 from Drogheda.

DUNLIN, in *Ornithology*, the English name of the Scolopax *pusilla*; which see.

DUNLOPE, in *Geography*, a fort of America, on the west bank of little Miama river, about 12 miles above Columbia, in the state of Ohio.

DUNLUCE, on the northern coast of Ireland, in the county of Antrim, is the ruins of an old castle, formerly belonging to the Antrim family, near Bushmills. The only passage into the castle lies along the top of a narrow wall, built in the form of a rude arch, from the main land to the rock on which the castle stands; an approach to which is attended with much terror to persons of weak nerves. Underneath is a curious cave in the rock. It is 120 miles N.W. from Dublin.

DUNMANUS-Bay, a bay of the Atlantic, on the south-west coast of Ireland, in the county of Cork. It is about 14 miles in length, and from one to three broad, and is separated from Bantry bay by a narrow mountainous district which terminates in the promontory of *Sheep's head*. This is a safe harbour, but is one of the many on the western coast which have yet been applied to no use. At present there does not appear to be even a fishing village on its shores. W. long. 9° 40′. N. lat. 51° 30′, at its mouth.

DUNMANWAY, a town of Ireland, in the county of Cork. It is a cheerful thriving town, where sir Richard Cox, formerly lord chancellor of Ireland, established the linen manufacture. It is on the Bandon river; and the country from it to Bandon is a fine well-improved vale, consisting of a light gravelly soil. The country on every other side is rocky. Dunmanway is 151 miles S.W. from Dublin, and 27 miles W. from Cork, on the road to Bantry.

DUNMORE, a small post-town in the northern part of the county of Galway, Ireland, which contains 86 houses, a market-house, and a parish church, built on the site of an old abbey. Near it is Dunmore castle, a large venerable ruin, pleasantly situated on the banks of the river Dunmore. It is 91 miles W. from Dublin, and 7 miles from Tuam. Wilson's Directory.

Dunmore-*Bay*, a bay of the Atlantic, on the west coast of Ireland, in the county of Clare. It is not a good harbour, but is frequented for sea-bathing. W. long. 9° 35′. N. lat. 52° 44′.

Dunmore-*Head*, a cape on the west coast of Ireland, in the county of Kerry. W. long. 10° 20′. N. lat. 52° 6′.

DUNMOW, Great, a market-town and parish in the hundred of Dunmow, in the county of Essex, England, is situated on an eminence near the river Chelmer, and consists principally of two streets. The town is of great antiquity, and is supposed to have been the site of the Roman station *Cæsaromagus*: which opinion has originated from the discovery

covery of various Roman coins in the town and its vicinity, and alſo by its ſituation on a Roman road to Colcheſter. The pariſh is very extenſive, comprehending ſeven manors. The church, dedicated to the Virgin Mary, is a large ancient ſtructure, conſiſting of a nave, chancel, and aiſles, with an embattled tower at the weſt end. Over the entrance into the latter are various ſhields of arms, carved in ſtone; among which are thoſe of the noble families of Mortimer, Bohun, Bourchier, and Braybrooke, who are ſuppoſed to have contributed towards the erection or repairs of the edifice. Dunmow was incorporated under a charter granted in the reign of Philip and Mary, and afterwards confirmed by Elizabeth. The government is veſted in a bailiff and twelve burgeſſes. The number of houſes, in the return of 1801, was 392; of inhabitants, 1828. The poorer claſſes derive their chief employment from the manufacture of baize and blankets. Dunmow is 37 miles N.E. from London; has a weekly market on Saturdays (by grant from Henry III. A.D. 1253); and two annual fairs.

Dunmow, *Little*, a village about two miles diſtant from Great Dunmow, in the ſame hundred, is noted for an ancient priory of Auguſtine canons, and alſo for a ſingular cuſtom or tenure annexed to the manor. The priory was founded in the year 1104, by lady Juga, ſiſter of Ralph Baynard, who held the manor at the time of the Domeſday ſurvey; and from whoſe family Baynard's caſtle in London obtained its name. On the ſuppreſſion, Henry VIII. granted the ſite of the priory, and the manor to Robert earl of Suſſex. The monaſtic buildings were ſituated on a riſing ground, ſouth weſt of the church, but are now entirely razed; and ſome part of the ſite is occupied by the preſent manor houſe. Under an arch in the ſouth wall of the preſent church is an ancient tomb, ſuppoſed to contain the body of the foundreſs, lady Juga. Near this ſpot are ſome well executed monuments of the Fitz-Walters, by whom this lordſhip was poſſeſſed for eleven generations. To one of this family is attributed the well known cuſtom of giving a *flitch of bacon* to any married couple, who had not repented of their marriage for a year and a day. The earlieſt delivery of the bacon on record was in the 23d of Henry VI.; two other inſtances occurred previous to the ſuppreſſion of religious houſes; and three times it has been delivered ſince that period. The laſt perſons who received it were John Shakeſhanks, woolcomber of Wethersfield, and Anne his wife, who eſtabliſhed their right on the 20th of June, 1751. Morant's Hiſtory of Eſſex, 2 vols. folio.

DUNNAGE, in *Sea Language*, a quantity of faggots, boughs of trees, or other looſe wood, laid in the bottom of a ſhip, either to raiſe the heavy goods which might make her too ſtiff, or to keep the cargo ſufficiently above the bottom, that it may receive no damage from the water, if the ſhip ſhould prove leaky.

DUNNET, in *Geography*, a town of Scotland, in the county of Caithneſs, ſituated on the eaſt ſide of a bay to which it gives name. The number of inhabitants, in 1791, was about 1400. The bay affords excellent flounders and haddocks, and is ſometimes frequented by ſhoals of herrings in July and Auguſt; 5 miles E. of Thurſo. N. lat. 58° 32′. Long. 0° 1′ W. of Edinburgh.

Dunnet *Head*, a cape on the north coaſt of Scotland, and county of Caithneſs. It conſiſts of ſeveral hills, with ſome bold rocks towards the ſea, from 100 to 400 feet in height; $3\frac{1}{2}$ miles N. of Dunnet.

DUNNOSE, a cape or promontory on the S.E. coaſt of the Iſle of Wight, in the Engliſh channel; about 17 leagues W. from Beachy-head. N. lat. 50° 33′. W. long. 1° 14′.

DUNOIS, John D'Orleans, *Count of*, in *Biography*, the natural ſon of Louis duke of Orleans, was born in 1403. His father being aſſaſſinated by the duke of Burgundy, his ducheſs declared that he alone of the ſons of the duke was capable of avenging his death. He was from an early age a youth of high martial ſpirit, and of great ſervice to his country. When France was almoſt reduced to the ſtate of conqueſt by England, he began to change its fortune by a victory in 1427, of which the conſequence was raiſing the ſiege of Montargis. He afterwards threw himſelf into the city of Orleans, which he defended with ſo much valour and intrepidity, when it was beſieged by the duke of Bedford, that he even reſolved, rather than ſurrender, to ſet fire to the city, and make his way through the enemy. At this critical moment appeared the celebrated Joan of Arc, by whoſe means the ſiege was raiſed. Dunois directed with prudence the enthuſiaſm which ſhe inſpired; and after her unhappy death, rendered the handſomeſt teſtimony to her memory. After this he atchieved many glorious deeds for his country; and from the title of "Baſtard of Orleans," by which he had been known, he was permitted to take the title of count de Dunois. In addition to this, the king, ſenſible of the obligations he was under to him, cauſed him to be legitimated, and to be entitled "The Reſtorer of his Country;" and, to maintain his rank, lands were preſented him, and the office of great chamberlain was beſtowed. In the following reign, Dunois joined the inſurrection called the "League for the public Good;" and was afterwards placed at the head of thirty-ſix notables, appointed to reform the ſtate. He died in 1468. Moreri. Hiſt. of France.

DUNRODUNUM, in *Ancient Geography*, a town ſituated in the northern part of the iſle of Albion, and belonging to the Carnovaces.

DUNROSSNESS, in *Geography*, a town of Scotland, ſituated in the ſouthern part of the iſle of Shetland; 28 miles S. of Lerwick.

DUNS, in *Antiquities*, are the remains of a peculiar kind of buildings, which abound in the northern parts of Scotland, and in the Orkney and Shetland iſles; though not excluſively ſo, as it has been generally ſtated. They are of two kinds: the firſt, which are moſt prominent in their appearance, are circular caſtles, ſuch as the caſtles of Moura and Glenbeg, in the ſhire of Inverneſs; or circular pyramids, like the ſpires of Brechin and Abernethy. Theſe towers, which generally ſtand upon ſome eminence, vary as to their internal ſtructure, but bear a great ſimilarity in their external appearance; though ſome of them have additional works of defence. Thus the burg of Moura was ſurrounded by a wall, which now forms round it an heap of ſtones. Others are guarded by foſſæ, both wet and dry ditches of conſiderable magnitude. The ſecond kind conſiſts of numerous ſubterraneous buildings, either entirely under ground, or nearly ſo: in the latter caſe, they exhibit the external appearance of numerous tumuli, or what in the highlands are called *Here cairns, i. e.* long burrows. Some of them are much larger than others; and a dun of this kind conſiſts of ſtrong circular walls without cement, ſurrounding a large oval area, which appears to have been divided into ſeveral diviſions, leaving a large internal ſpace in the centre, round which the other apartments ranged. The incumbent roof of earth appears to have been ſupported by one or more wooden columns, with croſs beams, reſting upon the walls. The interior ſpace was probably the dwelling, while the ſurrounding rooms ſerved for the purpoſe of laying up proviſions, and other neceſſary ſtores. The hillock over the upper flooring was raiſed to keep the habitation dry; and with the ſame view, many of them were ſurrounded with a deep ditch, over which the entrance was

made by a ridge of earth, left unexcavated; and in some instances, flanked by two dry walls.

They are not confined to one particular part, but are found in the lowlands, as well as the highlands; in the interior parts of the country, as well as in the isles. Nor are they peculiar to Scotland. Specimens of both kinds exist in Ireland, Wales, and Cornwall; a fact which certainly goes far towards demonstrating their Celtic origin. Although it has been confidently asserted, that "they are confined to the countries once subject to the crown of Norway," and out of our own kingdom, observes a Scottish writer, no buildings similar to these are to be found, except in Scandinavia. On the mountain Swalburg in Norway is one, the Stirbiskop at Upsal in Sweden is another, and Umesborg in the same kingdom is another.

The names, fabricators, and designation of these singular buildings have equally claimed the attention of antiquaries. They are called in the Orkneys *burgs*, or *broughs*, evidently a Saxon term for a fortification. On the main land, they have divers appellations, as *castell*, *bowie*, Celtic terms for cavernous fortresses; and *Picts houses*, as the supposed habitations of that ancient people. The general term, *duns*, is from *dun* or *din*, a Celtic word, simply signifying small hills, or fortified mounds of earth; and here applied to designate the shape of the smaller, and situation of the larger kind. When the highlanders in the shire of Inverness are asked to whom they belonged? the constant answer is, that they were the houses of the *Drinnich* or *Trinnich*, the Gaelic name for *labourers*; a term which they invariably apply to the Picts.

By some writers they have had a Danish or Norwegian origin assigned to them. Ware and Ledwich, in treating of Irish antiquities, contend for their Danish origin; and Dr. Borlase, in treating of *Castell Chun*, in the parish of Morvah, is of opinion, that such kind of buildings must be attributed to the Danes. But this mode of denomination is directly contrary to the analogy of tradition: for not only in Scotland, but in England, it is almost universally found, that the works of an early age are not usually attributed to the people to whom of right they belong, but successively to the different bodies of victorious armies, who have occasionally figured on the page of history. Thus it has been common for tradition, and those historians who implicitly believe, without having made previous inquiry, to describe camps as Danish or Saxon, which originally were the fortified heights of Britons; and subsequently, the strong holds occupied by the Roman legions. But setting aside the fabulous story of Kenneth Macalpin, which has been the foundation of much unprofitable controversy, it would be very difficult to counteract the force of arguments, adduced by the learned and profound adept in the school of antiquarian research, whose name alone is itself an host, the late erudite Mr. King; one of which is, "They are to be seen in parts of the kingdom, where the Danes never penetrated." And that he might not make an assertion without advancing proof, which has been hapless too common a case in this national contention, he refers to what is called *Black castle*, in the Parish of Mouline, Perthshire; to one of these buildings in the hill of Drummin; and to several others in different parts of the Glen Lion; which shew how numerous these structures were in what was denominated the country of the Picts. Mr. Chalmers, in his history of Caledonia, observes, that many of these edifices "in the Orkney and Shetland islands, and in Caithness, have been erroneously called Pictish castles, Pictish towers, and Picts houses, from a fabulous story which attributes to Kenneth Macalpin the impolicy of driving many of the Picts into the northern extremity of our island; whence they fled to the Orkney and Shetland isles." But the learned author himself does away the force of this reason for the denomination, by stating in another part of his work, that "it was asserted by ignorance, and believed by credulity, that Kenneth made so bad an use of the power which he had adroitly acquired, as to destroy the whole Pictish people in the wantonness of his cruelty." Caled. p. 333. And he is confident enough to infer, from consimilarity in the appearance of many of these buildings with others, which have generally been attributed to the northern nations, that their origin must be acknowledged Scandinavian. And in addition, he urges, that "not one of these *strengths* bears any appellation from the Pictish or British language; and that they have no similarity to any of the *strengths* of the genuine Picts, or British tribes of North Britain." Ibid. p. 343, 344.

For their *Scandinavian* origin, there is a degree of feasibility; because, from the accounts given by travellers of undoubted intelligence and veracity, it appears that, even at the present period, the houses of the Icelanders, allowed to be the least unmingled Gothic colony, exhibit a striking resemblance to these buildings. But the ground on which Mr. King rests his judgment, and with a much greater degree of probability, is, that "the Pictish buildings, or those so called, resemble the British remains in Cornwall and South Wales." And the writer of this article has seen a variety of remains of circular buildings, of a similar description, in different parts of North Wales, particularly in Caernarvonshire, of the origin of which the inhabitants are almost traditionally unacquainted. They are in some places called "round-abouts," and in others "Arthur's round tables;" *Buarth caedeu*, *Buarth Arthur*, &c.

It is a curious circumstance attached to these monuments of antiquity, that they have been made the criterion of systematic inquiries diametrically opposite. While Mr. King and Mr. Chalmers lay down the same general principle, as a powerful argument of the Celtic derivation of the Picts; it is singular that the one should attempt to prove they are of Celtic, and the other as strenuously contend that they are of Scandinavian origin. Upon a review of the arguments adduced by both, the hypothesis of Mr. King appears to stand the best supported, from similar structures acknowledged the retreats of the ancient inhabitants of the island, from the etymons of their names, and from the traditions and comparative history of the country.

Of their designation and use equally different opinions have been advanced. Of the first kind, or circular buildings, which appear above ground, no doubt can be entertained. They were evidently *watch towers*, and occasional fortresses for defensive warfare. Of the second sort, a latitude is afforded for variance in judgment. These have been considered as fortified recesses. But reasoning from analogy, they are evidently the remains of the *hybernacula*, or winter habitations of the aboriginal inhabitants; who, principally employed with their flocks on the hills, or cultivating the open fields in the plains, during the summer months, there erected their æstival tabernacles; and when the ungenial season arrived, they retired with their ingatherings to their brumal habitations. Thus, like the other British tribes, they had their *hucsodlys* and *gosen*, their summer and winter residences; and similarity of customs is a powerful argument for affinity of origin. See Pennant's Tour in Scotland. Statistical Account of the Highlands. King's Munimenta Antiqua. Chalmers's History of Caledonia.

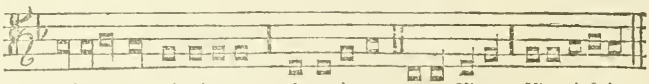
Duns, John, commonly called *Duns Scotus*, in *Biography*, one of the scholastics who flourished about the close of the 13th and commencement of the 14th centuries. He

was born, probably, at Dunſtance, near Alnwick in Northumberland. In his youth he was admitted to an inſtitution belonging to the Franciſcan friars at Newcaſtle, and ſent by them to complete his education at Merton college in the univerſity of Oxford, where he became a fellow, and diſtinguiſhed himſelf by his proficiency in ſcholaſtic theology, civil and canon law, logic, metaphyſics, mathematics, and aſtronomy. About the year 1301, he occupied the chair of theology in this univerſity; and his fame drew together a great number of ſcholars to attend upon his lectures. About the year 1304, he was admitted to the higheſt honours in the univerſity of Paris, whither he was ſent by his ſuperiors; and appointed profeſſor and regent in the theological ſchool. Having in this ſituation acquired ſingular reputation by his ſubtlety in diſputation, he was denominated "the moſt ſubtle doctor;" but his ingenuity was principally diſplayed in embarraſſing, with chimerical abſtraction and puzzling diſtinctions, ſubjects already ſufficiently perplexed. Thus, inſtead of promoting the knowledge of important and uſeful truth, he applied his talents and learning to purpoſes that were injurious to rational inveſtigation and inquiry. In the commencement of his literary career, he was a follower of Thomas Aquinas; but differing from this "angelical doctor," in his opinion concerning the efficacy of divine grace, he formed a diſtinct ſect; and hence proceeded the two denominations of *Thomiſts* and *Scotiſts*, which ſee. Duns Scotus was a zealous advocate for the immaculate conception of the Virgin Mary; a notion which ſome ſay was firſt propounded by him; and which, however, was ſtrenuouſly maintained by him and his ſect, in conjunction with the Franciſcans, and as vehemently oppoſed by the Thomiſts and the Dominicans. In the year 1308, Duns Scotus was deputed by the fraternity of Minors, of which he was a member, to teach theology at Cologne; where he was received with great pomp and ſanguine expectations; but a ſudden death, probably by an apoplexy, diſappointed the views and hopes of his adherents. This event took place, as ſome ſay, in the 43d, but according to others, in the 34th year of his age. But the preciſe time both of his birth and death has not been aſcertained. His works in dialectics and ſcholaſtic theology are numerous; moſt of them were printed ſeparately, and the moſt complete collection of the whole, together with the life of the author, was publiſhed by Lucas Waddingus, at Lyons, in 1639, in 12 vols. folio. Cave's Hiſt. Lit. vol ii. ſub. ſæc. Wicklev. Moſh. Eccl. Hiſt. ſæc. 14. Brucker's Hiſt. Phil. Enfield, vol. ii. p. 379. See SCHOLASTICS and SCOTISTS.

DUNSE, in *Geography*, a conſiderable town and pariſh in the county of Berwick, Scotland; is encompaſſed on the weſt, north, and eaſt by the Lammermuir hills, a plain of twenty-five miles extent lying towards the ſouth. The ancient ſite of the town was on the ſummit of a hill called Dunſe-Law, which riſes, from a baſe of about two miles and a half in circumference, to an elevation of 630 feet above the level of the ſea. The town was afterwards rebuilt at the foot of the hill. About half a mile diſtant is Dunſe-caſtle, a large, venerable building, commanding an extenſive proſpect ſouthward as far as the Cheviot hills, and ſurrounded by ſeveral hundred acres of thriving plantations; it is now the family reſidence of Hay of Drummelzier. In the year 1747 the celebrated mineral well, called Dunſe-ſpa, was diſcovered; it affords a ſtrong chalybeate water, ſimilar to that of Tunbridge in England. In the vicinity is an extenſive bleach-field, a tan-yard, and a very conſiderable woollen manufactory. The population of the town is about 2400; it has a weekly market; and four annual fairs, chiefly for horſes, ſheep, and black cattle. The pariſh extends eight miles in length and five in width: improvements in agriculture proceed here with great rapidity. The river Whittader, which riſes in Lammermuir, runs through the pariſh, and contains excellent ſalmon. Cockburn Law is a uſeful land mark for ſhips navigating the German ocean, as it riſes 900 feet above the ſea. On this hill are the ruins of a very ancient ſtructure called Woden's or Eden's Hall. The celebrated theologiſt and metaphyſician Johannes Duns Scotus, as ſome ſay, was born in Dunſe A. D. 1274. The houſe in which he was born is ſaid ſtill to remain. Sinclair's Statiſtical account of Scotland.

DUNSKERRY, a ſmall iſland near the north coaſt of Scotland; 4 miles E.S.E. of Farout Head.

DUNSTABLE, JOHN, in *Biography*, an Engliſh muſician, who at an early ſtage of counterpoint, acquired on the continent the reputation of being its inventor. He was the muſician whom the Germans, from a ſimilarity of name, have miſtaken for ſaint Dunſtan, and to whom, as erroneouſly, they have joined iſſue with others in aſcribing to him the invention of counterpoint in four parts. He was author of the muſical treatiſe "De Menſurabili Muſicâ," which is cited by Franchinus, Morley, and Ravenſcroft. But though this work is loſt, there is ſtill extant in the Bodleian library, a Geographical Tract by this author; and, if we may believe his epitaph, which is preſerved by Weaver, he was not only a muſician, but a mathematician, and an eminent aſtrologer. Of his muſical compoſitions nothing remains but two or three fragments in Franchinus, and Morley. He is very unjuſtly accuſed by this laſt writer of ſeparating the ſyllables of the ſame word by *reſts*. But I believe maſter Morley was ſo eager to make a wretched pun on the name of Dunſtable, that he did not ſufficiently conſider the paſſages which he cenſured; the errors in which ſeem to be only thoſe of the tranſcriber or printer: for the laſt ſyllable of Angelorum belongs to the laſt note of the firſt muſical phraſe, *before* the reſts, and not to the firſt note of the ſecond group.



Ipſum regem Anglorum An-ge-lo-rum Sola Virgo Virgo lactabat.

The words and ſyllables in this manner fall on the right notes.

Dunſtable ſeems to have acquired a great reputation on the continent; for he is not only cited by Franchinus, but John Tinctor, a writer ſomewhat more ancient, who gives to the Engliſh the invention of the new art of counterpoint, and places John Dunſtable at their head. Speaking of counterpoint he ſays, "Cujus ut ita dicam novæ artis fons et origo, apud Anglos, quorum Caput Dunſtable exiſtit fuiſſe perhibetur." It was in a MS. Latin tract, in the poſſeſſion of Padre Martini, that I ſaw this curious paſſage, which probably has done us ſome credit with thoſe who have believed and tranſcribed it; but he could not have been the inventor of that art concerning which ſeveral treatiſes were written before he was born. However this is but one proof more of what has been already remarked, that when a miſtake or a falſehood has once

once had admiſſion into a book, it is not eaſily eradicated; and this aſſertion concerning John of Dunſtable's invention of counterpoint, aſ if it were not ſufficiently falſe in itſelf, has been aggravated by the additional blunder of miſtaking his name for that of St. Dunſtan. Not only M. Marpurg, but the editors of the Supplement to the Encyclopedie, art. Contrepoint, have lately copied this error unexamined.

Dunſtable, whom Stow calls "a maſter of aſtronomie and muſic," was buried in the church of St. Stephen, Walbrook, 1453.

Dunstable, in *Geography*, a poſt town of America, in the ſtate of New Hampſhire and county of Hillſborough, on the weſt ſide of Merrimack river, below the town of Merrimack, and ſeparated by the ſtate line from Pepperel and Dunſtable in Middleſex county, Maſſachuſetts: incorporated in 1746, containing 862 inhabitants, and lying about 40 miles N.W. of Boſton.—Alſo, a townſhip of Maſſachuſetts, in the northern part of Middleſex county, on the ſouthern bank of Merrimack river; containing 485 inhabitants, and ſituated 37 miles north weſterly of Boſton.

Dunstable. See Dunstaple.

DUNSTAN, St. in *Biography*, was born of noble parents at Glaſtonbury in Somerſetſhire in the year 925. Under the patronage of his uncle Aldhelm, archbiſhop of Canterbury, he was well inſtructed in the literature and accompliſhments of thoſe times, and in conſequence of his recommendation invited by king Athelſtan to court. By his own addreſs and the intereſt of his uncle the king preſented him with ſome lands near Glaſtonbury, where he is ſaid to have ſpent ſome years in retirement. Edmund, the ſucceſſor of Athelſtan, appointed him abbot of a monaſtery, which he founded in that place. To this prince, however, he was repreſented as a man of licentious manners; and dreading the ruin of his fortune, by ſuſpicions of this nature, he determined to repair paſt indiſcretions by exchanging the extreme of ſuperſtition for that of licentiouſneſs. Accordingly he ſecluded himſelf altogether from the world; and he framed a cell ſo ſmall, that he could neither ſtand erect in it nor ſtretch out his limbs during his repoſe; and here he employed himſelf perpetually in devotion or manual labour. In this retreat his mind was probably ſomewhat deranged, and he indulged chimeras, which, believed by himſelf and announced to the credulous multitude, eſtabliſhed a character of ſanctity among the people. He is ſaid to have fancied that the devil, among the frequent viſits which he paid him, was one day more earneſt than uſual in his temptations; till Dunſtan, provoked by his importunity, ſeized him by the noſe with a pair of red-hot pincers as he put his head into the cell; and he held him there, till the malignant ſpirit made the whole neighbourhood reſound with his bellowings. The people credited and extolled this notable exploit; and it enſured to Dunſtan a degree of reputation, which no real piety, much leſs virtue, could, even in the moſt enlightened period, have ever procured for him. Supported by the character gained in his retreat, Dunſtan appeared again in the world; and gained ſuch an aſcendant over Edred, who had ſucceeded to the crown, as made him not only the director of that prince's conſcience, but his counſellor in the moſt important affairs of government. The prince, deluded by an appearance of ſanctity, which covered the moſt violent and moſt inſolent ambition, gratified him by re-building Glaſtonbury church and monaſtery in a very ſumptuous and magnificent ſtyle. He was placed at the head of the treaſury; and being poſſeſſed of power at court, and of credit with the populace, he was enabled to attempt with ſucceſs the moſt arduous enterprizes. Taking advantage of the implicit confidence repoſed in him by the king, Dunſtan imported into England a new order of monks, who, by changing the ſtate of eccleſiaſtical affairs, excited, on their firſt eſtabliſhment, the moſt violent commotions. Finding alſo that his advancement had been owing to the opinion of his auſterity, he profeſſed himſelf a partizan of the rigid monaſtic rules; and after introducing that reformation into the convents of Glaſtonbury and Abingdon, he endeavoured to render it univerſal in the kingdom. (See Celibacy.) This conduct, however, incurred the reſentment of the ſecular clergy; and theſe exaſperated the indignation of many courtiers, which had been already excited by the haughty and over-bearing demeanour which Dunſtan aſſumed. Upon the death of Edred, who had ſupported his prime miniſter and favourite in all his meaſures, and the ſubſequent ſucceſſion of Edwy, Dunſtan was accuſed of malverſation in his office and baniſhed the kingdom. But his cabal had obtained an influence over the minds of the populace which it was not eaſy to ſupplant, and during his abſence his ſanctity was extolled and ſerved to excite inſurrections againſt the government of Edwy. The moral and religious character of the king and queen was attacked, chiefly on the ground of their mutual attachment and endearment, and pretences of various kinds were directed for collecting together a great number of malcontents, who placed Edgar at their head and determined to exclude the reigning family. Edgar ſoon made himſelf maſter of the kingdom, and the death of Edwy made way for his acceſſion to the throne. As ſoon as Edgar's power was eſtabliſhed, Dunſtan was recalled and promoted firſt to the ſee of Worceſter, then to that of London; and about the year 959 to the archiepiſcopal ſee of Canterbury. For this laſt advancement it was requiſite to obtain the ſanction of the pope; and for this purpoſe Dunſtan was ſent to Rome, where he ſoon obtained the object of his wiſhes and the appointment of legate in England, with very extenſive authority. Upon his return to England, ſo abſolute was his influence over the king, he was enabled to give to the Romiſh ſee an authority and juriſdiction, of which the Engliſh clergy had been before in a conſiderable degree independent. In order the more effectually and completely to accompliſh this object, the ſecular clergy were excluded from their livings and diſgraced; and the monks were appointed to ſupply their places. The ſcandalous lives of the ſecular clergy furniſhed one plea for this meaſure, and it was not altogether groundleſs; but the principal motive was that of rendering the papal power abſolute in the Engliſh church, for, at this period, the Engliſh clergy had not yielded implicit ſubmiſſion to the pretended ſucceſſors of St. Peter, as they refuſed to comply with the decrees of the popes, which enjoined celibacy on the clergy. Dunſtan was active and perſevering, and ſupported by the authority of the crown, he conquered the ſtruggles which the country had long maintained againſt papal dominion, and gave to the monks an influence, the baneful effects of which were experienced in England until the era of the reformation. Hence Dunſtan has been highly extolled by the monks and partizans of the Romiſh church; and his character has been celebrated in a variety of ways, and particularly by the miracles, which have been wrought either by himſelf or by others in his favour. During the whole reign of Edgar, Dunſtan maintained his intereſt at court; and upon his death, in 975, his influence ſerved to raiſe his ſon Edward to the throne, in oppoſition to Ethelred. Whilſt Edward was in his minority, Dunſtan ruled with abſolute ſway both in the church and ſtate, but on the murder of the king in 979, and after the acceſſion of Ethelred, his credit and influence declined; and the contempt with which his threatenings of divine vengeance were regarded by the king are ſaid to have mortified him to ſuch a degree,

a degree, that he returned to his archbishopric, and died of grief and vexation in the year 988 Cave's Hist. Lit. vol. ii. p. 102. Rapin's Hist. Engl. vol. i. Hume's Hist. vol. i.

Dunstan is mentioned by several German writers not only as a great musician, but as the inventor of music in four parts: a mistake that has arisen from the similarity of his name with that of Dunstable, one of the earliest writers on counterpoint in this country; at least it is certain, that music in four parts was not only unknown here, but throughout Europe, in the tenth century, during which Dunstan flourished. Dunstan died 988, aged 64. Indeed, almost all the Monkish writers thought it necessary to make a conjurer of this turbulent prelate. Fuller, (Church History, 1666,) who has consulted them all, tells us, that he was an excellent musician, which, according to this writer, was a qualification very requisite to ecclesiastical preferment; for, he informs us, that, "preaching, in those days, could not be heard for singing in churches." However, the superior knowledge of Dunstan in music was numbered among his crimes; for being accused of magic to the king, it was urged against him, that he had constructed, by the help of the devil, (probably before he had taken him by the nose,) a harp, that not only moved of itself, but played without any human assistance. With all his violence and ambition, it may be supposed, that he was a man of genius and talents; since it is allowed, by the least monkish among his historians, that he was not only an excellent musician, but a notable painter and statuary, which, says Fuller, "were two very useful accomplishments for the furtherance of saint-worship either in pictures or in statues."

Indeed, it is expressly said, in a MS. life of this prelate, (Vit. St. Dunstan. MSS. Cott. Brit. Mus. Faustin. b. xiii.) that among his sacred studies, he cultivated the arts of writing, harping, and painting. It is likewise upon record, that he cast two of the bells of Abingdon abbey with his own hands. (Monast. Anglic. tom. i. p. 104.) And according to William of Malmesbury, who wrote about the year 1120, the Saxons had organs in their churches before the conquest. He says, that Dunstan, in the reign of king Edgar, gave an organ to the abbey of Malmesbury; which, by his description, very much resembled that in present use. "Organa, ubi per æreas fistulas musicis mensuris elaboratas, dudum conceptas follis vomit anxius auras." William, who was a monk of this abbey, adds, that this benefaction of Dunstan was inscribed in a Latin distich, which he quotes, on the organ-pipes. Vit. Aldhem. Whart. Ang. Sacr. ii. p. 33. Osb. Vit S. Dunst.

DUNSTANG, in *Geography*, a town of Lithuania, in the palatinate of Wilna; 28 miles N. E. of Wilkomierz.

DUNSTAPLE, a market town and parish in the hundred of Manshead and county of Bedford, England, is situated on a chalky soil at the entrance of the Chiltern hills, where the Roman Watling street is crossed by the Ickneild-street. It was constituted a borough and market town by king Henry I. who, to defeat the depredations of robbers who infested that part of the country, encouraged a settlement here, and built a royal mansion for himself. The name of the town is by some supposed to be derived from Dun, a chief of the robbers, but is with greater probability attributed to the market or staple on the downs. In the year 1131, the king bestowed the town with all its rights and privileges on a priory of Black Canons which he had founded near his palace. The town and priory were the scenes of many royal visits and solemnities in that and several succeeding reigns. In 1290 the corpse of Eleanor, Edward I.'s queen, was deposited here one night, which was commemorated by the erection of a cross in the market place. This remained till 1643, when it was destroyed by the parliamentary forces. The priors of Dunstaple enjoyed very considerable rights and liberties; having the power of life and death vested in them. At the dissolution in 1554 the site of the priory was granted to Dr. Leonard Chamberlayne; it is now the property of Col. Maddison. The only remains of the conventual buildings, except what is now the parish church, are a few rooms roofed with vaulted and groined stone. In the present parish church, which contains only the nave of that of the old priory, different styles of architecture are displayed. The inside is part of the original structure. At the west end is a stone gallery, which has pointed arches; the windows are more modern. The decorations of the west front externally are of the early pointed style. The great western door has a semicircular arch, richly ornamented, but is now in a mutilated state. The town consists of four principal streets, answering to the cardinal points. At the south end are a respectable charity school endowed in 1712, and several alms-houses. But few of the privileges conferred by Henry I. are now retained by the townsmen; the government is vested in four constables. The chief manufacture is that of various articles, useful and ornamental, in straw, particularly hats, which are known throughout the kingdom by the name of *Dunstaples*, the making of which affords subsistence to a great number of women and girls. King Henry I. granted two markets, held on Sundays (no unusual thing in ancient times) and Wednesdays; the latter only is now in use, with four annual fairs. Dunstaple is 33 miles N.W. from London; and contains, according to the returns under the late population act, 243 houses and 1296 inhabitants. Among the natives of this town, was Elkanah Settle, well known for his dramatic and political writings, which were published towards the close of the 17th century. The first attempt at theatrical representations in this kingdom is supposed to have been made in this town.

About a mile west of Dunstaple are the remains of an ancient fortification, called *Maiden Bower*. It is a circular earth-work, about 2500 feet in circumference, consisting of a single vallum and ditch.

Two miles north-west of the town, on the brow of a hill, is situated Totternhoe-castle, a work of great strength, consisting of a lofty circular mount, with a slight vallum round its base, and a larger one of an irregular form at some distance. On the south-east side is an encampment about 500 feet long and 250 wide; of which three sides are guarded by a vallum and ditch; the fourth being on the edge of a precipice has no vallum. Lysons's Magna Britannia, vol. i. Britton's Architectural Antiquities, vol. i.

DUNSTER, a town of England, in the county of Somerset, having a weekly market on Friday; 20½ miles W. of Bridgewater, and 158½ W. of London.

DUNTER GOOSE, a species of the wild goose, found in Zealand. Phil. Trans. N° 473. § 8. See *Colchert* DUCK.

DUNUM, BAY *of*, in *Ancient Geography*, is supposed to have been the mouth of the river Tees.

DUNWICH, in *Geography*, now a small borough and market town, in the hundred of Blything, in the county of Suffolk, England, was, during part of the Anglo-Saxon dynasty, a bishop's see, in which eleven prelates presided. In the year 955, this bishopric was united with that of Elmham in Norfolk, and both were soon afterwards transferred to Thetford, and thence, in 1088, to Norwich. Spelman states, that the town at one time contained 52 churches; but he must certainly mean the see. Dunwich, at present, consists of 42 houses, and 184 inhabitants. It sends two members to parliament; who are elected by a few freemen residing within the borough, and who do not receive alms.

alms. The corporation consists of two bailiffs and 12 capital burgesses. In the town are the remains of an old church, which some antiquaries endeavour to prove was the Saxon cathedral. Here are also some remains of an ancient chapel, and a building called the palace. Here is a small market on Monday, and one annual fair. See Gardner's History of Dunwich.

DUNWICH, a township of America, in the county of Suffolk, in Upper Canada, W. of Southwold, having the river Thames for its north, and lake Erie for its south boundary.

DUNZ, or DUNS, JOHN, in *Biography*, painter of portraits and flowers. He was born at Berne, in Switzerland. Possessing an affluent fortune, he never painted for money; but was, nevertheless, indefatigable in his art. He was a great encourager of the arts and artists of his own time, and was much respected for his virtues. Died 1736. Vie des Peintres Flamands, &c.

DUO, in *Music*, a song, or composition, to be performed in two parts only; the one sung, and the other played on an instrument; or by two voices alone. See DUET.

DUO is also when two voices sing different parts, accompanied with a third, which is a thorough base. Unisons and octaves are rarely to be used in *duos*, except at the beginning and end.

DUOBUS. *Pilulæ ex*, in *Medicine*. See PILLS.

DUOBUS, *Sal de*. See SULPHAT *of Potash*.

DUODENALIS, in *Anatomy*, a term applied to such parts as belong to the duodenum; as the arteries, veins, &c.

DUODENUM, the first portion of the small intestine which communicates at its origin with the stomach, through the pylorus, and is continuous, at its termination with the jejunum, or second division. See INTESTINE.

DUPAGE, in *Geography*, a circular lake on the S. E. side of Plein river in America, or rather an enlargement of that river; 5 miles from its mouth. Plein and Theakiki there form the Illinois.

DUPATY, in *Biography*, a distinguished magistrate, and man of letters, was born at Rochelle, and became advocate-general to the parliament at Bourdeaux, and afterwards president *à mortier*. He acquired great honour by his firmness and eloquence at the revolution in the magistracy which took place in 1771, and successfully defended three persons of Chaumont, who had been condemned to be broken on the wheel. He published "Historical Reflections upon the Criminal Laws," which display an humane and enlightened mind, and was long occupied in promoting a reform on this subject, contending with a zeal worthy the cause against the obstacles, which prejudice and powerful influence threw in his way. He spent the latter part of his life at Paris, and made himself known, as a man of letters, by "Academical Discourses," and "Letters on Italy." He was thought too close an imitator of the manner of Diderot, by which his style did not appear to advantage. He died in 1788. Gen. Biog.

DUPHLY, a musical professor on the harpsichord, who composed some agreeable pieces in the French style of the time, (30 or 40 years ago,) which were printed in England by Walsh, and which, as well as their author at Paris, were in high favour here, and thought well calculated to form the hand. Duphly was employed by Rousseau in drawing up the article *Doigter*, fingering; but his method is not what would be called good now, nor did it agree with the method of Couperin, good at the beginning of the last century, and in many particulars still excellent.

DUPIN, LOUIS ELLIS, a celebrated ecclesiastical historian, was born at Paris in 1657, where he was educated. In the year 1672, he was admitted to his degree, on which occasion he particularly recommended himself to notice, by the able manner in which he performed the customary exercises. Having fixed upon theology as a profession, he studied at the Sorbonne, and then applied himself with the utmost diligence to the history of the councils, and the works of the fathers. In the year 1680, he was licensed to officiate as a priest, and, in 1684, he received the bonnet of doctor of the Sorbonne, and then employed his time and talents on his great work, entitled "Bibliothèque universelle des Auteurs Ecclesiastiques," &c. or, "History of Ecclesiastical Writers, containing an Account of the Authors of the several Books of the Old and New Testament; and the Lives and Writings of the primitive Fathers," &c. &c. This work was well received, and has maintained a high reputation to the present time, as well for the information which it conveys, as for its impartiality. It has gone through many editions in France, Holland, and this country. He next published, "An Account of the Writers of the first Three Centuries." This work appeared in 1686, and was followed by a succession of volumes, published at different periods, from that time to 1719. Before M. Dupin had completed his "Account of the Writers of the first Eight Centuries," the freedom of his opinions called forth the remarks of some monks, which obliged him to justify what he had written. These were not the only enemies with whom he had to struggle; the celebrated Bossuet, in his zeal for the catholic faith, collected a number of propositions from the volumes of Dupin, which he asserted were of a highly dangerous tendency. The historian retracted, and was allowed to proceed without farther interruption. Notwithstanding the labour of research which this work required, the author, during the time of publishing it, presented to the world many other volumes on different subjects, and he sustained at the same time the office of commissary in the concerns of the faculty of the Sorbonne, discharged the duties of professor of philosophy in the college royal; furnished important contributions to the "Journal des Scavans;" supplied numerous applicants with memoirs, prefaces, advice on literary and other subjects; and yet, by his industry, and a methodical distribution of his time, found leisure to indulge in the society, and conversation of his friends. In the dispute concerning the opinions of Jansenius, he took that side which exposed him to the resentment of the pope, and of the court of France, and was, accordingly, deprived of his professorship in the year 1703, and likewise banished: nor was he permitted to return to Paris before he retracted the measures which he had taken; and even then he was not reinstated in his professorship. This was not his only trouble; he was harrassed under the regency, on account of the correspondence which he held with Dr. Wake, archbishop of Canterbury, relative to a project for uniting the churches of England and France. In the beginning of the year 1719, his papers were seized, by order of government, and innumerable calumnies propagated to his prejudice; but as no charge could be made out against him, he was permitted to spend his few remaining days in peace. He died in a very short time after at Paris, in the 62d year of his age, regretted by his friends, and by his enemies, who were now ashamed of their conduct towards him. His works were very numerous, of which an account will be found in Moreri, and also in the Gen. Biography.

DUPINO, or DUBLIN, in *Geography*, a town of Poland, in the palatinate of Posnania; 44 miles south of Posen.

DUPLA, DUPLE *Ratio*, is where the antecedent term is double the consequent; or, where the exponent of the

the ratio is 2 :—thus 6 : 3 is in a duple ratio. See Ratio.

Duple, *Sub*, *Ratio*, is where the consequent term is double the antecedent; or, the exponent of the ratio is $\frac{1}{2}$: Thus, 3 : 6 is in a sub-duple ratio.

Dupla *Sesquialtera* } *Ratio*. See Ratio.
Dupla *Superbipartiens tertias* }

Duple *Time*. See Time.

DUPLEIX, Scipio, in *Biography*, a French historian, was born at Condom in 1569. Queen Margaret of Navarre brought him to Paris in 1605, and made him her master of requests. After this he was appointed historiographer of France, and laudably employed many years in researches into the ancient records of his country. Hence he published "Memoirs of the Gauls," 1619, 4to., which, on account of the facts contained in them, were highly esteemed. It might also be regarded as the first part of his "History of France," which is brought down to the year 1645. The last two reigns were revised by cardinal Richlieu, which will account for the adulation paid to that minister. He intended to have re-written a part of the work after the death of the cardinal, but did not live to effect it. He was author of a "Roman History," and a "Course of Philosophy," and other pieces of no great note. In the decline of life he composed a work on the liberties of the Gallican church, which he presented in MS. to the chancellor Seguier, requesting permission to print it, but the chancellor unfeelingly threw it in the fire before his face. The poor old man was so affected with this circumstance that he never again looked up, and died soon after, in 1661, at the age of 92. Moreri.

Dupleix, Joseph, a celebrated French naval commander in the East Indies, was brought up to a mercantile life, and sent out in the year 1730 to direct and support the declining settlement of Chandernagore, which, by his activity and great address, he restored to a most prosperous condition. He extended his country's commerce through the great mogul's territories as far as Tibet, and established a maritime trade with the Red sea, the Persian gulf, the Maldives, and Manilla. And in 1742 his great services were recompensed with the government of Pondicherry. In 1746 La Bourdonnais asserted the honour of the French flag, by dispossessing the English of Madras: this excited the jealousy of Dupleix, who broke the capitulation, and sent charges against Bourdonnais to the French court, which caused him to be confined in the Bastile. In 1748 the English attacked Pondicherry, but Dupleix was successful in its defence, and exhibited so much skill and heroism on the occasion, that he was rewarded with the title of marquis, and the red ribbon. From this time his ambition was almost boundless, and to him is to be ascribed the system of entering into the quarrels of the native powers, and assisting them alternately against each other, so as to render them at length tributaries and subjects, and almost the slaves of European settlers. He was at first very successful in his projects, and procured for himself the nabobship of the Carnatic, of which he was extremely proud, and indulged his vanity in assuming the state of a sovereign prince. But fortune soon turned against him: the English under Lawrence and Clive became triumphant, and expelled the French from their usurpations. Dupleix was recalled in 1754, and the mortifications which he experienced at home preyed so much upon his mind, that he died soon after his return. Hist. of France. Modern Univ. Hist.

DUPLICATE, a second instrument, or act in writing; or a transcript, or copy of another.

The word is formed from the Latin *duploma*, or *duplum*, double.

It is usual to send a duplicate, when it is apprehended the first dispatch, &c. is lost.

Duplicate, in *Chancery*, is particularly used for a second letter patent granted by the lord chancellor, in a case where he had formerly done the same. See Patent.

Duplicate *Ratio*, the ratio between the squares of two quantities. Thus the duplicate ratio of a to b is the ratio of aa to bb, or of the square of a to the square of b.

In a series of geometrical proportions, the first term to the third is said to be in a duplicate ratio of the first to the second; or as its square is to the square of the second. Thus in 2, 4, 8, 16, the ratio of 2 to 8, is duplicate of the ratio of 2 to 4, or as the square of 2 to the square of 4: whereas, duplicate ratio is the proportion of squares; as triplicate is of cubes, &c. and the ratio of 2 to 8, is said to be compounded of that of 2 to 4, and of 4 to 8.

Duplicate *Root*, among *Bataniſts*, one composed of two coats. See Root.

DUPLICATION, Doubling, in *Arithmetic*, and *Geometry*, the multiplying of a quantity, either discrete, or continued, by two.

Duplication *of a Cube*, is the finding of the side of a cube that shall be double in solidity to a given cube; which is a famous problem cultivated by the geometricians two thousand years ago.

It was first proposed by the oracle of Apollo at Delos; which, being consulted about the manner of stopping a plague then raging at Athens, returned for answer that the plague should cease when Apollo's altar, which was cubical, should be doubled. Upon this, they applied themselves in good earnest, to seek the duplicature of the cube, which henceforward was called the *Delian problem*. The problem is only to be solved by finding two mean proportionals between the side of the cube, and double that side; the first whereof will be the side of the cube doubled, was first observed by Hippocrates Chius.

Thus let x and z be two mean proportionals between a and $2a$: then $a : x :: x : z = \frac{x^2}{a}$; and $x : \frac{x^2}{a} :: \frac{x^2}{a} : a$; therefore $x^3 = 2a^3$. Supposing the side of the given cube a to be 10, then the cube root of $2a^3$, or 2000, found by approximation, will be the side of the altar required, nearly.

Eutochius, in his comments on Archimedes, gives several ways of performing this by the mesolabe. Pappus Alexandrinus, and his commentator, Commandine, give three ways: the first, according to Archimedes; the second, according to Hero; and the third, by an instrument invented by Pappus, which gives all the proportions required.

The sieur de Comiers has likewise published an exact demonstration of the same problem, by means of a compass with three legs; but these methods are all only mechanical.

Re-Duplication. See Reduplication.

Duplication, a term in the French plain-chant. An intonation by duplication is made by a kind of periods, or leading notes, doubling the penultima note of the word which terminates the intonation; and which can only happen when this penultima is below the terminating note. The duplication then serves to prepare and mark the cadence in a manner of a *note sensible*, or sharp 7th of the key. See Periclesis.

DUPLICATUM Arcanum. See Arcanum.

DUPLICATURE, in *Anatomy*, a term applied to the folds of membranes or other soft parts, in which other organs are contained. Hence all duplicatures consist of two layers. Thus the lips and eyelids consist of duplicature of

the skin the cartilage of the ear is enclosed in a duplicature of the same part; the intestines, with the mesenteric vessels, &c are inclosed in a duplicature of the peritoneum, &c.

DUPLIN, in *Geography*, a county of America, in the state of North Carolina and district of Wilmington, bounded E. by Cellow, and S.W. by Sampson. The number of inhabitants is 6790, of whom 1364 are slaves. The farmers generally cultivate wheat and rice, but more commonly eat bread made of Indian corn Cotton and sweet potatoes are raised in considerable quantities. The court-house is 55 miles N of Wilmington, and 566 from Philadelphia.

DUPLODES. See GAMBEZON.

DUPONDIUS, in *Antiquity*, a weight of two pounds; or a money of the value of two asses. See AS.

As the as, at first, weighed a just pondo, or libra, the dupondius then weighed two. And hence the name.

And though the weight of the as was afterwards diminished, and of consequence that of the dupondius also, yet they still retained the denomination. See POUND and LIBRA.

Dupondii, or double asses, were coined both in the former and later period of the commonwealth. The dupondius was half the *Sestertius* (which see), and worth one penny sterling Prior to Augustus, and before the Orichalcus, or yellow brass, appeared in the Roman coinage so generally as it did afterwards, this coin was struck in copper just double the size of the as. There are indeed dupondii of Julius in yellow brass, weighing half an ounce, with a head of VENUS VICTRIX on one side, and CÆSAR DICT. TER. reverse a female figure, with serpents at her feet, C. CLOVI. PRÆF.; others have a victory on the reverse, with Q. OPPIUS PR. From the time of Augustus the dupondius was struck in yellow brass; as Pliny informs us it was in his time: and it is known that no change took place between that and the Augustan age. When this mode first began, the dupondiarius, tied by Pliny, seems to have been adopted, expressing that the coin was not dupondius, or double the weight of the as, but of a dupondiary value. The word dupondius, however was never confined, in its literal acceptation, to *double weight*, for Vitruvius and Varro use it as *double length* or *measure*, in the instance of *dupondius pes*, that is two feet, and the like. Hence, in the imperial times, it did not mean a coin of double the weight of the as, but of double the value. The sestertius weighed an ounce, and the dupondius was the half of it; the as being of copper, as Pliny informs us; and it is inferred from him and from the whole coins that remain, that it stood at half an ounce, till the gradual decline of the sestertius, hardly perceivable before the time of Alexander Severus, brought the as along with it. The dupondius, being the half of the sestertius, kept pace with it through all its stages. (See SESTERTIUS.) It was one of the most common coins in the Roman empire, and it was also common in the Byzantine empire. Although the dupondius was of the same size with the as, it was commonly of much finer workmanship, as its metal was esteemed superior in value. The sestertius and the dupondius continued to be of yellow brass to the termination of the sestertius under Gallienus; and the as was always of copper. Pinkerton's Essay on Medals, vol. i.

DUPORT, in *Biography*, a powerful performer on the violoncello. Till our *Crosdill*, stimulated, perhaps, by his example, had vanquished all the difficulties of finger-board and bow, incident to the instrument, we should readily have joined with M. Laborde, in calling him the most admirable performer on the violoncello that has ever been heard. When in England with his younger brother, it was thought that he could only be excelled by the elder.

DUPA, BRIAN, a respectable English prelate, who flourished in the 17th century, was born at Lewisham, in Kent, in the year 1588. The first part of his education he had at Westminster school, from whence he was removed to Christ-church, Oxford, in the year 1605. Here he took his first degree; and in 1612, he was chosen fellow of All-Souls college. Two years after, he took his degree of M. A.; and having entered into orders, he travelled on the continent for farther improvement. In 1619, he was made a proctor to the university of Oxford; and in 1625, he took the degree of doctor in divinity. At this time he was chaplain to the prince Palatine, and likewise to the earl of Dorset; by the interest of the latter, he was appointed to the deanery of Christ-church, in the year 1629. He was, in the year 1632, chosen to the office of vice-chancellor of the university of Oxford; and in 1634, he was appointed chancellor of the church of Sarum, and chaplain to king Charles I., who, in 1638, gave him the office of tutor to Charles, prince of Wales, and his brother, the duke of York: in the same year he was nominated to the bishopric of Chichester, and in 1640 translated to the see of Salisbury, though, owing to the confusion of the times, he drew no emolument from it. He was a great favourite with the king, attended him closely in the scenes of his affliction, and is said to have assisted him in the composition of the "Eikon Basilike." After the death of his royal master, bishop Duppa retired to Richmond, in Surrey, where he spent the greater part of his time in solitude, until the restoration opened to him brighter prospects. On the accomplishment of that event, the loyalty of the bishop was rewarded by a translation to the rich bishopric of Winchester, to which he was nominated in 1660; he was also made lord almoner, and received other marks of royal distinction. In the following year, he began to build, at his own expence, an hospital for the poor of Richmond, and projected other works of piety and benevolence; but death, in 1662, stopped his hand. Charles II. so much respected his faithful tutor and steady friend, that he paid him a visit only a few hours before his decease, and, it is said, knelt down by his bed-side, and fought the blessing of the dying prelate, which he, no doubt, bestowed with true zeal and devotion. The bishop died, as he had ever lived, honoured and beloved by all who knew him, and leaving behind him a character exemplary for piety, candour, humility, meekness, generosity, and every useful virtue. He was author only of a few occasional sermons. Burnet, in his history, assumes, that bishop Duppa was unequal to the task of educating the young princes; but the biographers of the prelate have given good reason to believe he was admirably qualified for the office, as well by his talents as his strict integrity. Biog. Britan.

DUPRE, DE ST. MAUR, NICHOLAS, was born at Paris about the close of the 17th century; by his education, he was intended for the law, and obtained a place of master of the accounts. He acquired great reputation as a man of letters, and was one of the first of his countrymen who possessed a taste for English literature, and who endeavoured to promote it among his countrymen. He translated Milton's Paradise Lost, which, perhaps, was as well done as the nature of the thing would allow, and on account of it, he was admitted into the French academy, in 1733. He wrote also an "Essay on the Monies of France," 1746, 4to.; "Inquiries into the Value of Monies, and the Price of Corn," 1761, 12mo. And he communicated to Buffon "Tables on the Duration of Human Life," which are to be found in his Natural History of Man. M. Duprè died in 1775, at a very advanced age, leaving behind him a number of MSS. on the same kind of topics as those which he had discussed during his life. Gen. Biog.

the ratio is 2 :—thus 6 : 3 is in a duple ratio. See Ratio.

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DUPLICATE, a second instrument, or act in writing; or a transcript, or copy of another.

The word is formed from the Latin *duploma,* or *duplum,* double.

It is u
first disp
Dup
letter p
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a duplicate, when it is apprehended the
lost.
Chancery, is particularly used for a second
by the lord chancellor, in a case where
e the same. See Patent.
tio, the ratio between the squares of two
he duplicate ratio of *a* to *b* is the ratio of
e square of *a* to the square of *b*.
eometrical proportions, the first term to
be in a duplicate ratio of the first to the
uare is to the square of the second: thus
ratio of 2 to 8, is duplicate of that of 2
are of 2 to the square of 4: wherefore,
he proportion of squares; as triplicate is
the ratio of 2 to 8, is said to be com-
f 2 to 4, and of 4 to 8.
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the ſkin; the cartilage of [illegible] nclofed in a duplicature of the ſame part; the in[illegible] th the mæſenteric veſſels, &c. are incloſed in a [illegible] of the peritoneum, &c.

DUPLIN, in *Geogra*[illegible] y of America, in the ſtate of North Carolina a[illegible] Wilmington, bounded E. by Onſlow, and S.W. [illegible] n. The number of inhabitants is 6796, of wh[illegible] e ſlaves. The farmers generally cultivate wheat [illegible] t more commonly eat bread made of Indian co[illegible] and ſweet potatoes are raiſed in conſiderable [illegible] The court-houſe is 55 miles N. of Wilmington [illegible] n Philadelphia.

DUPLODES. See [illegible]

DUPONDIUS, in [illegible] ight of two pounds; or a money of the valu[illegible] See As.

As the as, at firſt, wei[illegible] do, or libra, the dupondius then weighed t[illegible] e the name.

And though the weig[illegible] as afterwards diminiſhed, and of conſequence [illegible] ondius alſo, yet they ſtill retained the denomin[illegible] UND and LIBRA.

Dupondii, or double a[illegible] both in the former and later period of t[illegible] . The dupondius was half the *Seſtertius* [illegible] orth one penny ſterling. Prior to A[illegible] ichalcus, or yellow braſs, appeare[illegible] lly as it did afterwards, th[illegible] le the ſize of the as. [illegible] yellow braſs, weig[illegible] VICTRIX on one [illegible] female figure, wit[illegible] others have a vic[illegible] From the time [illegible] yellow braſs [illegible] is known t[illegible]

[illegible] uſt [illegible]

[illegible] *doub*[illegible] or *mea*[illegible] and the [illegible] a coin of [illegible] value. The [illegible] was the half [illegible] us; and it is [illegible] that remain, th[illegible] decline of the fe[illegible] of Alexander Seve[illegible] dupondius, being the [illegible] through all its ſtages. (S[illegible] the moſt common coins in [illegible] alſo common in the Byzantine [illegible] pondius was of the ſame ſize with [illegible] of much finer workmanſhip, as its me[illegible] rior in value. The ſeſtertius and the du[illegible] to be of yellow braſs to the termination [illegible] under Gallienus; and the as was always of cop[illegible] erton's Eſſay on Medals, vol. i.

DUPORT, in *Biography*, a powerful performer [illegible] violoncello. Till our *Croſdil*, ſtimulated, perhaps, by [illegible] example, had vanquiſhed all the difficulties of finger-bo[illegible] and bow, incident to the inſtrument, we ſhould readily have [illegible] joined with M. Laborde, in calling him the moſt admirable [illegible] performer on the violoncello that has ever been heard. When [illegible] in England with his younger brother, it was thought that [illegible] he could only be excelled by the elder.

DUPPA, BRIAN, a reſpectable Engliſh prelate, who flouriſhed in the 17th century, was born at Lewiſham, in Kent, in the year 1588. The firſt part of his education he had at Weſtminſter ſchool, from whence he was removed to Chriſt-church, Oxford, in the year 1605. Here he took his firſt degree; and in 1612, he was choſen fellow of All-Souls college. Two years after, he took his degree of M. A.; and having entered into orders, he travelled on the continent for farther improvement. In 1619, he was made a proctor to the univerſity of Oxford; and in 1625, he took the degree of doctor in divinity. At this time he was chaplain to the prince Palatine, and likewiſe to the earl of Dorſet; by the intereſt of the latter, he was appointed to the deanery of Chriſt-church, in the year 1629. He was, in the year 1632, choſen to the office of vice-chancellor of the univerſity of Oxford; and in 1634, he was appointed chancellor of the church of Sarum, and chaplain to king Charles I., who, in 1638, gave him the office of tutor to Charles, prince of Wales, and his brother, the duke of York: in the ſame year he was nominated to the biſhopric of Chicheſter, and in 1640 tranſlated to the ſee of Saliſbury, though, owing to the confuſion of the times, he drew no emolument from it. He was a great favourite with the king, attended him cloſely in the ſcenes of his affliction, and is ſaid to have aſſiſted him in the compoſition of the "Eikon Baſilike." After the death of his royal maſter, biſhop Duppa retired to Richmond, in Surrey, where he ſpent the greater part of [illegible] e in ſolitude, until the reſtoration opened to him [illegible] proſpects. On the accompliſhment of that event, [illegible] ty of the biſhop was rewarded by a tranſlation to [illegible] iſhopric of Winchester, to which he was nominated [illegible] he was alſo made lord almoner, and received other [illegible] al diſtinction. In the following year, he began [illegible] own expence, an hoſpital for the poor of [illegible] rojected other works of piety and benevo- [illegible] in 1662, ſtopped his hand. Charles II. [illegible] his faithful tutor and ſteady friend, that [illegible] nly a few hours before his deceaſe, and, [illegible] by his bed-ſide, and fought the bleſſing [illegible] which he, no doubt, beſtowed with [illegible] . The biſhop died, as he had ever [illegible] eloved by all who knew him, and [illegible] acter exemplary for piety, candour, [illegible] erosity, and every uſeful virtue. [illegible] few occaſional ſermons. Burnet, [illegible] t biſhop Duppa was unequal to [illegible] young princes; but the biogra- [illegible] iven good reaſon to believe he [illegible] e office, as well by his talents [illegible] ritan.

[illegible] CHOLAS, was born at Paris [illegible] ; by his education, he [illegible] d a place of maſter of [illegible] tation as a man of [illegible] ntrymen who poſ- [illegible] endeavoured to [illegible] ſlated Milton's [illegible] done as the [illegible] nt of it, he [illegible] He wrote [illegible] ; "In- [illegible] Corn," [illegible] ables [illegible] d in [illegible] a very [illegible] on the [illegible] during h[illegible]

the ratio is 2:—thus 6 : 3 is in a duple ratio. See RATIO.

DUPLE, *Sub*, *Ratio*, is where the consequent term is double the antecedent; or, the exponent of the ratio is $\frac{1}{2}$: Thus, 3 : 6 is in a sub-duple ratio.

DUPLA *Sesquialtera* } *Ratio*. See RATIO.
DUPLA *Superbipartiens tertias* }

DUPLE *Time*. See TIME.

DUPLEIX, SCIPIO, in *Biography*, a French historian, was born at Condom in 1569. Queen Margaret of Navarre brought him to Paris in 1605, and made him her master of requests. After this he was appointed historiographer of France, and laudably employed many years in researches into the ancient records of his country. Hence he published "Memoirs of the Gauls," 1619, 4to., which, on account of the facts contained in them, were highly esteemed. It might also be regarded as the first part of his "History of France," which is brought down to the year 1645. The last two reigns were revised by cardinal Richlieu, which will account for the adulation paid to that minister. He intended to have re-written a part of the work after the death of the cardinal, but did not live to effect it. He was author of a "Roman History," and a "Course of Philosophy," and other pieces of no great note. In the decline of life he composed a work on the liberties of the Gallican church, which he presented in MS. to the chancellor Seguier, requesting permission to print it, but the chancellor unfeelingly threw it in the fire before his face. The poor old man was so affected with this circumstance that he never again looked up, and died soon after, in 1661, at the age of 92. Moreri.

DUPLEIX, JOSEPH, a celebrated French naval commander in the East Indies, was brought up to a mercantile life, and sent out in the year 1730 to direct and support the declining settlement of Chandernagore, which, by his activity and great address, he restored to a most prosperous condition. He extended his country's commerce through the great mogul's territories as far as Tibet, and established a maritime trade with the Red sea, the Persian gulf, the Maldives, and Manilla. And in 1742 his great services were recompensed with the government of Pondicherry. In 1746 La Bourdonnais asserted the honour of the French flag, by dispossessing the English of Madras: this excited the jealousy of Dupleix, who broke the capitulation, and sent charges against Bourdonnais to the French court, which caused him to be confined in the Bastile. In 1748 the English attacked Pondicherry, but Dupleix was successful in its defence, and exhibited so much skill and heroism on the occasion, that he was rewarded with the title of marquis, and the red ribbon. From this time his ambition was almost boundless, and to him is to be ascribed the system of entering into the quarrels of the native powers, and assisting them alternately against each other, so as to render them at length tributaries and subjects, and almost the slaves of European settlers. He was at first very successful in his projects, and procured for himself the nabobship of the Carnatic, of which he was extremely proud, and indulged his vanity in assuming the state of a sovereign prince. But fortune soon turned against him: the English under Lawrence and Clive became triumphant, and expelled the French from their usurpations. Dupleix was recalled in 1754, and the mortifications which he experienced at home preyed so much upon his mind, that he died soon after his return. Hist. of France. Modern Univ. Hist.

DUPLICATE, a second instrument, or act in writing; or a transcript, or copy of another.

The word is formed from the Latin *duploma*, or *duplum*, double.

It is usual to send a duplicate, when it is apprehended the first dispatch, &c. is lost.

DUPLICATE, in *Chancery*, is particularly used for a second letter patent granted by the lord chancellor, in a case where he had formerly done the same. See PATENT.

DUPLICATE *Ratio*, the ratio between the squares of two quantities. Thus the duplicate ratio of a to b is the ratio of aa to bb, or of the square of a to the square of b.

In a series of geometrical proportions, the first term to the third is said to be in a duplicate ratio of the first to the second; or as its square is to the square of the second: thus in 2, 4, 8, 16, the ratio of 2 to 8, is duplicate of that of 2 to 4, or as the square of 2 to the square of 4: wherefore, duplicate ratio is the proportion of squares; as triplicate is of cubes, &c. and the ratio of 2 to 8, is said to be compounded of that of 2 to 4, and of 4 to 8.

DUPLICATE *Root*, among *Batanists*, one composed of two coats. See ROOT.

DUPLICATION, DOUBLING, in *Arithmetic*, and *Geometry*, the multiplying of a quantity, either discrete, or continued, by two.

DUPLICATION *of a Cube*, is the finding of the side of a cube that shall be double in solidity to a given cube; which is a famous problem cultivated by the geometricians two thousand years ago.

It was first proposed by the oracle of Apollo at Delphos; which, being consulted about the manner of stopping a plague then raging at Athens, returned for answer, that the plague should cease when Apollo's altar, which was cubical, should be doubled. Upon this, they applied themselves in good earnest, to seek the duplicature of the cube, which henceforward was called the *Delian problem*. The problem is only to be solved by finding two mean proportionals between the side of the cube, and double that side; the first whereof will be the side of the cube doubled, as was first observed by Hippocrates Chius.

Thus let x and z be two mean proportionals between a and $2a$: then $a : x :: x : z = \frac{x^2}{a}$; and $x : \frac{x^2}{a} :: \frac{x^2}{a} : 2a$; therefore $x^3 = 2a^3$. Supposing the side of the given altar a to be 10, then the cube root of $2a^3$, or 2000, found by approximation, will be the side of the altar required, nearly.

Eutochius, in his comments on Archimedes, gives several ways of performing this by the mesolabe. Pappus Alexandrinus, and his commentator, Commandine, give three ways: the first, according to Archimedes; the second, according to Hero; and the third, by an instrument invented by Pappus, which gives all the proportions required.

The sieur de Comiers has likewise published an elegant demonstration of the same problem, by means of a compass with three legs; but these methods are all only mechanical.

Re-DUPLICATION. See REDUPLICATION.

DUPLICATION, a term in the French plain-chant. An intonation by duplication is made by a kind of periclesis, or leading notes, doubling the penultima note of the word which terminates the intonation; and which can only happen when this penultima is below the terminating note. The duplication then serves to prepare and mark the close in the manner of a *note sensible*, or sharp 7th of the key. See PERICLESIS.

DUPLICATUM ARCANUM. See ARCANUM.

DUPLICATURE, in *Anatomy*, a term applied to the folds of membranes or other soft parts, in which other organs are contained. Hence all duplicatures consist of two layers. Thus the lips and eyelids consist of duplicatures of the

the skin; the cartilage of the ear is enclosed in a duplicature of the same part; the intestines, with the mesenteric vessels, &c. are inclosed in a duplicature of the peritoneum, &c.

DUPLIN, in *Geography*, a county of America, in the state of North Carolina and district of Wilmington, bounded E. by Onslow, and S.W. by Sampson. The number of inhabitants is 6790, of whom 1364 are slaves. The farmers generally cultivate wheat and rice, but more commonly eat bread made of Indian corn Cotton and sweet potatoes are raised in considerable quantities. The court-house is 55 miles N. of Wilmington, and 566 from Philadelphia.

DUPLODES. See GAMBEZON.

DUPONDIUS, in *Antiquity*, a weight of two pounds; or a money of the value of two asses. See AS.

As the as, at first, weighed a just pondo, or libra, the dupondius then weighed two. And hence the name.

And though the weight of the as was afterwards diminished, and of consequence that of the dupondius also, yet they still retained the denomination. See POUND and LIBRA.

Dupondii, or double asses, were coined both in the former and later period of the commonwealth. The dupondius was half the *Sestertius* (which see), and worth one penny sterling. Prior to Augustus, and before the Orichalcus, or yellow brass, appeared in the Roman coinage so generally as it did afterwards, this coin was struck in copper just double the size of the as. There are indeed dupondii of Julius in yellow brass, weighing half an ounce, with a head of VENUS VICTRIX on one side, and CÆSAR DICT. TER. reverse a female figure, with serpents at her feet, C. CLOVI. PRÆF.; others have a victory on the reverse, with Q. OPPIUS PR. From the time of Augustus the dupondius was struck in yellow brass; as Pliny informs us it was in his time: and it is known that no change took place between that and the Augustan age. When this mode first began, the dupondiarius, used by Pliny, seems to have been adopted, expressing that the coin was not dupondius, or double the weight of the as, but of a dupondiary value. The word dupondius, however, was never confined, in its literal acceptation, to *double weight*, for Vitruvius and Varro use it as *double length* or *measure*, in the instance of *dupondius pes*, that is two feet, and the like. Hence, in the imperial times, it did not mean a coin of double the weight of the as, but of double the value. The sestertius weighed an ounce, and the dupondius was the half of it; the as being of copper, as Pliny informs us; and it is inferred from him and from the whole coins that remain, that it stood at half an ounce, till the gradual decline of the sestertius, hardly perceivable before the time of Alexander Severus, brought the as along with it. The dupondius, being the half of the sestertius, kept pace with it through all its stages. (See SESTERTIUS.) It was one of the most common coins in the Roman empire, and it was also common in the Byzantine empire. Although the dupondius was of the same size with the as, it was commonly of much finer workmanship, as its metal was esteemed superior in value. The sestertius and the dupondius continued to be of yellow brass to the termination of the sestertius under Gallienus; and the as was always of copper. Pinkerton's Essay on Medals, vol. i.

DUPORT, in *Biography*, a powerful performer on the violoncello. Till our *Crosdill*, stimulated, perhaps, by his example, had vanquished all the difficulties of finger-board and bow, incident to the instrument, we should readily have joined with M. Laborde, in calling him the most admirable performer on the violoncello that has ever been heard. When in England with his younger brother, it was thought that he could only be excelled by the elder.

DUPPA, BRIAN, a respectable English prelate, who flourished in the 17th century, was born at Lewisham, in Kent, in the year 1588. The first part of his education he had at Westminster school, from whence he was removed to Christ-church, Oxford, in the year 1605. Here he took his first degree; and in 1612, he was chosen fellow of All-Souls college. Two years after, he took his degree of M. A.; and having entered into orders, he travelled on the continent for farther improvement. In 1619, he was made a proctor to the university of Oxford; and in 1625, he took the degree of doctor in divinity. At this time he was chaplain to the prince Palatine, and likewise to the earl of Dorset; by the interest of the latter, he was appointed to the deanery of Christ-church, in the year 1629. He was, in the year 1632, chosen to the office of vice-chancellor of the university of Oxford; and in 1634, he was appointed chancellor of the church of Sarum, and chaplain to king Charles I., who, in 1638, gave him the office of tutor to Charles, prince of Wales, and his brother, the duke of York: in the same year he was nominated to the bishopric of Chichester, and in 1640 translated to the see of Salisbury, though, owing to the confusion of the times, he drew no emolument from it. He was a great favourite with the king, attended him closely in the scenes of his affliction, and is said to have assisted him in the composition of the "Eikon Basilike." After the death of his royal master, bishop Duppa retired to Richmond, in Surrey, where he spent the greater part of his time in solitude, until the restoration opened to him brighter prospects. On the accomplishment of that event, the loyalty of the bishop was rewarded by a translation to the rich bishopric of Winchester, to which he was nominated in 1660; he was also made lord almoner, and received other marks of royal distinction. In the following year, he began to build, at his own expence, an hospital for the poor of Richmond, and projected other works of piety and benevolence; but death, in 1662, stopped his hand. Charles II. so much respected his faithful tutor and steady friend, that he paid him a visit only a few hours before his decease, and, it is said, knelt down by his bed-side, and fought the blessing of the dying prelate, which he, no doubt, bestowed with true zeal and devotion. The bishop died, as he had ever lived, honoured and beloved by all who knew him, and leaving behind him a character exemplary for piety, candour, humility, meekness, generosity, and every useful virtue. He was author only of a few occasional sermons. Burnet, in his history, assumes, that bishop Duppa was unequal to the task of educating the young princes; but the biographers of the prelate have given good reason to believe he was admirably qualified for the office, as well by his talents as his strict integrity. Biog. Britan.

DUPRE, DE ST. MAUR, NICHOLAS, was born at Paris about the close of the 17th century; by his education, he was intended for the law, and obtained a place of master of the accounts. He acquired great reputation as a man of letters, and was one of the first of his countrymen who possessed a taste for English literature, and who endeavoured to promote it among his countrymen. He translated Milton's Paradise Lost, which, perhaps, was as well done as the nature of the thing would allow, and on account of it, he was admitted into the French academy, in 1733. He wrote also an "Essay on the Monies of France," 1746, 4to.; "Inquiries into the Value of Monies, and the Price of Corn," 1761, 12mo. And he communicated to Buffon "Tables on the Duration of Human Life," which are to be found in his Natural History of Man. M. Dupré died in 1775, at a very advanced age, leaving behind him a number of MSS. on the same kind of topics as those which he had discussed during his life. Gen. Biog.

DUPUIS, Dr. Thomas Saunders, late one of the organists and composers of the king's chapel. He was a correct harmonist in his compositions, and a good performer on the organ, with a fancy not very rich or original; but his finger was lively, and he knew the instrument well. He died in 1796, and was succeeded in the chapel-royal by Dr. Arnold.

Dupuis, Ericius. Cardinal Bona pretended, that ever since the eleventh century (which was that of Guido), Ericius Dupuis had added a note to the hexachord of Guido, to avoid the difficulties of the mutations in solmisation, and facilitate the study of plain-chant. This assertion cannot be supported, as there remains not the least vestige of any such addition. No one doubts at present of this 7th syllable *si* having been added to the other six by Le Maire, about the end of the 17th century.

All his merit, however, consists in giving the syllable *si* to the 7th note, for its utility had long been demonstrated. See the works of Pere Mersenne. Laborde. The use of this syllable, however, is not yet general in any part of Europe, except France; nor in any other country do they agree to call *c* ut, except when it is the key note.

DUQUE Cornejo, Pedro, sculptor, painter, and architect, born at Seville in 1677; disciple of Pedro Roldan, but inferior to his master. His works are very numerous at Seville, and particularly in the cathedral. He was already in high estimation in that city, when Philip V., passing through it, carried the artist with him to Madrid. He there executed several works; but, his royal patron dying, he returned to Seville, where he maintained, and even increased his former reputation. Thence, he accepted an invitation to Granada, to make the statues for the chapel of Nuestra Senora de las Angustias, and afterwards proceeded, on a similar invitation from the chapter of the cathedral at Cordova, to undertake the works of that church, which he had scarcely completed, when he died, at the age of 80, and was sumptuously interred in the cathedral, at the expence of the chapter.

He possessed a ready invention, and great facility in all the arts of design; but his public works are chiefly on sculpture. Diccionario Historico de las Bellas Artes en Espana.

DUQUELLA, in *Geography*, a province of Africa, in the empire of Morocco, which extends to the walls of Saffi. This province is bounded on the north by that of Temsena; to the east by those of Escura, Ramna, and Morocco; to the south by the province of Abda, and to the west by the ocean. It is populous, rich, and commercial, abounds in corn, and produces a great quantity of wool, part of which is sold unwrought, and the rest employed in the manufactures, with which it supplies the southern provinces. This province formerly extended to the river Tansif; but that of Abda has been taken out of it, in order to divide it between two brothers who disputed the government. The inhabitants of Duquella are, in general, of a large size, and robust; they are a trading people, and all more affable and engaging than those of the other southern provinces. The province of Abda, which once made a part of that of Duquella, begins at the city of Saffi, and extends to the river of Tansif: its form is triangular. The inhabitants are addicted to the profession of arms, and many of them are in the service of the court.

DUQUESNE, a river of the island of Grenada, which runs into the sea, in a bay to which it gives name. N. lat. 12° 18′. W. long. 61° 27′.

Duquesne *Point*, a cape on the W. coast of the island of Grenada. N. lat. 12° 17′. W. long. 61° 29′.

DUR, Fr. harsh, in *Music*. Every sound is called *dur* that is shrill, piercing, and disagreeable. There are coarse voices, harsh instruments, rough harmony. The harshness of B quadrum, made it at first be called *durum*. There are harsh intervals in melody; such are the tritonus and sharp 5th; and, in general, all the major discords. The harshness of extraneous modulation renders the harmony disagreeable, and offends the ear.

DURA, or Duris, in *Ancient Geography*, a river of Hibernia, according to Ptolemy.—Also, a town of Asia, in Mesopotamia, according to Steph. Byz. and Polybius.—Also, a river of Greece, in Trachinia, a canton of Thessaly.—Also, an episcopal town of Africa, in the Byzacene territory.—Also, a town of Asia, in Cœlesyria, according to Polybius; who says, that it was well fortified, and unsuccessfully besieged by Antiochus, king of Syria. It is thought to be the *Dor* of Scripture, situated between Ptolemais and Cæsarea.—Also, *Imam-Mohammed-Dour*, a town of Asia, on the left bank of the Tigris, E.S.E. of Birtha.—Also, a town of Asia, in Mesopotamia, on the banks of the Euphrates, called also *Nicanoris*, and situated S.E. of Circesium.

DURA-MATER, or Meninx, in *Anatomy*, is the membrane which lines the inner surface of the cranium. See Brain.

Dura-mater, *tumours of*. Most writers have not understood the diseases, which are now well known by the appellation of fungous tumours of the dura-mater, or outer membrane of the brain. These swellings make their appearance suddenly under the integuments of the head; but they can only protrude externally in this manner, after they have made their way through the bones of the skull, which, one might suppose, would be capable of impeding their progress outward.

M. Louis, one of the greatest of the French surgeons, has written a very interesting memoir on the present subject. It is observed by this gentleman, that the kind of relation, which unintelligent persons generally discern between causes and effects, creates a prejudice, which prevents them from seeing the possibility of the cranium being perforated by a subjacent, soft, fungous excrescence, formed by the vessels of the dura-mater. But the comparative density of the bones, and softness of the tumour, which present, on one hand, a cause to all appearances very weak, and on the other, a resistance which might be thought invincible, can only deceive such persons as are inattentive to the ordinary actions of nature. Numerous phenomena of a similar kind might be pointed out. But, not to quit the human body, do we not frequently see aneurisms of the arch of the aorta occasion an absorption of the sternum and ribs, while the aneurismal sac, on the side towards these bones, suffers the least degree of attenuation?

The symptoms and complaints, which fungous tumours of the dura mater have in common with some other diseases, have been too superficially attended to by many practitioners, who have, therefore, imbibed erroneous opinions concerning the true character of these swellings. M. Louis also very justly imputes some of the slowness, with which surgeons became acquainted with the real nature of the present disease, to those few observers who did know something about it, not extending their investigations beyond one particular fact, which was the exclusive object of their consideration. Their views of the subject being circumscribed, they regarded the case only in the light of a very singular and extraordinary affection; and every one will be of opinion with M. Louis, that our knowledge, which is always too confined, must necessarily be very imperfect, when not drawn from a due number of facts relating to one object, which facts ought

ought to be moſt ſcrupulouſly examined in every poſſible point of view.

We think the beſt way of making the reader acquainted with the nature of fungous tumours of the dura mater is, to preſent him with the particulars of a caſe recorded by M. Louis.

This eminent ſurgeon was requeſted by M. Pibra to examine the head of a man, 35 years of age, who had died of a diſeaſe which had for ſome time been the ſubject of converſation among profeſſional men. The patient had had an excellent conſtitution, and was born of very healthy parents. Towards the end of December, 1761, he ſlipped, and fell with conſiderable force on the tuberoſities of the iſchium, which alone ſuſtained all the violence of the ſhock. The latter circumſtance was aſcertained beyond the poſſibility of doubt. It is alſo highly deſerving of notice, that the perſon felt ſo ſtunned at the inſtant of the fall, that he could ſcarcely manage to get up again. The accident was attended with no degree of pain. The ſenſation of ſtunning in the head laſted inceſſantly for four months, and then gradually went off.

After four months eaſe, a barber, who was ſhaving the man's head, perceived an odd ſenſation under the razor, on the right ſide of the top of the head. It was a ſort of crepitation, like that occaſioned by the handling of a piece of dry parchment, which lay under the integuments. The hair-dreſſer expreſſed his ſurpriſe to the patient, who felt his head, and experienced the ſame ſenſation. At this period there was no elevation nor depreſſion at the part. The next day, a tumour, about as large as a ſhilling, made its appearance; it was not very prominent, but it had a pulſatory motion. It is obvious, that the crepitation previouſly felt had been occaſioned by the compreſſion of the razor and fingers on the ſurface of the parietal bone, which was exceedingly attenuated by the fungus, the upper part of the tumour being merely covered with a plate of bone, ſo very thin as to be flexible.

The tumour, which was always of an indolent nature, made conſiderable progreſs in a few days, and this circumſtance led the patient to conſult ſeveral perſons about it. The firſt one, whoſe opinion was requeſted, thought that the ſwelling was an aneuriſm, and, conſequently, adviſed the employment of a bandage, for the purpoſe of making preſſure on it. The patient, however, could not endure this plan. The tumour, when compreſſed, was eaſily reduced to a level with the opening in the parietal bone; but when this was done, very alarming numbneſſes were produced, and it was abſolutely neceſſary to leave off the uſe of the bandage. The ſwelling continued to grow larger, and the opening in the parietal bone acquired an increaſe of ſize in proportion. Several phyſicians and ſurgeons met to give their opinions concerning the diſeaſe; only one of them thought the caſe an aneuriſm. Some ſuppoſed it was a hernia of the brain; but moſt of them ſuſpended their judgment, not wiſhing to hazard an opinion on a diſeaſe which they regarded as altogether extraordinary. The patient was exempt from all ſuſpicion of having any venereal complaints; but, when he was about 18, he had had ſome appearances of ſcurvy, and this circumſtance led to the trial of antiſcorbutic remedies.

Theſe, however, only impaired the conſtitution, and, far from retarding the growth of the tumour, it increaſed more rapidly in ſize during the exhibition of ſuch medicines than before. It made its appearance externally, being as large as a turkey's egg, painful, and remarkable for this ſingularity, that when the tumour was compreſſed the pain ceaſed. The ſtupefaction, which was the immediate effect of ſuch compreſſion, made the method intolerable, ſo that the patient preferred an habitual pain to the means of getting relieved of it. M. Louis thought this circumſtance eaſily admitted of explanation: the ſenſe of pain was not a part of the character of the diſeaſe, but only aroſe from the irritation which the tumour ſuffered from the irregular points and inequalities of the edges of the opening in the parietal bone. Gently puſhing back the prominent part of the fungus kept the tumour at the inſtant from being hurt by the inequalities and ſharp edges of the preternatural opening in the parietal bone. The patient for the four or five laſt months of his exiſtence gave himſelf up to empirics: he died April 17th, 1763.

For the purpoſe of examining the diſeaſe with the utmoſt care, and not doing miſchief with the knife, M. Louis made a circular inciſion in the ſoft parts at the baſe of the ſkull-cap, ſo as to be able to ſaw it and take it away, together with the dura-mater and integuments, while theſe parts retained the ſame relations which they had to the tumour, both internally and externally. The tumour aroſe from the convex ſurface of the dura-mater, was as large as the fiſt, and was very regularly circumſcribed, being rather leſs prominent under the cranium than above it. The baſe of the ſwelling was more extenſive than its upper part; the protuberant part under the cranium was occaſioned by a kind of thickening of the dura-mater, and was lodged in a depreſſion, which it had formed for itſelf in the correſponding portion of the brain. The inner layer of the dura-mater, in the ſituation of the tumour, was a little thicker than elſewhere, and its veſſels were more conſiderable and large.

The tumour was not at all adherent to the cranium; the preternatural opening in the ſkull was exceedingly irregular; and on the outſide of the parietal bone, round the aperture, there were ſome bony eminences. Between the two anterior angles of the parietal bone, near the coronal ſuture, an unequal piece of bone was found, as wide as a quill, and about an inch long, which roſe almoſt perpendicularly from a baſe very little larger than the reſt of this portion of bone. The inner table of the parietal bone was irregularly deſtroyed around the opening, and to an extent proportioned to the baſe of the ſwelling, which the inceſſant pulſations of the brain tended to force entirely out of the cranium, by beginning to deſtroy the bony parts, which covered the diſeaſe.

Both externally and internally there were numerous inequalities on the ſurface of the adjacent bones for ſome way from the opening. The fungous ſubſtance of the dura-mater was covered with a membrane which accurately circumſcribed its extent. Its conſiſtence was ſuch as common ſarcomatous ſwellings uſually have, being attended at no point with either elaſticity or fluctuation. The blood, which flowed out when an inciſion was made, was dark coloured, like what the veins of the above kind of ſwelling commonly contain.

Paré has recorded a caſe, which M. Louis concludes was certainly a fungous tumour of the dura-mater; although Paré himſelf was informed by two ſurgeons, who examined the head after death, that it was a tumour compoſed of the ſubſtance of the brain itſelf. M. Louis ſays, that this muſt certainly have been a miſtake; for, while the cerebrum is covered by the dura-mater and cranium, it cannot overcome the reſiſtance which theſe parts preſent. For a hernia cerebri to have taken place the bone muſt have been previouſly deſtroyed in ſome way or another, and there muſt have been at the ſame time a ſolution of continuity in the dura-mater. Experience has frequently proved, that in wounds of the head, attended with great deſtruction of the cranium, no hernia, nor fungus cerebri ever occurs as long as the dura-mater covers this viſcus. In the ſame caſes, when this membrane has been torn or cut, a protruſion of the brain does not happen, except from a pe-

culiar alteration of the very ſubſtance of this organ, in conſequence of the injury it has ſuſtained.

M. Petit, in his "Traité des Maladies des Os," takes notice of certain tumours, attended with a pulſation on the ſurface of the cranium, and with caries of the bone. Theſe were obviouſly, according to M. Louis, fungous ſwellings of the dura-mater; they alſo had been miſtaken by ſeveral practitioners for aneuriſms. Petit ſhews how wrong this opinion was, and explains that the pulſation of the tumours in queſtion was only communicated to them by the brain.

M. Louis, in his valuble diſſertation on the preſent ſubject, cites a vaſt number of caſes, from which it appears, that fungous tumours of the dura-mater are uſually preceded by external violence done to the head. Some examples are alſo adduced, which were ſuppoſed to have proceeded from internal ſyphilitic cauſes. However, M. Louis himſelf was well aware, that the tumours in queſtion might only be an accidental complication, and not at all connected with the venereal diſeaſe. Of this fact, we think there can be little doubt.

Fungous tumours of the dura-mater may originate at any part of this membrane; but they are ſaid to be particularly apt to grow on the ſurface, which is adherent either to the upper part of the inſide of the ſkull, or to its baſis. They are firm, indolent, and chronic, ſeeming as if they were the conſequence of a ſlow inflammation, affecting the veſſels which ſupply the dura-mater, and inoſculate with thoſe of the diploe. It is very difficult, one might ſay impoſſible, to determine, whether an affection of this kind always begins in the dura-mater, or the ſubſtance of the bone itſelf. The patient, whoſe caſe is above quoted from the memoir of M. Louis, had received no blow upon the head, and could only impute his complaint to a fall, in which the head had not ſtruck againſt any thing. Although this caſe may tend to ſhew that fungous tumours of the dura-mater may form ſpontaneouſly, yet, it is confirmed by the examination of a vaſt number of caſes, that the diſeaſe more frequently follows blows, than any other cauſe. Hence, a ſlow kind of thickening of the dura-mater is produced, which ends in a ſarcomatous excreſcence, the formation of which always precedes the deſtruction of the bone.

In the memoir, publiſhed by M. Louis in the 5th volume of thoſe of the Royal Academy of Surgery, there is a very intereſting caſe, illuſtrating to what an extent this diſeaſe may proceed. The ſubject is a young man, aged 21, who had on the left ſide of his head a conſiderable tumour, which was ſuppoſed to be a hernia cerebri. The ſwelling had begun in the region of the temple, and had gradually acquired the magnitude of a ſecond head. The external ear was diſplaced by it, and puſhed down as low as the angle of the jaw. At the upper part of the circumference of the baſe of the tumour, the inequalities of the perforated bone, and the pulſations of the brain, could be diſtinctly felt. Some parts of the maſs were elaſtic and hard; others were ſoft and fluctuating. A plaſter, which had been applied, brought on a ſuppuration at ſome points, from which an ichorous diſcharge took place. Shiverings, and febrile ſyptoms enſued, and the man died in leſs than four months. On diſſection, a ſarcomatous tumour of the dura-mater was detected, together with a deſtruction of the whole portion of the ſkull, correſponding to the extent of the diſeaſe.

When a fungous tumour of the dura-mater has once formed, it makes its way outward, through all the parts, ſoft, or hard, which are in its way. Such portion of the ſkull, as oppoſes its progreſs outward, is abſorbed, and then the ſwelling, all on a ſudden, and, in general, very unexpectedly, riſes up externally, confounds itſelf with the ſcalp, and preſents itſelf outwardly in the form of a preternatural, ſoft, yielding ſwelling, which even ſometimes betrays an appearance of a decided fluctuation, or a pulſation; which latter ſymptom, as we have remarked above, has very frequently led former practitioners to ſuppoſe the caſe an aneuriſm. When once the ſwelling has made its exit from the cavity of the cranium, it ſpreads out on every ſide under the integuments, which readily make way for its growth. The ſcalp becomes diſtended, ſmooth, and œdematous over the extent of the tumour, and, laſtly, it ulcerates. The matter which is diſcharged from ſuch ulcerations, is thin and ſanious. The outer part of the tumour is confounded with the integuments and edges of the ſkull on which it reſts, ſo that, in this ſtate, it is eaſy to miſtake the tumour for one whoſe baſe is altogether external. While the ſwelling thus increaſes in ſize externally, it alſo enlarges internally. The latter change takes place, in particular, while the opening in the cranium is not large enough to admit the whole maſs of the tumour, which then depreſſes the brain, and lodges in an excavation which it forms for itſelf. But this cavity quickly diminiſhes, and becomes reduced almoſt to nothing, as ſoon as the tumour has formed an external protruſion. In order to make way for the progreſs of the ſwelling outward, a portion of both tables of the ſkull is abſorbed; but, it is remarked, that the internal, or vitreous table, is always found much more extenſively deſtroyed than the external one. Sometimes, as is mentioned in the preceding caſe, new bony matter is found depoſited around the opening in the cranium.

The exiſtence of a fungous tumour of the dura-mater cannot be aſcertained, as long as there is no external change. The effects produced may originate from ſo many cauſes, that there would be great riſk of a groſs miſtake in referring them to any particular ones. This is not the caſe when there is an opening in the ſkull. Then a hardneſs, which is always perceptible from the very firſt, at the circumference of the tumour, denotes, that it comes from within. When the part of the ſkull, immediately over the diſeaſe, has become exceedingly attenuated, and the outward ſwelling is juſt commencing, a crackling ſenſation is perceived, on handling the part, juſt ſuch as one may ſuppoſe would ariſe from touching ſome dry parchment ſtretched under the ſkin. When much preſſure is made on the diſeaſe, conſiderable pain is excited, and ſometimes a numbneſs in all the limbs, ſtupefaction, and other more or leſs alarming ſymptoms. Preſſure makes the tumour recede inward, in a certain degree, eſpecially when the ſwelling is not very large. However, as ſoon as the compreſſion is diſcontinued, it gradually riſes up again. In ſome inſtances, the diſeaſe is attended with pain; in others, this effect is not produced; which circumſtances may depend on the manner in which the tumour is affected by the edges of the bone, through which it paſſes. The pain often admits of being relieved by compreſſion; but recurs as ſoon as this is diſcontinued. The tumour has a pulſatory motion, which is communicated to it by the brain, and which, as we have above related, has led many practitioners into an erroneous ſuppoſition, that the caſe was an aneuriſm. When the tumour is puſhed ſideways, and the finger is put between it and the edge of the bone through which the diſeaſe protrudes, the bony margin may be felt preſſing againſt the baſe of the ſwelling, ſo as to cauſe a certain conſtriction of it. When this ſymptom is diſtinguiſhable, and conjoined with a certain degree of firmneſs and elaſticity, and occaſionally with a facility of reducing the ſwelling, it ſerves as a criterion for diſcriminating.

ing a fungous tumour of the dura-mater, from a hernia of the brain, external fleshy tumours, abscesses, exostoses, and other diseases, which sometimes exhibit somewhat similar appearances to those of the present affection.

Fungous tumours of the dura-mater are generally attended with a vast deal of danger, as well on account of their nature, as of the difficulty of curing them in any certain manner, and of the dreadful symptoms which they are apt to induce. Those fungous swellings of the dura-mater which have a small base, which are firm in their texture, which are unattended with much disease of the surrounding bone, which are moveable, and not very painful, and which also affect persons who are, in other respects, quite well, afford most room for hope. However, though it is our duty to make some effort to cure the disease, when thus circumstanced, the event must always be regarded as very uncertain.

Our expectations of success must be very inconsiderable, indeed, when the disease has existed a great while, and the functions of the brain are seriously impaired by it.

The most simple mode of attempting a cure is compression. It was this which naturally presented itself to the minds of all those former surgeons, who fell into the error of mistaking the disease for an aneurism, or a hernia cerebri. Erroneous opinions have also arisen, concerning the efficacy of compression, in consequence of the tumour, while below a certain size, sometimes admitting of being reduced into the cranium, without any bad effects. However, as any one, at all acquainted with the nature of the disease, might expect, the reduction was only attended with a very temporary appearance of good being done. It had no effect whatever on the original cause of the affection, the symptoms returned, and the swelling rose up again, immediately when the pressure was discontinued.

M. Louis records, in his dissertation on the present subject, a fact, which tends to shew, that a certain degree of relief may sometimes be derived from a prudent employment of pressure. A woman, who had been brought to death's door by the alarming symptoms arising from a fungous tumour of the dura-mater, rested, for some time, on the same side of her head on which the disease was situated, the consequence of which act was, that all her appearances of dissolution suddenly vanished, and the swelling disappeared in so instantaneous a way, that she conceived her cure was the effect of a miracle. The tumour was afterwards kept from protruding again, by means of a piece of tin, fastened to the inside of her cap. The pressure, however, was not always maintained in an equal and regular manner, so that the bad symptoms occasionally recurred. They then ceased, after the swelling was reduced, and had got into a certain position. There cannot be the smallest doubt, that the bad symptoms were produced by the irritation which the tumour suffered in passing the inequalities of the edges of the opening in the cranium. The patient lived in this state nine years, subject to occasional fits, in one of which, attended with hiccough and vomiting, she perished.

The compression being a very uncertain means of relief, it is, perhaps, better to expose the tumour with a knife. This plan of bringing the swelling into view is infinitely preferable to that of applying caustic for the same purpose. Every one knows, that the action of caustic can never be regulated with sufficient precision, besides being considerably more painful than an incision, and attended with an unnecessary destruction of parts. The best way is to make a crucial division of the scalp, immediately over the tumour, and then dissect up the flaps, and reflect them, so as to expose all the bony circumference of the opening, through which the fungous tumour projects. The surgeon should next cautiously remove all the part of the skull immediately surrounding the base of the fungus. This object has usually been effected by applying the trephine as often as necessary, but, perhaps, the best instruments for the accomplishment of the object in view, would be the saws described by Mr. Hey, and now sold by all the makers of surgical instruments.

The fungous swelling having been disengaged on all sides, is next to be cut off with a scalpel. Some advise the surface, from which the tumour grew, to be next sprinkled with some of the pulv. hydrarg. nitrat. rub. However, the latter measure seems by no means certainly proper; for, applying escharotics to one of the membranes of the brain cannot be free from danger. Were we to offer our sentiments on this part of the subject, they would be in favour of cutting away the very root of the disease, in preference to using escharotic applications.

Cutting away fungous tumours of the dura-mater is always a more advisable plan than tying their roots with a ligature, which cannot be executed, without dragging and seriously injuring the dura-mater, so as to occasion the dangerous effects always attending any considerable inflammation of this membrane. The employment of the knife is also preferable to that of caustics, which are productive of much more pain and irritation, are apt to bring on fatal convulsions, and can never be accurately made to destroy a certain quantity of substance, and no more.

In whatever way the surgeon chooses to operate, the root of the fungus must be destroyed, or else the excrescence will shoot up again, and, by its injurious effects on the brain, at length prove fatal. When the knife is used, the practitioner must not be afraid of removing a piece of the inner layer of the dura-mater, if there is any likelihood that the whole of the disease cannot be taken away without this proceeding. Cutting the dura-mater is certainly by no means a thing unattended with risk; but the disease, if not suppressed, is surely fatal; and of the plans which hold forth the chance of a cure, none seem less dangerous and objectionable than that attempted with the knife. The effort to extirpate the disease at its very origin is less perilous, and less certainly fatal, than the unchecked progress of the fungus, and, upon this principle, is obviously right, and, indeed, the only rational alternative.

Another circumstance, which we wish to urge, is, that the attempt to extirpate fungous tumours of the dura-mater be always made as soon as the nature of the disease is known. In the early period of the disorder, the prospect of a cure must be more hopeful, as it would not be necessary to expose so much of the dura-mater, as afterwards becomes unavoidable.

Writers have described other tumours of the dura-mater, which chiefly differ from the preceding ones, in only occurring after a perforation has been made in the cranium. They should be discriminated from a hernia of the brain. See Fungus.

The inflammation of the dura-mater will be spoken of in another place. See *Injuries of the* Head.

Every one who is desirous of being well acquainted with the subject we have just quitted, should read the dissertation written by M. Louis, entitled, "Memoire sur les tumeurs fongeuses de la Dure-mere," and inserted in the fifth vol. of the Mem. de l'Acad. de Chirurgie. 4to.

Dura-*portio*, is that part of the seventh pair of nerves, which supplies the face, and is more properly termed the facial nerve. See Nerves.

DURADE, or Duro, in the *Italian Music*, signifies hard, harsh, or, more properly, sharp. This name is given to B natural.

tural, becauſe its ſound is ſharp, when compared with B mol, or flat.

DURAKA, in *Geography*, a ſmall iſland of Arabia, in the Red ſea, about four leagues from the coaſt. N. lat. 16° 48′. E. long. 41° 31′.

DURAKOVA, a town of Ruſſia, in the government of Archangel, on the coaſt of the White ſea; 48 miles W. of Archangel.

DURAMPOUR, a town of Hindooſtan, in the country of Guzerat; 45 miles S.S.E. of Surat, and 96 N.N.E. of Bombay. N. lat. 20° 32′. E. long. 73° 14′.

DURANCE, *The*, a river of France, which has its ſource in the mountains north of Briançon, near the high road over Mont Genèvre, in the department of the Upper Alps. It runs to Briançon, Vailand, and Embrun; thence flowing to the weſt, and taking up the river Ubaye, it paſſes by Talard, near Gap, divides the department of the Upper from that of the Lower Alps, the latter of which it croſſes from north to ſouth; paſſes by Siſteron, where it receives the river Bucche, by Manoſque and Saint Paul; after which, ſhaping its courſe to the weſt, it divides the department of Vaucluſe from that of the Bouches du Rhône, flows to Pertuis, in the neighbourhood of which place it takes up the Verdon, and a little lower down the Cavallon, and at laſt falls into the Rhône, three miles below Avignon. Its whole courſe is about 180 miles.

The current of the Durance is ſo rapid, that this river can be croſſed only in barks; hitherto, at leaſt, it has been found impracticable to throw a bridge over it below Siſteron. Its frequent inundations make a dreadful havoc; it even alters its bed, and cannot be navigated on account of the many iſlets and ſand-banks by which its courſe is obſtructed. A company or aſſociation of Jews offered ſeveral years ago to embank the Durance at their own charge, provided all the land ſaved ſhould be declared their property; to this the land owners objected, but it would now be conſidered as a very advantageous bargain. The Durance generally overflows its banks in July, after the melting of the ſnow in the Alps, and after the heavy rains of the month of November. It abounds, however, in fiſh, chiefly eels and trout. Its numerous iſlets, abounding with rabbits, are the haunts of ſnipes and wild ducks.

DURAND De St. Pourrain, William, in *Biography*, a learned ſcholaſtic divine in the 14th century, was born in the town annexed to his name, in the dioceſe of Clermont, and educated as a preaching monk of the Dominican order. In conſequence of his eminent attainments in philoſophical and theological ſtudies, he was admitted to the degree of doctor in divinity, in the univerſity of Paris, in the year 1313; and he afterwards delivered public lectures on ſacred literature as maſter of the ſacred palace at Rome. In 1318 he was nominated biſhop of Rey, and, in 1326, tranſlated to the biſhopric of Meaux, by pope John XXII. By his indefatigable perſeverance in the diſcuſſion of difficulties in ſcholaſtic theology, he obtained the appellation of the "Moſt reſolute Doctor." He was at firſt a follower of Thomas Aquinas, but afterwards attached himſelf to the ſect of Scotiſts, and defended their tenets with ſo much acuteneſs and zeal, that he offended the Thomiſts, and incurred their diſpleaſure to ſuch a degree, as to induce one of them, after his death, which happened in 1332, to degrade his memory by the following epitaph:

"Durus Durandus jacet hic ſub marmore duro,
An ſit ſalvandus ego neſcio, nec quoque curo."

He was the author of "Commentaria ſuper libros 4 Sententiarum," the beſt edition of which was publiſhed in 1571; alſo, "Liber de origine Juriſdictionum, ſeu de eccleſiaſtica Juriſdictione, et Tractatus de legibus," printed in 4to. in 1571; and other treatiſes, one of which was never publiſhed, and others enumerated in a collection of his works edited under the care of Dr. Merlin in 1515. Cave's Hiſt. Lit. vol. ii. Sæc. Wicklev. p. 22. Brucker's Hiſt. Philoſ. by Enfield. vol. ii. p. 381.

DURANGO, in *Geography*, a town of Spain, in the province of Biſcay, about three leagues from the ſea-coaſt, and four eaſt of Bilboa.

Durango, the capital of the kingdom of New Biſcay, in the Spaniſh dominions of North America, and the fartheſt town of any note towards the north. This city is more remarkable for the extent of its biſhopric, than for its population, which only conſiſts of 5000 perſons, including the companies of militia appointed to defend it againſt the Indians. The climate is mild and healthy, and the ſoil extremely fertile in wheat, maize, and fruits, whilſt the paſtures abound with excellent cattle. It contains four convents and three churches, one of which is ſituated on a hill without the city. It has an office of the royal treaſury, for collecting the duties on the numerous mines in New Biſcay. The biſhopric was founded in 1620, and extends over all the provinces of New Biſcay, *viz.* Tepeguana, Taraumara, Topia, Batopilas, Culiacan, Cinaloa, Oſtimuri, Senora, and Pimeria. The amount of the tythes in the biſhopric of Durango for ten years is 1,080,313 peſos. Durango is ſituated on an inland river, which is loſt in a lake. This river ſeems to be the Guadiana, (another name of Durango,) or the Sauceda of D'Anville. N. lat. 23° 30′. W. long. 103°.

DURANTA, in *Botany*, in honour of Caſtor Durante, phyſician to pope Sixtus V., who publiſhed ſeveral medico-botanical works, amongſt others an Italian herbal, which paſſed through many editions in folio, and ſome in quarto, illuſtrated with the ſmaller wooden cuts uſed by Matthiolus. Plumier, who founded this genus, called it *Caſtorea*, but Linnæus rightly changed it, to accord with the family name of the perſon commemorated, as in other caſes. Linn. Gen. 324. Schreb. 424. Willd. Sp. Pl. v. 3. 380. Mart. Mill. Dict. v. 2. Juſſ. 109. Gærtn. t. 57. (Caſtorea; Plum. Gen. 30. t. 17. Eliſha; Browne Jam. 262. Loefl. It. 194.) Claſs and order. *Didynamia Angioſpermia.* Nat. Ord. *Perſonatæ*, Linn. *Vitices*, Juſſ.

Gen. Ch. *Cal.* Perianth of one leaf, inferior, tubular, ſomewhat abrupt, five-cleft. *Cor.* of one petal. Tube longer than the calyx, a little curved; limb ſpreading, rounded, in five deep, nearly equal, ſegments. *Stam.* Filaments four, enclofed within the tube, two longer than the reſt; anthers roundiſh. *Piſt.* Germen inferior, roundiſh; ſtyle thread-ſhaped, ſhorter than the tube; ſtigma a little ſwelling. *Peric.* Berry roundiſh, clothed with the calyx, and crowned with its teeth, of one cell. *Nuts* four, convex on one ſide, angular on the other, each of two cells. *Seeds* ſolitary.

Eſſ. Ch. Calyx inferior, tubular, with five teeth. Corolla tubular, curved, its limb five-cleft, nearly equal. Stamens in the tube. Berry with four nuts, of two cells each.

1. D. *Plumieri.* Linn. Sp. Pl. 888. Jacq. Amer. 186. t. 176. f. 76. Ic. Rar. v. 3. t. 502. Leaves ovato-lanceolate, ſlightly ſerrated. Calyx-teeth of the fruit ſpirally twiſted together.—Gathered by Plumier, probably, and certainly by Jacquin, in Hiſpaniola. The *ſtem* forms a ſmall tree, about fifteen feet high, with alternate, erect or drooping, ſquare leafy branches. *Leaves* oppoſite, ſtalked, an inch and half long, lanceolate, inclining to ovate or elliptic, more or leſs acute, uſually with a few ſhallow ſerratures towards the upper part, ſometimes nearly entire, ſmooth on both ſides,

paler and opaque beneath, veiny. In the bofom of each leaf is a fmall tuft of other leaves, or a downy bud, above which ftands a horizontal awl fhaped *thorn*, various in length, and fometimes wanting. *Clufters* of flowers fituated in the place of thefe thorns, in great abundance towards the upper part of each branch, folitary, fimple, many-flowered, three or four inches long, their common ftalks, and efpecially their partial ones, filky, as are likewife the awl-fhaped bracteas. *Calyx* fomewhat bell fhaped, rather filky, with five angles, and five fmall, acute, incurved teeth. *Corolla* blu-ith or lilac, its two uppermoft fegments rather narroweft, and each marked with a dark longitudinal line. *Fruit* invefted with the permanent bafe of the calyx, which becomes united to it, and orange-coloured, while the teeth are fpirally twifted together and crown the top. Such is the plant of the Linnæan herbarium, in which are very perfect fpecimens in flower and fruit. The figure in Plumier's Icones, t. 79, is probably the fame plant, but its leaves are much too ftrongly ferrated, and there are no thorns; the latter circumftance is, however, faid to be variable. We cannot but rely on the repeated affurances of the learned Jacquin, that this fpecies is different from the following, and that the character taken from the calyx-teeth is permanent, efpecially as there is a difference in the leaves alfo. Swartz appears to have known but one fpecies.

2. D. *Ellifia.* Linn. Sp. Pl. 888. Jacq. Amer. 187. t. 176. f. 77. Hort. Vind. v. 3. 51. t. 99. Sm. Tour on the Continent, ed. 2. v. 3. 97. (Ellifia frutefcens, quandoque fpinofa, foliis ovatis utrinque acutis ad apicem ferratis, fpicis alaribus; Browne Jam. 262. t. 29. f. 1.) Leaves ovato-lanceolate, fharply ferrated. Calyx-teeth of the fruit erect.—Native of Jamaica. Very like the foregoing in general afpect and characters, except the calyx-teeth, and the deeper ferratures of the leaves, which are conftant, as reprefented by Jacquin, in all the fpecimens that have fallen in our way. We have feen this fpecies cultivated in the open ground near Genoa, fo that it feems lefs tender than moft Jamaica fhrubs. Its beautiful flowers rival thofe of our *Veronica Chamædrys.* Jacquin's plate is excellent.

3. D. *Mutifiana.* Sm. Intr. to Bot. 381. (D. Mutifii; Linn. Suppl. 291. Willd. Sp. Pl. v. 3. 380.) Leaves elliptical, obtufe, entire, fhining on both fides. Sent from New Granada by Mutis to Linnæus. This has the general habit of the two preceding, but is ftronger, and, notwithftanding the fuggeftion of the younger Linnæus in the Supplementum Plantarum, we cannot but think it clearly and abundantly diftinct. The *leaves* are of an elliptical figure, fcarcely above an inch long, and above half as broad, very obtufe, perfectly entire, fomewhat revolute, fhining on both fides, and very little paler beneath. *Clufters* about as long as the leaves, only ftronger, but in other refpects much like the laft. The *branches* alfo are fpinous. The *fruit* we have not feen. S.

DURANTE, Francisco, in *Biography.* This illuftrious difciple of Alaffandro Scarlatti, whom he fucceeded as principal mafter of the confervatorio of Sant' Onofrio in Naples, defervedly merited the character of the beft and moft judicious contrapuntift that Italy can boaft; not fo much for the fugues, canons, or maffes which he has compofed, as for the number of illuftrious fcholars which his inftruction and example have produced. No better proofs need be inftanced than Pergolefi, Terradeglias, Piccini, Sacchini, Guglielmi, Traetta, Anfoffi, and Paefiello, with whofe admirable productions all Europe is well acquainted. Though Durante can hardly be called a fecular compofer, having pointed his labours to facred mufic, in which no very light or gay melodies can occur with propriety: yet his maffes and motets abound with elegant movements ingeniouffy and richly accompanied; in which there is learning without pedantry, and gravity without dulnefs. Thefe are treafured up in the confervatorio, for which they were produced, and where, in 1770, they were ftill in conftant ufe.

But the cantatas of his mafter Alaff. Scarlatti for a fingle voice, which, after his deceafe, Durante formed into duets, of the moft learned, graceful, and expreffive kind, are what the greateft maffers now living continue to ftudy, and teach to their favourite and moft accomplifhed fcholars.

Several muficians have doubted whether the ground-work of thefe very elaborate *ftudj* was Scarlatti's, among whom was Pacchierotti; but in turning over different volumes of his cantatas in the prefence of this admirable finger, while he refided in London, we found, and fhewed him in Scarlatti's own hand-writing, the beautiful movements and recitatives upon which Durante worked with much felicity.

DURANTI, John Stephen, was born at Toulouffe, and defigned in early life for the bar, at which he afterwards diftinguifhed himfelf for his eloquence. In the year 1563, he was made firft magiftrate; afterwards he became advocate-general, and, in 1581, was nominated by the king prefident of the parliament of Toulouffe. He was ftrongly attached to the royal caufe, and when the maffacre of the duke and cardinal of Guife, in 1589, had inflamed the rage of the leaguers, efpecially at Toulouffe, he employed all the force of his eloquence to appeafe the people. He afterwards prevented the parliament from throwing off their obedience to Henry III, and narrowly efcaped with his life. His papers were feized and fearched, but nothing was found to criminate him; fome letters however written by his brother-in-law, Daffis, to the king's commandant at Bourdeaux, imploring affiftance, being intercepted, the crime was imputed to Duranti, and the mob went in a body to the Jacobin convent, where he had fought protection, and demanded him to be given up. Taking leave of his wife and children, and commending his foul to God, he went forth, and afked with a tranquil mind of what he had been guilty. For a moment a profound filence enfued, at length a villain fired a mufket which brought him to the ground, and immediately he was oppreffed by a thoufand bloody hands, which inftantly put an end to his life. They treated the dead body with every indignity, and, at length, tied it to the pillory, with the king's picture hung at its back. This maffacre of an excellent man, who had, in a hundred inftances, been beneficial to his country, was perpetrated in February 1589. He was a friend and patron to letters, and had collected a fine library which was difperfed after his death. He is fuppofed to have been the author of a learned and excellent work, "De ritibus Eccleffiæ," which was given to Peter Danes, bifhop of Lavaur. Moreri.

DURAS, in *Geography*, a fmall town of France, in the department of Lot and Garonne, chief place of a canton, in the diftrict of Marmande, with a population of 1576 individuals. It is feated on a fmall river which flows into the Drot, 40 miles N.W. of Agen. Its diftrict was erected into a dukedom in the year 1688, but loft its title with the French revolution of 1789. The canton has an extent of 222½ kiliometres, and contains 18 communes and 11,907 inhabitants.

Duras, in *Ancient Geography*, a river of Vindelicia, which ran into the Ifter, according to Strabo, fuppofed to be the prefent *Draum.*

DURASTANTE, La Margarita, in *Biography*, the firft capital female finger imported for the Italian opera in

in England. When Handel was commissioned by the directors of the Royal Academy of Music to engage vocal performers in the year 1720, he brought over from Dresden the Duraslante at the same time as Senesino, Borenstadt and Boschi. The figure of the Durastante was somewhat masculine; but she was thought a good actress, and more admired in male than female parts. She seems to have been in great favour at our court; for his majesty, Geo. I., honoured her so far as to command an opera, and be present at her benefit, July 5, 1722; and in the Evening Post, N° 1810, from Saturday the 4th to Tuesday the 7th of March 1721, we find the following paragraph: "Last Thursday his majesty was pleased to stand godfather, and the princess and the lady Bruce. godmothers, to a daughter of Mrs. Durastante, chief singer in the opera-house. The marquis Visconti for the king, and the lady Litchfield for the princess."

In the British Museum, among the Harleian MSS. there are verses written by Pope on the Duradante leaving England.

"Generous, gay, and galant nation," &c. which are parodied by Arbuthnot, "Puppies, whom I now am leaving." &c.

DURATION, an idea we get by attending to the fleeting, and perpetual perishing parts of succession.

The idea of succession we get by reflecting on that train of ideas, which continually follow one another in our minds, while awake. The distance between any parts of this succession is what we call duration; and the continuation of the existence of ourselves, or any thing else commensurate to the succession of ideas in the mind, is called our own duration, or that of the thing co-existing with our thinking. So that we have no perception of duration when that succession of ideas ceases.

Duration, in Mr. Locke's philosophy, is a mode, or modification of space.

The simple modes of duration are any lengths, or parts thereof, of which we have distant ideas; as hours, days, weeks, months, years, time, eternity, &c.

Duration, as marked by certain periods and measures, is what we call properly call *time*.

1. By observing certain appearances at regular and seemingly equidistant periods, we get the ideas of certain lengths and measures of duration, as minutes, hours, &c. 2. By being able to repeat those measures of time, as often as we will, we come to imagine duration where nothing really endures, or exists: thus we imagine to-morrow, next year, yesterday, &c. 3. By being able to repeat such ideas of any length of time, as of a minute, year, &c. as often as we will, and add them to one another, without ever coming to an end, we get the idea of eternity.

Time is to duration, as place is to space, or expansion. They are so much of those boundless oceans of eternity, and immensity, as is set out, and distinguished, from the rest; and thus they serve to denote the position of finite real beings, in respect of each other, in those infinite oceans of duration and space.

DURATION *of action*. See ACTION.

DURATION *of an Eclipse*. See ECLIPSE.

DURATION, *scruples of half*. See SCRUPLE.

DURATION *of a solar eclipse*. See ECLIPSE.

DURATION *of sound*, in *Music*. See SOUND.

DURATION, in *Vegetable Physiology*, means the determinate period of existence appropriated to each species of plant, whether annual, biennial, or perennial. Annual plants are such as spring up from seed, arrive at perfection, ripen their seed, and totally perish, in the space of one year, or rather one season, as Mustard, Radishes, Barley, and various garden flowers. In some instances the existence of such plants is limited to a very few months or even weeks, and is dormant in their seed the greater part of the year. Truly annual plants can never be propagated by cuttings or layers, except indeed some whose decumbent branches of themselves take root, and may therefore be separated from the parent root for that season only, as the common annual meadow-grass, *Poa annua*. The roots of some also are capable of division, and may therefore be increased artificially to a great extent, as is sometimes practised by curious persons on corn by way of experiment.

Biennial plants arrive at only a certain degree of perfection the first season, shewing no signs of flowering, and continuing stationary through the winter. In the following season they bear flowers, perfect their seed, and then perish like annuals. Of this nature are many species of mullein or *Verbascum*, the Fox-glove, *Digitalis purpurea*, the Canterbury Bell, *Campanula Medium*, &c. The tree mallow *Lavatera arborea* is justly esteemed biennial, because though it may survive several winters, if circumstances do not favour its flowering, it soon dies after ripening seed. A biennial plant therefore never fructifies more than once, how long soever its previous existence may be. Wheat is perhaps rather to be reckoned annual than biennial; for though with us it is found most convenient to commit it to the ground in autumn, it may be raised in one season, and does not require one summer to bring its herbage to perfection, and another to form fructification.

Perennial plants live and fructify through many successive seasons, like the generality of trees and shrubs, as well as many herbaceous plants, and may be increased by dividing their roots, or by cuttings, layers, or grafts. Their propagation however by such methods, does not appear to be unlimited. Several herbaceous perennial plants are well known to require frequent renewal from seed, in order to flourish in perfection, and some late experiments and observations on fruit-trees seem to prove that each variety, or, in other words, each individual plant, originally raised from seed, is limited to a certain period, in some kinds longer, in others shorter, beyond which the offspring of their buds or cuttings drag on but a sickly existence, and finally perish. This is best seen in the history of the different varieties of apples, some of which, after flourishing long, are now in decay, witness the golden pippin, while others raised from time to time by seed, either disappear by the effects of canker in a very few seasons, or seem to promise a long future existence. Willows and osiers of various kinds seem, as far as we can observe, to be of very long, or even indeterminate, duration, being increased by cuttings, year after year, without any apparent decay or deterioration. This is perhaps because each species is in its natural original state, without the marks or properties of a variety. Besides, we have had ample opportunities of observing that this genus of plants are frequently renewed spontaneously by seed, and such seedlings, being more vigorous, may often be chosen unconsciously for cuttings by their cultivators. But human life is not long enough fully to determine this question. Gardeners well know that the frequent renewal of plants from seed is the best way to have them in perfection, and they chiefly therefore prefer that method, except where a variety is to be preserved, which is not propagated by seed. This general experience is sufficient to confirm what we have advanced above. S.

DURATON, in *Geography*, a river of Spain, which runs into the Duero, near Penafiel.

DURAVEL, a small town of France, in the department

ment of the Lot, on the river of that name; 3 miles E. of Fumel.

DURAZZO, a fea-port town of European Turkey, in Albania, anciently named *Epidamnus* and *Dyrrachium*, ftrong and populous, with a good harbour in the gulf of Venice; the fee of a Greek bifhop; 88 miles S.S.E. of Ragufa. N. lat. 41° 42′. E. long. 19° 16′.

DURBACH, a fmall town of Auftria, in the Saxon country of Tranfylvania, in the diftrict of Biftritz.

DURBAN, a fmall town of France, in the department of the Aude, chief place of a canton in the diftrict of Narbonne. It has only 296 inhabitants; but the canton contains 2837 individuals, difperfed in 12 communes, upon a territorial extent of 240 kiliometres.

DURBEN, a town of the duchy of Courland; 24 miles S.S W. of Goldingen.

DURBION, a river of France, which runs into the Mofelle, near Chatel fur Mofelle, in the department of the Vofges.

DURBUNGA, a town of Hindoeftan, in the country of Bahar; 48 miles N.E. of Patna, and 58 S.W. of Amerpour.

DURBUY, a fmall town of France, in the department of Sambre and Meufe, chief place of a canton in the diftrict of Marche, with a population of 312 individuals, fituated on the river Ourte, 30 miles S. of Liege and 40 miles S.E. of Namur. It is alfo called Durbu. The canton has a territorial extent of 150 kiliometres, and contains 19 communes, with 5783 inhabitants.

DURCKHEIM, a fmall town of France, in the department of Mont-Tonnerre, chief place of a canton in the diftrict of Spire, 15 miles N.W. of Spire, with a population of 3037 individuals. The canton has 19 communes, and 14,520 inhabitants.

DURDUS Mons, in *Ancient Geography*, a chain of African mountains in Mauritania Cæfarienfis, which extend themfelves from the fouth-weft to the north-eaft.

DURE, Door. See Suth-*Dure*.

DUREL, John, in *Biography*, was born at St. Helier, in the ifland of Jerfey, in the year 1626. He was entered a ftudent at Merton college, Oxford, in 1640, and having continued there about two years, he was, on account of the civil wars, induced to retire into France, and become a member of the college at Caen in Normandy. Here he took his degree of M. A. in the year 1644, and henceforth applied himfelf affiduoufly to the ftudy of theology. In 1647 he returned to Jerfey, and took active meafures in behalf of the royal caufe, fo that when the ifland was reduced by the parliament's forces, he was obliged to feek refuge at Paris. Here he was ordained according to the Englifh epifcopal forms at the chapel of fir Richard Brown, king Charles refiding at that time in France. He received two invitations to fettle as a minifter, which he declined, and engaged himfelf as chaplain to the duke de la Force, father to the princefs of Turenne, a fituation in which he continued about eight years. On the reftoration of Charles II. he came to England, affifted in eftablifhing the French church at the Savoy, London, where he continued to officiate feveral years. His fteady zeal in defence of the royal prerogative obtained for him confiderable preferment. In 1663, he was made prebendary in the cathedral church of Salifbury; chaplain to the king; and foon after canon of Windfor, and prebend of Durham. He was afterwards created doctor in divinity by the univerfity of Oxford, in confequence of letters addreffed to that body by the chancellor, in which the greateft praife was beftowed on his loyalty, fidelity, and important fervices atchieved by him for the king. He had every profpect of being made bifhop, but his death, in 1683, put an end to farther promotion. He was the author of feveral works, but chiefly of the controverfial kind; from this general account we muft except his "Theoremata Philofophiæ rationalis, moralis, naturalis, & fupernaturalis," &c. 4to. 1664. It muft be fpoken highly to his praife, that as an honeft and truly confiftent character, he was always a zealous advocate for the conftitution of the church of England, even when he was in the moft hopelefs and defperate condition. As a controverfialift he was, by the learned Du Moulin, reckoned candid and open, but by the puritans of England he is differently characterized. Biog. Britan.

DURELL, David, was born at Jerfey in 1728, and though the name is differently fpelt, it has been thought that he was of the fame family as John already mentioned. He ftudied at Pembroke college, Oxford, where he took his degree of M. A. in the year 1753. At this college he was chofen firft a fellow, and in 1753 the principal. In 1764, he publifhed a learned theological work, entitled "The Hebrew Texts of the parallel prophecies of Jacob and Mofes relating to the 12 tribes, with a tranflation and notes, &c. &c." He now took his degree of doctor of divinity, and great expectations were formed of his future fervices in biblical criticifm, from his publication in which he difplayed confiderable knowledge in the oriental languages, and much induftry in elucidating the fenfe of the facred fcriptures. Dr. Durell was prefented in 1767 to a prebend in the church of Canterbury, and foon after to the vicarage of Tycehurft in Suffex. In 1772, he laid before the public "Critical remarks on the books of Job, Pfalms, Ecclefiaftes, and Canticles," in a 4to. volume. This work will long remain a monument to his erudition, and at the fame time it exhibits a fuperiority to long eftablifhed prejudices. In his preface, the doctor pleads earneftly for a new tranflation of the bible, and offers powerful arguments for this meafure, in oppofition to the objections urged againft it. To the great lofs of biblical literature, he died in the year 1775, when he was only in the 48th year of his age; he was as diftinguifhed for piety and goodnefs, as he was eminent for found and extenfive learning. Biog. Britan.

DUREN, in *Geography*. See Deuren.

DURENMETTSTETTEN, a fmall town of the kingdom of Wirtemberg, which formerly was an independent lordfhip in Suabia, and which was ceded to Wirtemberg at the peace of Luneville as part of its indemnity for the lofs of fome provinces on the left fhore of the Rhine.

DURER, Albert, in *Biography*, a painter and engraver of hiftory, portrait, and landfcape, born at Nuremberg, A. D. 1471. He was the fon of an eminent goldfmith of that town, by whom, as he has himfelf left on record, he was inftructed in the art of working in gold, as well as in chafing in general. His father appears to have defigned him to follow his own bufinefs, fince, during his childhood, he had not made even the flighteft attempt at painting, and it was not until he had reached the fifteenth year of his age, that he received the firft inftructions in that art from Michael Walzemuth, a painter of Nuremberg, under whofe tuition he was then placed for a term of three years.

At the expiration of that term, Albert was fent by his father into Belgium, with what view is uncertain, but he continued there four years, and it is evident that he muft, in that period, have made himfelf mafter of confiderable knowledge in the art of engraving, fince the firft of his

works that is noticed, on his return to his native city, was a print of three or four naked females; a work which bears the date of 1497, and is remarkable for the ſuperſcription which he affixed to it, of O. G. H. ſaid by Sandrart to be deſigned for the initials of the German words O Gott Hilfe! or, O God, deliver us from witchcraft!

His engravings of "The paſſion of Chriſt," bear the dates of 1507, 1508, and 1512. The laſt date found on many of his works is that of 1526, on the portrait of Melanchthon.

But the diſplay of his talents, however conſpicuous in that art, was not confined to engraving. He diſcovered a general capacity, not only for every branch of deſign, but for every ſcience that ſtood in any relation to it, and wrote treatiſes on proportion, perſpective, geometry, civil and military architecture. He crowned his various knowledge by the moſt eminent ſkill in painting, in which he ſo far ſurpaſſed all thoſe who had hitherto ſtudied and practiſed the art in his own country, that he obtained the appellation of "Father of the German ſchool."

The firſt pictures which are known to have been painted by him, are a portrait of his mother, and another portrait of himſelf in his thirtieth year, A. D 1500; placed in the palace of Prague, as were, afterwards, many other of his works. Among the moſt celebrated in that collection, were the "Magi;" "The Virgin crowned with Roſes by Angels;" "Adam and Eve," of the ſize of life; "The ſufferings of the Martyrs;" and the "Chriſt on the Croſs, ſurrounded with Glory;" in which the painter has introduced, at the foot of the croſs, a group of popes, cardinals, and emperors, and a figure repreſenting himſelf as holding a ſmall canvas, on which is written: Albertus Durer, Noricus, faciebat, anno de Virginis partu 1511.

His ſtyle was ſo generally admired by the artiſts of his time, that it was imitated by his countrymen to the utmoſt of their ability, and he received a ſtill more gratifying homage from the profeſſors of the Italian ſchool, many of whom, and thoſe, (according to Sandrart) of the higheſt reputation, thought it no diminution of their fame to adopt not only the attitudes, deſigns, dreſſes, and other ornaments of Albert's figures, but the entire figures themſelves, and even ſometimes painted nearly the whole of large hiſtorical compoſitions from his engravings on wood and copper.

Among the artiſts of the then flouriſhing Tuſcan ſchool, in whoſe principles and taſte the importation of his works into Italy is ſaid to have effected a change, Andrea del Sarto, and Jacopo da Pontormo, are particularly mentioned; and Raffaelle himſelf is ſaid to have accepted with pleaſure ſome engravings ſent to him by Albert, and to have hung them in his own apartment.

His works are at preſent very numerous throughout Italy and Germany; and in fame he ranks with the higheſt artiſts of his time.

His character is thus given by an artiſt of our own days. "He was a man of extreme ingenuity, without being a genius. In compoſition, copious without taſte, and anxiouſly preciſe in parts. In conception, he had ſometimes a glimpſe of the ſublime; but it was a glimpſe only. Such is the expreſſive attitude of his "Chriſt in the Garden," and ſuch the figure of "Melancholy," as the mother of invention. He ſtudied, and, as far as his penetration reached, eſtabliſhed certain proportions of the human frame; but he did not invent or compoſe a permanent ſtandard of ſtyle. He made the neareſt approach to genius in his *colour*, which went beyond the age he lived in, and, in ſeveral pictures, he as far ſurpaſſed the oil colour of Raffaelle, in juicyneſs, breadth, and handling, as Raffaelle ſurpaſſed him in every other part of his art. His drapery is broad, but much too angular in its folds."

The merit of Albert Durer was not loſt in obſcurity. Having painted a picture of St. Bartholomew, for the church dedicated to that ſaint at Venice, the fame of the work roſe ſo high, that the emperor Rodolphus II. ſent orders to Venice for the picture to be purchaſed for himſelf at any price, and to be brought to Prague, (a journey of great length,) not by the ordinary methods of conveyance, for fear of its receiving ſome damage, but by means of a pole carried on men's ſhoulders.

With the emperor Maximilian he was a ſtill greater favourite, enjoying his particular patronage, as well as afterwards that of Charles V. Several of his principal pictures were painted expreſsly for Maximilian's palace. And it is related that, one day, when the emperor came to viſit Albert in his room, where he was employed on a picture of large dimenſions, the artiſt being deſirous to touch ſome part of his work at a conſiderable height from the ground, and his ſtool not enabling him to reach it, Maximilian ordered one of his nobles who attended him to hold the ladder for Albert, while he went up to the point he wiſhed. The nobleman drew back, and, with the utmoſt reverence and humility, ventured to repreſent to his majeſty his doubt, how far ſuch an office might be derogatory to his rank: on which, Maximilian is ſaid to have replied, that he conſidered Albert Durer as a man far above any noble in his ſuite; for that he could, at any time, make a nobleman of a clown, but that he could not make a painter of a nobleman. In confirmation of theſe ſentiments, he immediately ordered a patent of nobility to be made out for the painter.

In addition to his great celebrity as an artiſt, Albert Durer eſtabliſhed a character no leſs reſpectable in private life. In domeſtic patience he unfortunately experienced very ſevere trials, which he ſupported with calmneſs; and preſerved the ſingular benignity of his diſpoſition unimpaired to the laſt. The avarice of an ill-tempered wife had diſcovered itſelf for a ſeries of years, in continual ſuggeſtions of her huſband's want of proper aſſiduity in the lucrative points of his profeſſion; and her reproaches allowed him ſo little reſt, that ſome of his friends counſelled him to leave her for a time: and, agreeably to their advice, he ſet out ſecretly for Flanders, and took up his reſidence in the houſe of the celebrated painter, Lucas Van Leyden, where the artiſts drew the portraits of each other, in ſign of mutual friendſhip and eſteem. But his abode could not long be concealed from the unremitting curioſity and reſearches of his wife; and, having once diſcovered the ſecret, ſhe, by repeated ſolicitation, and the moſt earneſt promiſes of gentle conduct on her part, prevailed on him to return to his home. He returned, and her ill temper returned, and, fatally for the world, triumphed over the ſtrength of his conſtitution. He is ſaid to have died of this ſecond perſecution.

In his behaviour to contemporary artiſts he was ſo courteous, that, whenever they brought their works to him to receive his judgment, even the total want of any thing which he could commend in the pictures did not leſſen his attention to the authors of them. In converſation he was cheerful, without licentiouſneſs; and, as a firm friend of piety and virtue, he never profaned his talents, by employing them on ſubjects unworthy of his mind and pencil.

On his return to Nuremberg, he was named one of the members of the council. He died in that city, in 1528, and was buried in the church of St. John: and a monument was raiſed to his memory, which, falling to ruin, was repaired

paired 153 years afterwards; and the following elogium inſcribed in braſs over his grave:

Vixit Germaniæ ſuæ decus
ALBERTUS DURERUS,
Artium lumen, ſol artificum,
Urbis patriæ Nor. Ornamentum,
Pictor, chalcographus, ſculptor,
Sine exemplo, quia omniſcius,
Dignus inventus exteris,
Quem imitandum cenſerent,
Magnes magnatum, cos ingeniorum,
Poſt ſeſquiſæculi requiem,
Quia parem non habuit,
Solus heic cubare jubetur,
Tu flores ſparge, viator.
A. R. S. MDCLXXXI.
Opt. Mer. F. Cur.
J. DE S.

Some books written by him in German, on the rules of painting, his "Inſtitutiones Geometricæ," &c. were publiſhed after his death.

He uſed this mark on his works  ; and ſome of his contemporaries having alſo aſſumed it, and particularly Marc Antonio Raimondi, in a ſeries of engravings of the Life of Chriſt, Albert Durer brought an accuſation againſt the latter before the ſenate of Venice, who ordered M. Antonio to efface the mark, and forbad any one beſide Albert to uſe it in future. Sandrart, Pilkington, &c. &c.

DURESSE, *Hardſhip*, in *Law*, is where a perſon is kept in priſon, or reſtrained of his liberty, contrary to the order of law; or is threatened to be killed, maimed, or beaten.

In which caſe, if a perſon ſo in priſon, or in fear of ſuch threats, make any ſpeciality, or obligation, by reaſon of ſuch impriſonment, or threats, ſuch deed is void in law; and in an action brought on ſuch ſpeciality, the party may plead, that it was brought by dureſſe.

DURETAL, in *Geography*. See DURTAL.

DURFORT, a ſmall town of France, in the department of the Oude.—Alſo, a ſmall town of France, in the department of the Gard; 9 miles S.W. of Alais.—Alſo, a ſmall town of France, in the department of the Arriège; 6 miles N W. of Pamiers.

D'URFY, or D'URFEY, TOM, in *Biography*. We cannot help being a little familiar with this facetious bard, who was himſelf no reſpecter of perſons. Tom had much wit and humour of a certain kind, but very little delicacy or decorum in expreſſing it. Tom's muſe was hardly of a higher order than an oyſter girl, or a cinder-wench, who are not without their wit and humour any more than Tom: only the uſe theſe ladies make of the vulgar tongue is in plain proſe, and Tom's is embelliſhed with verſe.

Tom lived in a merry time, and his writings are well tinctured with the mirth in ſeaſon. As a poet, Tom's meaſures are as frolicſome as his ideas; and as a muſician, his tunes correſpond with the *comicality* of his verſes. If Tom had been a little more ſqueamiſh in his moments of jocularity, and, in making up his "pills to purge melancholy," had kept out the moſt offenſive ingredients, the recipe itſelf, being a good one, might have been filed with ſafety and benefit to the public. To quit the medical metaphor, the collection, had it been purified of its moſt groſs and coarſe materials, containing ſo many original ſongs, and groteſque tunes of a much higher date than his own, would have been a curious repoſitory of ſuch words and tunes as it would be difficult to find any where elſe.

D'Urfy was deſcended from an ancient family in France. His parents, being Hugonots, fled from Rochelle before it was beſieged by Lewis XIII. in 1628, and ſettled at Exeter, where this their ſon was born, but in what year is uncertain. He was originally bred to the law; but ſoon finding that profeſſion too ſaturnine for his volatile and lively genius, he quitted it, to become a devotee of the muſes; in which he met with no ſmall ſucceſs. His dramatic pieces, which are very numerous, were in general well received: yet, within thirty years after his death, there was not one of them on the muſter-roll of acting plays; that licentiouſneſs of intrigue, looſeneſs of ſentiment, and indelicacy of wit, which were their ſtrongeſt recommendations to the audiences for whom they were written, having very juſtly baniſhed them from the ſtage in the periods of purer taſte. Yet are they very far from being totally devoid of merit. The plots are in general buſy, intricate, and entertaining; the characters are not ill drawn, although rather too farcical; and the language, if not perfectly correct, yet eaſy and well adapted for the dialogue of comedy. But what obtained Mr. D'Urfy his greateſt reputation, was a peculiarly happy knack he poſſeſſed in the writing of ſatires and irregular odes. Many of theſe were upon temporary occaſions, and were of no little ſervice to the party in whoſe cauſe he wrote; which, together with his natural vivacity and good humour, obtained him the favour of great numbers of all ranks and conditions, monarchs themſelves not excluded. He was ſtrongly attached to the tory intereſt, and in the latter part of queen Anne's reign, had frequently the honour of diverting that princeſs with witty catches and ſongs of humour, ſuited to the ſpirit of the times, written by himſelf, and which he ſung in a lively and entertaining manner. And the author of the Guardian, who, in N° 67, has given a very humorous account of Mr. D'Urfy, with a view to recommend him to the public notice for a benefit-play, tells us, that he remembered king Charles II. leaning on Tom D'Urfy's ſhoulder more than once, and humming over a ſong with him. He uſed frequently to reſide with the earl of Dorſet at Knowle; where a picture of him, painted by ſtealth, is ſtill to be ſeen.

He was certainly a very diverting companion, and a cheerful, honeſt, good-natured man; ſo that he was the delight of the moſt polite companies and converſations, from the beginning of Charles II.'s to the latter part of king George I.'s reign; and many an honeſt gentleman got a reputation in his county, by pretending to have been in company with Tom D'Urfy. Yet, ſo univerſal a favourite as he was, it is apparent that towards the latter part of his life he ſtood in need of aſſiſtance, to prevent his paſſing the remainder of it in a cage, like a ſinging-bird; for, to ſpeak in his own words, as repeated by the above-named author, "After having written more odes than Horace, and about four times as many comedies as Terence, he found himſelf reduced to great difficulties by the importunities of a ſet of men, who of late years had furniſhed him with the accommodations of life, and would not, as we ſay, be paid with a ſong." Mr. Addiſon then informs us, that, in order to extricate him from theſe difficulties, he himſelf immediately applied to the directors of the play-houſe, who very generouſly agreed to act "The Plotting Siſters," a play of Mr. D'Urfy's, for the benefit of its author. What the reſult of this benefit was, does not appear; but it was probably ſufficient to make him eaſy, as we find him living and continuing to write with the ſame humour and livelineſs to the

time of his death, which happened Feb. 26, 1723. What was his age at this time, is not certainly ſpecified any where; but he muſt have been conſiderably advanced in life, his firſt play, which could ſcarcely have been written before he was 20 years of age, having made its appearance 47 years before. He was buried in the church-yard of St. James's, Weſtminſter.

Thoſe who have a curioſity to ſee his ballads, ſonnets, &c. may find a large number of them in 6 vols. 12mo. entitled, "Pills to purge Melancholy," of which the Guardian, in N° 29, ſpeaks in very favourable terms. The titles of his dramatic pieces, thirty-one in number, may be found in the Biographia Dramatica.

DURGA POOGA, the name of the great autumnal feſtival of the Hindoos. On this occaſion, an effigy of Durga, in combat with the chief of the Raccuſſes Soomne Soom, is exhibited, amidſt a gaudy group of evil genii and auxiliary gods, forming a picture, in alto relievo, ſufficient to fill the breadth of a large ſaloon, as ſhewy as brilliant colours and tinſel ornaments can make it. This effigy is removed, on the laſt day at noon, and conveyed in proceſſion to the Ganges, where Durga and her aſſociates are committed all together to the deep. During this latter part of the feſtival, which is generally known in Calcutta by the appellation of the Nautches, the houſes of the moſt opulent Hindoos are open to European viſitors, and conſtantly attract a prodigious concourſe of company. This feſtival, which is the moſt famous among the Hindoos, gives occaſion alſo in Bootan to a great diſplay of ingenuity. The feſtival laſts for ten days, and it is there termed "Mullaum." The groteſque figures that exhibited themſelves in the combat formed a very fantaſtic motley group. Elephants, horſes, apes, and a moſt frightful figure environed with ſnakes, were among the repreſentations intended to perſonate raccuſſes, or evil genii. Virtue appeared in the ſhape of Durga, with a view to exterminate vice; and ſome of the group received very hard blows before they would quit the ſtage; but the force of Durga never failed to maintain its ground in all the triumph of victory. The object of this feſtival ſeems to have been the celebration of the arrival of the autumnal, as that of the "Hooli" does the vernal equinox.

Durga Poogah is diſtinguiſhed alſo as being the well-known period, when the armies of the native powers in India have always been accuſtomed to take the field: and till their acquaintance with Europeans taught them the neceſſity of relinquiſhing ſome of their moſt inveterate prejudices, it was very ſeldom that any of their troops aſſembled in the field, till after the celebration of the Duſſera, which happens on the firſt full moon after the equinox. As that has been ever conſidered as the ſignal for hoſtile preparations, ſo has the Dewali, the following new moon, a feſtival kept in honour of the dead, when it is uſual to make large feaſts, to diſtribute food to the poor, and to make grand illuminations during the night, been commonly the time to ſet their troops in motion. Turner's Embaſſy to Tibet, p. 162.

DURGAN, in *Geography*, a town of Aſiatic Turkey, in the province of Natolia; 48 miles S.E. of Caſtamoni.

DURGUT, a town of Aſiatic Turkey, in the province of Natolia; 18 miles E. of Smyrna.

DURHAM, a county in the northern part of England, bounded to the eaſt by the German ocean, to the north by Northumberland, from which it is ſeparated by the rivers Tyne and Derwent, on the weſt by the counties of Cumberland and Weſtmoreland, and on the ſouth by Yorkſhire. The area thus encloſed forms a triangular figure, and meaſures about 36 miles in its greateſt extent from north to ſouth, by nearly 45 miles in an oppoſite direction. Its ſuperficial area includes about 610,000 acres. This ſpace is divided into four wards, all of which derive their names from places of little importance, *viz.* Cheſter, Darlington, Eaſington, and Stockton; beſides which there are two other diſtricts, called Norhamſhire and Iſlandſhire. The county is divided, according to ſome authors, into 113 pariſhes, while others ſay 120, including one city and ten market towns. According to the laſt report to parliament, this diſtrict contained 27,195 houſes, and 160,361 inhabitants, of whom 74,770 were males, and 85,591 were females. Four members are returned to parliament; two for the county and two for the city.

This part of England was anciently inhabited by the *Brigantes*, a claſs of Britons, diſtinguiſhed by Tacitus as being powerful, brave, and numerous; but who were ſubdued by the Romans. The latter included Durham within the diviſion of Maxima Cæſarienſis; and the Saxons made it part of the kingdom of Northumbria. In the year 685, Egfrid, king of this diſtrict, granted all the lands between "the rivers Weare and Tyne" to St. Cuthbert, the apoſtle of the north. From this time the county was inveſted with great privileges, and has been generally termed the *Biſhopric*, and *County palatine*. Edward I., however, ſeized the power from the biſhop, and transferred the liberties of the ſee to the crown. Theſe were afterwards reſtored in part; and were augmented or enlarged by different monarchs, till queen Mary re-eſtabliſhed them. The biſhops of Durham, from time immemorial, have exerciſed peculiar immunities and power; conſiſting of all manner of royal juriſdiction, both civil and military, by land and ſea. For the exerciſe of which they had their proper courts of chancery, exchequer, and court of pleas, as well of the crown as of the county. The nature and peculiarity of all theſe cannot be properly deſcribed in this place, but may be found fully explained in Hutchinſon's Hiſtory of Durham, 3 vols. 4to. and Gough's edition of Camden's Britannia, vol. iii. p. 109, &c.

The general aſpect of Durham is hilly and mountainous, particularly towards the weſtern angle, which is a bleak, barren, and naked region, croſſed by a lofty ridge called the Engliſh Apennines. Several different ſtreams iſſue from the eaſtern ſide of theſe mountains. On the eaſtern ſide, and near the centre of the county, are ſome fine and fertile vallies, through which various brooks and rivers flow to the ſea. Nearly one-third of the land is held by eccleſiaſtical tenure, under leaſes for lives, or for 21 years. The cattle of Durham are in great repute, as to ſhape, weight, produce of milk, &c. The ſheep are moſtly large, and covered with long wool.

The waſte or uncultivated lands of this county are of conſiderable extent, occupying, according to Mr. Granger, nearly 130,000 acres. According to ſir William Appleby, in a communication to the author of the Agricultural Report, "Durham, taking its ſmall dimenſions into conſideration, is not to be equalled by any other county in Great Britain, except Middleſex, for its numerous and important coal, lead, and iron mines; its large caſt-metal founderies, and iron manufactories, potteries, glaſs-houſes, copperas works, coal, tar, and ſalt works, quarries of marble, fire and free-ſtone; lime, brick, and tile-kilns; grind-ſtone and mill-ſtone; linen and woollen manufactories; trade, agriculture, and population." Granger's general View of the Agriculture of the County of Durham, 4to.

Towards the eaſt and north-eaſt parts of Durham are ſeveral extenſive coal-mines. The ſeams or ſtrata, now worked, are five in number, which extend horizontally for many miles, and are from 20 to 100 fathoms beneath the ſurface.

ſurface. Each ſtratum is from three to about eight feet in thickneſs. Below theſe are ſeveral other ſeams of coal. Some ſteam-engines have been erected, to raiſe the coal to the ſurface, and for the purpoſe of pumping the water out of the mines. In the great ſea-ſale collieries, ſeveral horſes are conſtantly kept under ground, to draw the coals to the mouths of the pits.

In the vicinity of Walſingham, a firm black ſpotted limeſtone or marble is procured, and is much uſed for hearths, chimney-pieces, &c. The ſame neighbourhood alſo abounds with ſtone, much uſed in making mill-ſtones. Many quarries of excellent ſlate have been opened in different parts of the county; and Gateſhead-fell is particularly famous for producing what are vulgarly termed Newcaſtle grind-ſtones, from being moſtly ſhipped off at that port. Fire-ſtone, in high eſtimation for making ovens, furnaces, &c. is obtained in various parts of the county; and large quantities are annually exported. Several lead-mines are worked in Teesdale and Wear-dale. Some extenſive works for manufacturing ſalt from ſea-water have been long eſtabliſhed at South Shields; but theſe have been much neglected, in conſequence of a ſingular ſalt ſpring having been diſcovered at Birtley. The water riſes at the depth of 70 fathoms, and has produced 20,000 gallons *per* day for ſome years paſt. The water is found to be four times ſtronger than any ſea-water.

The manufactures of Durham are numerous and important, and are diſtributed over various parts of the county. At Cheſter-le-Street is a very extenſive foundery for cannon; and another at Waſhington. At Swalwell and at Winlaton are ſome very large iron-works; and at Lumley is a manufactory for converting ſcrap-iron into engine-boiler-plates, and caſt metal into malleable iron. At Shortley-Bridge, Derwent-Coal, and Blackhall-Mills, are manufactories of ſteel for ſword-blades. Tammies, carpets, and waiſtcoat-pieces, are manufactured at Durham; tammies and huckabacks are alſo made at Darlington; cottons are manufactured at Caſtle-Eden, Stockton, and Biſhops-Auckland; glaſs-bottles in large quantities are made at Sunderland, &c.

The chief rivers of this county are the Tees, the Weare, and the Derwent. The total return of income, under the influence of the property-tax bill for this county, in 1806, was 1,320 364*l.* The amount of the poor-rates for 1803, at 2*s.* $4\frac{1}{4}$*d.* in the pound, was 71,665*l.*

Durham, a city, and the capital of the county of the ſame name, England, is ſituated on a ſingular rocky eminence, riſing near the centre of the county, and almoſt ſurrounded by the river Weare. From all the neighbouring points of view, its appearance is unique and ſtriking: its public edifices exhibiting a degree of magnificence not to be expected at ſo remote a diſtance from the metropolis; and its ſituation and figure being ſo peculiar as to have acquired the emphatic appellation of the *Engliſh Zion.* Durham derives its name from its ſituation; the term being a corruption from the Saxon words, *Dur*, a hill, and *holme*, a river iſland. By the Latins, obſerves Camden, "it is called Dunelmus; and by the common people, Durham or Duriſme." The earlieſt hiſtorical notice of this city is contained in the monkiſh legend of St. Cuthbert, from whoſe votaries Dunholme, as it was then called, accumulated all its celebrity and riches. From this legend we collect, that the ſaint died in 687, and was buried in the church of Landisfarne, at that period an epiſcopal ſee, which rank it continued to hold till the year 876, when the Danes, under Halfden, ravaged this part of the country, exerciſed peculiar cruelty againſt the clergy: on which biſhop Eardulf, and the other members of the church, reſolved on immediate migration; and collecting all their relics, ſacred veſſels, ſhrines jewels, and ornaments, abandoned Landisfarne, and were followed by all the inhabitants. After a long ſeries of temporary reſidences, Dunholme was the place fixed on for the laſting abode of St. Cuthbert's relics, and the further eſtabliſhment of the holy fraternity. From theſe and other correllative circumſtances, we are led to date the riſe of the town of Durham in the beginning of the eleventh century. In the year 1040, it appears to be ſtrongly fortified, when attacked by Duncan king of Scotland: for the townſmen ſuſtained his aſſaults for a conſiderable time; and at length, by a vigorous ſally, totally routed the aſſailants, and beheaded the leaders in the market-place. In 1069, William I. ſent Robert Cumin, whom he had created earl of Northumberland, with 700 veteran Normans, to enforce his authority. Theſe warriors committed great enormities, which excited the inhabitants to a deſperate reſiſtance; when, after a very ſanguinary conteſt, the earl with his 700 guards (one only excepted, who eſcaped wounded) were put to death. William, determined on revenge, indulged the malignity of his heart in the ſpoil and blood of his ſubjects, and deſolated the country in ſuch a manner, that, for 60 miles between York and Durham, he did not leave a houſe ſtanding; reducing the whole diſtrict by fire and ſword. Churches and monaſteries were not ſpared. A dreadful famine enſued; and a mortality unequalled in the annals of this country. The biſhop, eccleſiaſtics, and principal inhabitants, evacuated Durham, and again returned to Landisfarne, till the king's departure, and the reſtoration of ſome degree of tranquillity enabled them to return to their deſolated country. William, on his retreat from an expedition againſt Malcolm king of Scotland, conſidering that Durham was a proper barrier againſt the Scottiſh incurſions, reſolved to erect a caſtle here, which might ſerve alſo to keep the neighbourhood in awe; or, as he explained it, "to ſecure his earl of that province from tumults and inſurrections, as alſo to protect the biſhop of the ſee, and his church." About this time, the Domeſday book was compiled; and as Durham does not occur in it, a ſuppoſition ariſes, that the county was ſo waſted, as not to be worth the expence of a ſurvey. Malcolm king of Scotland now entered the county, and being oppoſed by Robert, ſon of king William, a freſh ſcene of warfare commenced. On the acceſſion of William Rufus, the biſhop of Durham, William de Carilepho, fled into Normandy; and his temporalities were ſeized by the king, who appointed John de Tailbois and Erneſius de Burone governors of the caſtle and palatinate. Durham ſuſtained great injury by fire in the time of biſhop Flambard, when, in conſequence of his flight to Robert duke of Normandy, his poſſeſſions were in the hands of the crown. This biſhop, to ingratiate himſelf at court, oppreſſed the biſhopric with taxes, but without ſucceſs; king Henry having an invincible hatred to the principles of the prelate. In 1112, the biſhop founded the hoſpital of Kepier, which he dedicated to St. Egidius or Giles, and amply endowed it. After his reſtoration to the ſee, he improved the fortifications, by extending the walls between the cathedral and caſtle, removing the houſes on the intermediate area, and levelling the ground. He fortified the caſtle with a moat, improved the banks of the river, and built Framwell-gate bridge. In the reign of Stephen, Durham and its vicinity again experienced the horrors of war, from the incurſions of David king of Scotland, in behalf of his niece Matilda. On the eſtabliſhment of peace, this city was choſen as the place of aſſembly by the members of that convention, in April, 1139. Henry II. having a diſpute with biſhop Pudſey, took poſſeſſion of the caſtle and city of Durham; and, on various pretexts, deprived-

prived the bishop of the custody of so strong a post. This bishop obtained a charter from pope Alexander III. at the council of Lateran, in 1176. He also made many additions to the cathedral, and ornamented the city by several public structures; he built Elvet bridge, and rebuilt the borough of that name, which had been destroyed by Cumin and his adherents; he constructed the city wall from the Gaol-gate to the Water-gate, part of which is still remaining; and re-edified the castle, which had been destroyed by fire. The *Boldon buke*, now remaining in the auditor's office, was compiled by his order; and has been admitted as evidence in all cases, to ascertain the ecclesiastical property of the diocese. The castle seems to have remained in the crown: for, when Henry III. consented to the election of Richard Poore to this see, he excepted the possession of the castles of Durham and Norham. This pious prelate made, by an agreement with the convent, several regulations concerning the privileges of the two boroughs of Durham and Elvet, with respect to civil authority, weights, measures, &c. In this reign, it appears that Durham had a royal and palatinate mintage within itself, which Edward I. on his accession, made a point of reforming. This city exhibited a singular scene of festivity in 1333, on the promotion of Richard de Bury or Aungerville to the bishopric. He entertained, in the great hall of his palace, Edward III. and his queen, the queen dowager, the king of Scotland, the two metropolitans, and five bishops, seven earls and their ladies, all the nobility north of Trent, with a vast concourse of knights, abbots, priors. It was in this year that king Edward III. gained the famous battle of Halidown-hill. This monarch again visited the city in 1336, and issued summonses for the military tenants to attend him, previously to the siege of Berwick. Bishop Hatfield, who succeeded De Bury, was a great benefactor to the church and city. In 1357, he granted a toll on certain merchandize brought to Durham, to defray the charges of paving the city and repairing the walls. Letters patent were likewise granted by him to William de Elmedon, gaoler and porter of the castle, with certain profits annexed to the office, among which are fees for sealing the measures to be used in the city. In the 3d of Henry VI. the city was enlivened by the marriage of James king of Scotland with his cousin Jane of Somerset, grand-daughter of John of Gaunt duke of Lancaster: the solemnity was attended by many of the most illustrious persons of both kingdoms. The suppression of the rebellion of the Nevilles, in the reign of Elizabeth, occasioned a scene of horror in Durham; not fewer than 66 persons being executed, to satisfy the brutality of sir George Bowes, who boasted, that in a tract of country 60 miles in length and 40 in breadth, between Newcastle and Wetherby, there was scarcely a town or village wherein he had not sacrificed some of the inhabitants. During the time of the commonwealth, an attempt was made to establish a university at Durham: the plan was strenuously promoted by Oliver, and advanced so far as to excite the jealousy and opposition of the universities of Oxford and Cambridge; when the machine of government fell to pieces, and involved in its ruins this new seminary of learning. It is a singular fact, that George Fox, the founder of the quakers, assumed to himself the consequence, and, as he thought, merit of being the means of suppressing this laudable institution.

The present magnificent cathedral of Durham owes its origin to bishop William de Carilepho, who, having projected a change in the government of this church, which had hitherto been directed by the secular clergy and their provost, obtained, under the authority of the king and the pope, a licence to introduce regular canons. Conceiving also, that the church built by his predecessors was unsuitable to the increasing dignity of the see, he formed a plan for erecting a structure similar to the superb fabrics he had seen during his exile on the continent. Accordingly, on August 11, 1093, the foundation was laid with suitable solemnity, at which Malcolm, king of Scotland, assisted. The bishop compelled the monks to labour in the holy work constantly; but no considerable progress was made in his life time, which terminated within two years after the commencement of the edifice. His successor, Ralph Flambard, who enjoyed the bishopric twenty-nine years, and was equally zealous in the pious undertaking, finished the building nearly to the roof. This prelate, before his promotion to the see of Durham, had given proof of his ability in architecture, by the erection of the collegiate church of Twinambourne, or Christ church, Hampshire. The cathedral erected by these bishops was of the form universally adopted by the Norman architects; a long cross, with two turrets at the west end, and between them, a large and richly ornamented entrance: the east end probably terminated in a semicircular form, as the lines of union of the original work, with the chapel of the nine altars, strongly indicate. The side aisles, both of the nave and choir, were vaulted with semicircular arches, groined, and the ribs of the groins carved; but the nave and the choir were open to the timber roof. The nave exhibits the next change of style. Bishop Poore, having already given a specimen of his taste in the construction of Salisbury cathedral, induced prior Melsonby to conform to a more ornamental mode of architecture in the roof, which he was then building. Under his direction the whole vault was accommodated to the pointed arch, though the Norman zig-zag is used along the ribs of the groins. Successive additions have rendered this church as it now appears; not only an enlarged specimen of Norman building, but "a most instructive series of examples, illustrating the gradual change of style which took place during the reigns of the three first Henrys, till, by degrees, the pointed had completely superseded the semicircular arch; and the heavy clusters of the Norman pillars were polished into the light shafts of the early English." "Account of the Cathedral Church of Durham, with Plan, Sections, &c." published by the Society of Antiquaries of London.

To describe the whole of this structure, with its numerous chapels, tombs, connected edifices, &c. would occupy more space than we can consistently appropriate to this article. Those who are desirous of such information, may consult the work just referred to, also the Beauties of England, vol. v., and Hutchinson's History, &c. of Durham. A few additional particulars respecting it may, however, be required. When bishop Flambard deposited the remains of St. Cuthbert in the new church, he erected an elegant shrine, called the *Feretory*, over them. Bishop Hugh Pudsey began to erect, at the east end of the cathedral, a chapel to the Virgin Mary; but relinquishing this, he appropriated a part of the west end, called the *Galilee*, for the admission and sanctuary of females; as they were not allowed to enter the cathedral. This exclusion was one of the strange prejudices, or infatuations, of the disciples of St. Cuthbert, who, they asserted, had an antipathy to the female sex.

The great central tower, 214 feet in height, was partly built by prior Melsonby, soon after 1233, and completed by priors Middleton and Hugh, before the year 1258. A survey of the cathedral was made in 1776, when it was found to want much reparation, &c. which was immediately commenced: and since that period, workmen have been constantly employed on this structure. During the last fifteen or sixteen years a sum amounting to not less than 1500*l.* or

2000*l.* has been annually expended for this purpose; and a fund is provided to answer future demands. Of this noble structure Dr. Johnson speaks in his usual style, that "it strikes with a kind of gigantic dignity, and aspires to no other praise than that of rocky solidity, and indeterminate duration." The cathedral may be described as consisting of a nave, with two aisles; a transept with an aisle towards the east; a choir, with two aisles; the chapel of the nine altars at the east end, extending north and south; an oblong chapter-house, with semicircular east end; a cloister to the south; a chapel, or Galilee, at the west end; and several apartments on the west and south sides of the cloisters. The entire length of this structure is 461 feet, thus divided: nave 260 by 74 feet, and 69 feet six inches in height; length of transept 170 by 57 feet in width; choir 120 by 74 feet; chapel at east end 130 feet from N. to S. by 51 in an opposite direction; Galilee 50 feet from E to W. by 80 feet from N. to S. These are interior measurements.

From the cathedral on the north extends an open area, called the Place, or Palace Green, on the north side of which is the castle, now the residence of the bishop when he visits Durham. This structure stands on the continuation of the same rocky eminence on which the cathedral is built; and from its upper apartments commands some fine views of the city and surrounding country. The most ancient part of this edifice is the keep or tower, which occupies the top of an artificial mount, and is supposed to have been of Norman construction. The buildings, which now constitute the castle, have been erected at various periods, and have consequently but little uniformity. Some parts, which have suffered by fire, were restored by bishop Pudsey, who acceded to the see in 1153. He is also supposed to have erected the first hall: but this, with other parts of the castle, going to decay, a new and more magnificent hall was built by bishop Hatfield, the original length of which was 120 yards. From this apartment the present hall was formed, which is of extensive dimension; its length being 180 feet, the breadth 50, and the height 36. Contiguous to the keep, on the east, is the great north gateway, a very strong fabric, erected by bishop Langley, and now used as the gaol. The outward, or lower part, was defended by a gate and portcullis; within which is a recess, constructed with sallyports and galleries, for the annoyance of assailants, who might force the first gate: the upper part was secured by double gates. All the other gates of the city have been removed. On the west side of the Place Green is the exchequer, a strong square stone building, erected by bishop Neville about the year 1450. Adjoining it is the bishop's library, built by bishop Cosin, who also greatly contributed towards the erection of the law courts, where the assizes, quarter sessions, &c. are held. The court for the trial of crown causes was much enlarged in 1791. On the opposite side of the green is an hospital, or almshouse, for eight poor men and women, founded by bishop Cosin in 1666; and adjoining it, at each end, a school-house, rebuilt by him about the same period, but originally endowed by bishop Langley. From the Place Green is an avenue leading to the public walks called the Banks, which skirt the river, and were made, and are still kept in repair, by the munificence of the dean and chapter. These walks are much celebrated for their beauty and interesting views. Over the river Weare are three bridges: Framwell-gate bridge, erected by bishop Flambard, about 1120, Elvet bridge, by bishop Pudsey, about 1155; and the New bridge, built in 1772.

Independently of the cathedral, Durham contains six churches, the principal of which is that dedicated to St. Nicholas, an ancient structure, situated on the south side of the market-place. It consists of a nave and side aisles, with a square tower at the south-west angle. The church of St. Mary-le-Bow, or Bough, is on the east side of the North Bailey; on the same spot, according to tradition, where St. Cuthbert's remains were lodged, in a tabernacle of boughs and wands, when first brought by the monks to Durham. St. Oswald's church is an ancient structure, occupying an elevated situation on the eastern banks of the river in that part of the suburbs called New Elvet: it consists of a nave, chancel, and side aisles. St. Giles's church is of remote origin, having no aisles; it is narrow, long, and lofty. The church of St. Margaret, situated in Crossgate, and that of Little St. Mary, in the South Bailey, display nothing remarkable. The market-place is a small square, having a Guildhall, or Tolbooth, on the west side, a pant to supply the inhabitants with water, near the centre, and a piazza, where the corn-markets are held on the south.

The original denomination of Durham, after its civil establishment, was that of Borough; and its local polity was exercised by a bailiff, appointed by the bishops. In 1565 the civil jurisdiction was vested, by bishop Pilkington, in an alderman and twelve burgesses. In 1602 bishop Matthew changed it to that of a mayor, twelve aldermen, and twenty-four common councilmen. This mode of government, having sustained several interruptions, was finally re-established in 1780, by a new charter from bishop Egerton, in which the rights of the citizens were explained and confirmed.

Neither the county, nor the city of Durham, was represented in parliament till the reign of Charles II.; a circumstance which may be ascribed to the vast power and influence of the bishop: as returning members to parliament was anciently considered more grievous and inconvenient, than useful or honourable. The extension of learning induced ideas more favourable to liberty: and, in 1673, an act was passed, authorizing the city and county to send each two members; and from that time the returns have been regularly made. The right of election for the city is in the mayor, aldermen, and freemen: the voters are about 1000. Durham is situated 260 miles N. from London; has a weekly market on Saturdays, and three annual fairs; and contained, as returned under the late act, 1024 houses, and 7530 inhabitants.

Durham, a township of America, in Cumberland county, Maine, on the S.W. bank of Androscoggin river, which separates it from Bowdoin on the N.E. It was incorporated in 1789, contains 1242 inhabitants, and lies 145 miles north-easterly of Boston. N. lat. 43° 55′.—Also, a post town in Strafford county, New Hampshire, seated on Oyster river, near its junction with the Piscataqua; 12 miles W. of Portsmouth. It was incorporated in 1633, and contains 1126 inhabitants. It was formerly a part of Dover, which adjoins it on the north, and was called Oyster river.—Also, a post town in New Haven county, Connecticut, settled from Guildford in 1698, and incorporated in 1708. It is about 22 miles S.W. of Hartford, and 18 miles N.E. of New Haven. The Indians called it "Cagingehague," which name a small river that rises here still bears. It has 1029 inhabitants.—Also, a township in Bucks county, Pennsylvania, having 405 inhabitants.—Also, a county in Upper Canada, bounded on the E. by the county of Northumberland, on the S. by lake Ontario, until it meets the westernmost point of Long Beach, thence by a line running N. 16° W. until it intersects the southern boundary of a tract of land belonging to the Missassaga Indians, and thence along the said tract, parallel to lake Ontario, until it meets the N. westernmost

N. weſternmoſt boundary of the county of Northumberland. Morſe.

DURIA Major *and* Minor, in *Ancient Geography*. See *La* Doria *Baltea* and *Riparia*.

DURIO, in *Botany*, (from a Malay word *dury*, which, according to Rumphius, means a thorn, the names of this ſpinous fruit, *Duryon*, Durëin, or *Dureyn*, in Malacca, Ternate and Ambovna, are derived. Linnæus, perhaps, conſidered the word *Durio* as rendered canonical, by an equally correct alluſion to the hard coarſe rind of the fruit, "a fructûs duritiâ.") Durion. Linn. Syſt. Veg. ed. 13. 581. Schreb. 516. Willd. Sp. Pl. v. 3. 1434. Juſſ. 244. König in Tr. of Linn. Soc. v. 7. 266. Claſs and order, *Polyadelphia Polyandria*. Nat. Ord. *Malvaceæ*, König.

Gen. Ch. *Cal.* Perianth inferior, double, each of one leaf, ſomewhat coriaceous, ſmooth within, externally clothed with very minute, ſhining, ſilvery, ſtellated, pellucid ſcales: the outer one wideſt, obtuſely two-lobed, ſpreading: the inner longeſt, nearly an inch in length, urn-ſhaped, ſwelling, with five erect, acute, equal, marginal ſegments. *Cor.* Petals five, above twice as long the inner calyx, inſerted into its baſe, elliptic-lanceolate, entire, recurved, equal, with furrowed claws. *Stam.* Filaments numerous, from twenty-five to forty-five, rather longer than the petals, upright, thread-ſhaped, equal, united in a ſomewhat forked manner into five ſets, inſerted into the bottom of the calyx, oppoſite to the petals; anthers roundiſh, compoſed of numerous aggregate cells. *Piſt.* Germen ſuperior, obovate, obſcurely five-ſided, ſcaly; ſtyle ſimple, thread-ſhaped, the length of the filaments, a little twiſted upwards; ſtigma capitate, with five furrows. *Peric.* Apple very large, globoſe, inclining to oval, pointed, entirely clothed with crowded, prominent, pyramidal, acute tubercles, of five cells which open outwardly. *Seeds* from two to five in each cell, ovate-oblong, ſhining, enclaſed in one, common, aggregate, ſoft, pulpy tunic, which fills each cell, and is firmly attached to the central column. Cotyledons two, without any ſeparate albumen. Embryo ſtraight, in the baſe of the ſeed.

Eſſ. Ch. Calyx double, the outer one two-lobed. Petals five. Style one. Apple with five cells. Seeds in a pulpy tunic.

D. *zibethinus*, the only ſpecies. Kön. Tr. of L. Soc. v. 7. 266—273. t. 14, 15, 16. Mart. Mill. Dict. v. 2. Lamarck Dict. v. 2. 333. t. 641. (Durio. Rumph. Amb. v. 1. 90. t. 29.) Native of Malacca, Sumatra, Java, Borneo, and the Molucca iſlands. It forms a very lofty tree. *Leaves* alternate, on ſwelling ſtalks, elliptic-oblong, pointed, entire, with one rib and numerous veins; ſmooth and dark green above; clothed with minute ruſty ſcales beneath. Stipulas none? *Flowers* in lateral bracteated branches from the larger branches, unpleaſantly ſcented. *Partial ſtalks* two or three inches long, round, ſcaly, jointed at the baſe. *Petals* of a dirty white. *Stamens* and ſtyle red. *Fruit* yellowiſh-green externally. *Seeds* of a yellowiſh brown; their tunics white, of a ſoft, mucous, and very tender ſubſtance. Theſe tunics conſtitute the eatable part of the Durion fruit, which is eſteemed one of the moſt delicious vegetable productions of India, and compared by Rumphius to cream or *blanc manger*. This author tells us, however, that perſons not accuſtomed to eat this fruit, are at firſt deterred from taſting it by the intolerable ſmell which it diffuſes, reſembling rotten onions; but thoſe who overcome their firſt repugnance grow extremely fond of it. He further mentions, that it is not always to be eaten with impunity. The pulp of one or two Durions is ſufficient for one perſon at a time, though ſome ſtomachs will bear a much greater quantity. Their immoderate uſe cauſes violent and dangerous inflammatory diſorders, and the ſeaſons when they abound are generally very unhealthy. It is forbidden by law to throw the rinds of this fruit into much-frequented places, on account of their dangerous fœtor. The Chineſe uſe their aſhes in painting and dyeing. Mr. König is the firſt who has given an accurate botanical deſcription of this plant.

DURIUS, in *Ancient Geography*, a river of Hiſpania Interior, now *Douero* or *Douro*.

DURKO, in *Geography*, a town of Aſiatic Turkey, in the province of Natolia; 42 miles S.W. of Amaſieh.

DURLACH, or Dourlach, a ſmall but handſome town of Germany, in the grand duchy of Baden, on the river Pfinz, with a caſtle called Karlſburg. It was formerly the reſidence of one branch of the houſe of Baden, the ſons of margrave Chriſtopher of Baden, who had reunited two former lines in 1503, having commenced two new lines of Baden Baden, and Baden Durlach. See Baden.

DURLAH, a river of Bengal, which divides the diſtrict of Cooch Bahar from that of Rungpore.

DURNESS, a town of Scotland, in the county of Sutherland, near the N. coaſt, at the bottom of a bay, formed by a river of the ſame name, called the "Kyle of Durneſs;" 46 miles N.N.W. of Dornoch. N. lat. 58° 33′. Long. 1° 21′ W. of Edinburgh.

DURNISH, a town of Scotland, on the weſtern coaſt of the iſland of Skye.

DURNOVARIA, in *Ancient Geography*, a town of Albion, which all our antiquaries agree to fix at Dorcheſter, where many Roman antiquities have been found, and where the veſtiges of the Roman walls of the city and of an amphitheatre without them are ſtill viſible. See Dorchester. It was alſo called Dunium, which ſee.

DUROBRIVIS, the ancient name of Rocheſter in Antonine's Itinerary, which our antiquaries derive from *Dur*, a river, or water, and *Briv*, a town.

Durobrivis, is alſo a name given in the 5th Iter of Antonine to a place ſituated between Cambridge and Ancaſter. Dr. Gale fixes it at Bridge Caſterton, two miles N. from Stamford: but Camden, Baxter, and Horſley, place it at Caſtor upon the river Nen, or rather at the village of Dornford, near Caſtor, where many Roman coins and other antiquities have been found.

DUROCHSKOI, in *Geography*, a town of Ruſſia, in the government of Irkutſch, on the borders of China, near the river Arguria; 160 miles S.S.E. of Nertchinſk.

DUROCOBRIVIS, in *Ancient Geography*, a place marked in Antonine's Itinerary between Fenny Stratford and St. Albans, which is generally fixed at Dunſtable; though Mr. Horſley conjectures, that the two ſtations Magiovintum and Durocobriva have been tranſpoſed by the careleſſneſs of ſome tranſcriber; and that the latter was at Fenny Stratford, and the former at Dunſtable; becauſe, in that caſe, the meaning of the original Britiſh names of theſe places will be more agreeable to their ſituations.

DUROCORNOVIUM, a ſtation between Glouceſter and Speen, ſuppoſed to be Cirenceſter.

DUROIA, in *Botany*, (in commemoration of Dr. John Philip Duroi, a phyſician of Brunſwick, author of an inaugular diſſertation, conſiſting of botanical remarks, publiſhed in 1771, and of a German work on trees and economical plants, with figures. He was a frequent correſpondent of Linnæus, whoſe herbarium, as we are informed by Dr. Smith, he much enriched.) Linn. Suppl. 30. Schreb. 230. Willd. Sp. Pl. v. 2. 222. Juſſ. 203. Mart. Mill. Dict. v. 2. (Pubet; Linn. Amœn. Acad. v. 8. 264.) Claſs and order, *Hexandria Monogynia*. Nat. Ord. *Rubiaceæ*, Juſſ.

Gen. Ch. *Cal.* Perianth of one leaf, ſuperior, cylindrical, abrupt, ſhort, contracted. *Cor.* of one petal. Tube cylindrical; limb

nab the length of the tube, in six deep, oval, spreading segments. *Stam.* Filaments none; anthers six, oblong, sessile in the tube of the corolla. *Pist.* Germen inferior; style thread shaped, the length of the tube; stigmas two. *Peric.* Berry globose, umbilicated, densely clothed with prominent hairs. *Seeds* numerous, imbedded in pulp, oval, flat, very smooth, lying in two rows over each other. The flowers are often abortive, and there are many of them also male, wanting the germen altogether. Linn.

Jussieu, from the evident characters of his natural order of *Rubiaceæ* in this plant, presumes its fruit to be of two cells. Its characters very nearly approach *Gardenia*.

Ess. Ch. Calyx superior, cylindrical, abrupt. Corolla with a cylindrical tube, and six-cleft regular border. Anthers sessile in the tube. Berry hispid, umbilicated.

D. *Eriopila.* is the only species. Linn. Suppl. 209. (Marmelade-Doosjes-Boom; Merian Surin. 43. t. 43.) Native of Surinam, whence it was sent by Dalberg to Linnæus, from whose account and the figure in Merian, concerning whose synonym there surely can be no reasonable doubt, all our knowledge is derived, for we have never seen a specimen. It is described as a lofty tree, with thick, unequal branches, hairy in their upper part. *Leaves* about the summits of the branches, opposite, crowded, a span long, obovate, bluntish, entire, hard, rigid, downy above, reticulated beneath, with one rib, and many transverse veins. *Foot stalks* short, hairy. Merian describes a kind of rough excrescences, growing either on the stalks or branches, throwing out numerous cylindrical or awl-shaped horns, which are prescribed in pulmonary disorders. The *flowers* are terminal, sessile, clustered, numerous, but most of them abortive; their *corolla* white, resembling the Arabian Jasmine. *Fruit* rather larger than a turkey's egg, globose, with a furrow on each side, yellow, covered with short, dense, brown, prominent hairs, crowned with the cup-like permanent base of the calyx, and filled with numerous seeds lodged in pulp which is eatable, and compared by Madam Merian to that of the European medlar. Her figure evidently indicates a separation of the berry into two cells, as suspected by Jussieu. The bark resembles a box, and hence the above Dutch name, equivalent to Marmelade-box tree.

The caterpillar of a beautiful butterfly feeds on this tree, which is near *Papilio Protesilaus* of Linnæus, but, we believe, very distinct, though cited for it by him as well as by Fabricius.

DUROLEVUM, the name of a station between Rochester and Canterbury; the situation of which is uncertain; and Mr. Hersley seems to be singular in placing it at Milton.

DUROLIPONS, a station fixed by some at Cambridge; but those antiquarians who place Camboricum at Cambridge, fix Durolipons at Godmanchester.

DUROLITUM, in *Ancient Geography*, a station between Chelmsford and London, supposed to be Lecton.

DURONIA, a town of Italy, placed by Livy in the country of the Samnites.

DUROT, in *Geography*, a bay on the N. side of the S. peninsula of the island of St. Domingo.

DUROTRIGES, in *Ancient Geography*, the name of an ancient British nation, seated next to the Danmonii on the east side, and possessing that country, which is now called Dorsetshire. The name is evidently derived from the two British words *dur* or *dwr*, water, and *trigo*, to dwell; and it is equally evident that they owed this name to the situation of their country, which lies along the sea-coast. It is not very certain whether the Durotriges formed an independent state under a prince of their own, or were united with their neighbours, the Danmonii; as they were reduced by Vespasian under the dominion of the Romans, at the same time, and with the same ease, and never revolted. (Eutrop. l. 5. c. 8.) The peaceable disposition of the inhabitants is the reason why the Romans had so few towns, forts, and garrisons in this pleasant country. Dorchester, its present capital, was a Roman city of some consideration, and is supposed to have been called Durnovaria. The country of the Durotriges was included in the Roman province called Flavia Cæsariensis, and governed by the president of that province, as long as the Romans kept any footing in these parts.

DUROVERNUM, a station about the situation of which at Canterbury there is no doubt; and Mr. Baxter derives its name from *dur* a river, and *vern*, a sanctuary.

DUROUR's Island, in *Geography*, an island in the Pacific ocean, discovered by Capt. Carteret, in September, 1767. S. lat. 1° 14′ or 16′. E. long. 143° 21′.

DURRENBERG, a small town of the kingdom of Saxony, in the district of Merseburg, remarkable for some very abundant salt-springs, which furnish as much salt as the whole consumption of the kingdom requires.

DURROW, a market and post town of the county of Kilkenny, Ireland, on one of the roads from Dublin to Cork. It is very neat, and has an excellent inn. The roads near it are peculiarly pleasant, passing through the demesne and plantations of lord Ashbrooke, whose residence is at Castle Durrow adjoining the town. It has been observed that this tract contains more extensive woods, and presents a greater variety of beautiful prospects from the diversity of well planted hills, and rich vallies, than any other part of Ireland. Durrow, though surrounded by the Queen's county, is in Kilkenny, which is thus accounted for. On its coming into the possession of the Butler family, who were perpetually harrassed by the powerful sept of the Fitzpatricks, the earl of Ormond procured an act of parliament to make this estate part and parcel of the county of Kilkenny, and the offending Fitzpatricks being taken were transferred immediately to Kilkenny, and there, removed from their connections, they suffered the penalties of the law. Durrow is 52 miles S.W. from Dublin, and 12 from Maryborough. Wilson's Directory, &c.

DURSEY, an island in the Atlantic, about two miles long, and half a mile broad, situated near the south-west coast of Ireland, belonging to the county of Cork. It is near the northern point of Bantry bay. It is in long. 10° 4′ W. Lat. 51° 33′ N. Beaufort.

DURSIANS, or Dururians, in *Ecclesiastical History*, See Druses.

DURSLEY, in *Geography*, a town in the hundred of Berkeley, Gloucestershire, England, was formerly a borough, but has long since lost the privilege of sending members to parliament. It consists of two narrow streets. The government is vested in a bailiff and four constables. The church is a spacious structure, having two aisles and a tower. On the south side of the church-yard a copious spring of water rises, which gives motion to a fulling mill. In the vicinity is a peculiar rock, called by Leland *Towsfe stone*, and by the natives Puff-stone, which, though soft in hewing, becomes very durable when exposed to the air: of this stone the church is built. Dursley is 108 miles N.W. from London: has two annual fairs; and a market on Thursdays: the market house, which is a handsome edifice, was erected in 1738. By the late return, the town contained 460 houses, inhabited by 2379 persons, of whom 1040 were described as being employed in trade and manufacture; there being a considerable traffic in broad cloth, and card making for the clothiers; and an extensive paper manufactory. Here was anciently a castle, the site of which is still

called

called *Castlefeld*, where some earth-works are still to be seen. Rudge's History of Gloucestershire, vol. ii. p. 219

DURSTUS, or Drust, in *Biography*, was the son of Erp, or Erpin, a distinguished character in the line of Pictish kings; who began to reign A. D 406; and after fighting more than a hundred battles, and living to the protracted age of one hundred years, died A. D. 451. In that monarch's reign the Picts were converted to Christianity by St. Ninian. See Dr. Anderson's Royal Genealogies.

DURTAL or Duretal, in *Geography*, a small town of France, in the department of Mayenne and Loire, chief place of a canton in the district of Segré, 9 miles S W. of la Flèche, with a population of 3107 individuals, and remarkable for the fertility of its territory, which produces excellent wine, and abundance of corn. The canton contains six communes and 9498 inhabitants, upon a territorial extent of 205 kiliometres.

DURVES, a town of Asia, in the country of Candahar; 130 miles S.E. of Candahar.

DURUM, *Latin*, in *Music*, hard, harsh, sharp, one of the distinctive terms applied to the three original major keys, in forming the hexachords. G is the *ut* of the durum hexachord. C of the *natural* hexachord, and F of the *molle*. These furnish a series of six sounds ascending in each, by the same intervals.

G A B C D E
C D E F G A
F G A B♭ C D

By these hexachords the three keys are connected: there being three notes of each, in common with the next hexachord above or below.

DURUNGI, or Durunigi, in *Botany*, the Arabic appellation of the *Doronicum Pardalianches*, from which its present generic name is supposed to have been corrupted by modern writers, as some still more recently have made *Ailanthus* from Aylanto, and *Pandanus* from Pandang, words which, to use the expression of Linnæus, "may be tolerated, but are not to be imitated." See Doronicum.

DURVUS Mons, in *Ancient Geography*, a mountain of Gaul, in the province called "Maxima Sequanorum." By this mountain there was a passage from the country of the Rauraci on the north to that of the Helvetii in the south.

DURY, John, in *Biography*, a learned divine, who flourished in the seventeenth century, was born in Scotland, and educated for the ministry. The great object of his early life was an endeavour to unite the Lutherans and Calvinists; for this purpose he obtained the approbation of the archbishop of Canterbury, and some other of the bishops. He circulated his plans over the whole of protestant Europe, which he seconded by his own personal labours, and by almost innumerable journies taken expresly with this view. After many years of labour and toil, he gave up the hope of uniting the Protestants; and began a still more arduous work, *viz.* of uniting in the bonds of friendship Christians of all sects, which he expected to effect by a new explication of the Apocalypse. Besides this work he published a book, entitled "Johannis Duræi Irenicorum Tractatuum Prodromus, in quo præliminares continentur tractatus de I. pacis ecclesiasticæ remoris è medio tollendis. II. Concordiæ Evangelicæ fundamentis sufficienter jactis. III. Reconciliationis Religiosæ procurandæ argumentis et mediis. IV. Methodo investigatoria ad controversias omnes, sine contradicendi studio et præjudicio pacifice decidendas, &c." In this book the author gives an account of the works which he had promised to the public, and of the expedients which he thought most favourable to his design. Dury wrote a letter to Peter du Moulin, concerning the state of the English, Scotch, and Irish churches under Cromwell, which, with other pieces, was printed at London, in the year 1658, by the care of Louis du Moulin. It is uncertain in what year he died. Bayle.

DUSART, Cornelius, painter of conversations, dancings, and taverns, born at Haerlem 1665, disciple of Adrian Ostade. He studied with great assiduity, and expressed with equal humour and spirit the manners and passions of the boors in their feasts, sports, &c. and he nearly approached, although he never equalled, the merit of his master. He was naturally of a weak constitution, which he had still more impaired by study; but his memory continued so surprisingly retentive, that he could, at any distance of time, retrace any striking object which he had once seen, with the utmost accuracy and precision in every point. He died in 1704. Pilkington.

DUSENSUS, or Dusitanus, in *Ancient Geography*, an episcopal see of Africa.

DUSKY Bay, in *Geography*, a bay on the S.W. coast of the most southerly island of New Zealand, discovered and so named by Cook in March 1770. It is between three and four miles broad at the entrance, and seemed to be as deep as broad: it contains several islands, behind which a shelter is afforded from all winds. The north point of this bay, when it bears S. E. by S. is rendered very remarkable by five high peaked rocks which lie off it, and have the appearance of the four fingers and thumb of a man's hand, on which account it was called "Point Five Fingers:" and the land of this point is further remarkable, for being the only level land within a considerable distance.

It extends nearly two leagues to the northward; it is lofty and covered with wood. The land behind it is very different, consisting wholly of mountains, totally barren and rocky; and this difference gives the cape the appearance of an island. The western-most point of land upon the whole coast, called "West Cape," lies about three leagues to the southward of Dusky bay, in the latitude of 45° 54′ S. and in the longitude of 193° 17′ W. The land of this cape is of a moderate height next the sea, and is distinguished by a very white cliff, two or three leagues to the southward of it. Captain Cook again visited Dusky bay in March 1773; and found, at the entrance of it, 44 fathoms water, a sandy bottom, the West Cape bearing S. S.E. and Five Fingers point, or the north-point of the bay, north. A great swell rolled in from the S.W. The depth of water decreased to 40 fathoms; and afterwards they had no ground with 60. Disliking the place in which they had anchored, they removed to another on the S. E. side of the bay, where they had a good harbour, with every convenience. Captain Cook determined to make some stay in this bay, and thoroughly to examine it; as no one had ever landed before, on any of the southern parts of this country. He also availed himself of the opportunity that was now afforded for necessary repairs, and for other occupations that were conducive to the health and convenience of his fellow-navigators. Here he found a tree, resembling the American black spruce, from the branches and leaves of which he made a kind of beer, that with the addition of inspissated juice of wort and molasses furnished a very wholesome beverage, and supplied the want of vegetables, which the place did not afford.

The south entrance of Dusky bay is situated on the N. side of Cape West, in S. lat. 45° 48′; and is formed by the land of the cape to the south, and Five Fingers point to the north. This land, when viewed from certain situations, bears some resemblance to the five fingers of a man's hand,

whence it takes its name; and different from the other adjacent lands, it is a narrow peninsula, lying north and south, of a moderate and equal height; altogether covered with wood. The depth of water is the only inconvenience that attends the entrance into this bay, as it affords no anchorage, except in the coves and harbours, and very near the shores, which is sometimes impracticable. The anchoring places, however, are sufficiently numerous, and equally safe and commodious. "Pickersgill harbour," where captain Cook lay, is not inferior to any other bay for two or three ships; it is situated on the south shore abreast of the west end of "Indian island," which island may be known from the others by its greater proximity to that shore. There is a passage into the harbour on both sides of the isle, which lies before it. The next place on the upper or east side is "Cascade Cove," so called from a large cascade at the east point of the cove, that falls from a high mountain on the S. side of the bay. In this cove there is room for a fleet of ships, and a passage in, on either side of the island which lies in the entrance. The several anchoring places in this capacious bay are marked in Cook's chart, which will be a sufficient guide to all who need information. The north entrance into this bay lies in S. lat. 45° 38′, and five leagues to the north of Five Fingers Point.

The adjacent country is very mountainous; not only about Dusky bay, but through all the southern part of the western coast of "Tavai Poenammoo." Within land nothing appears but the summits of mountains of a stupendous height, and consisting of rocks that are totally barren and naked, except where they are covered with snow. But the land bordering on the sea-coast, and all the islands, are thickly covered with wood, almost down to the water's edge. The trees are of various kinds, and are fit for the shipwright, house-carpenter, cabinet-maker, and many other uses. The most considerable for size is the spruce tree, many of which trees are from six to eight or ten feet in girt, and from 60 to 80 or 100 feet in length; large enough to make a main-mast for a 50 gun ship. The woods in many parts are so overrun with supple-jacks, 50 or 60 fathoms in length, that it is scarcely possible to force one's way amongst them. The soil is a deep black mould, composed of decayed vegetables; and the ground amongst the trees is covered with moss and fern, of both which there is great variety; but except the flax or hemp plant, and a few other plants, there is very little herbage, and none that is eatable, except some few cresses and a small quantity of celery. Dusky bay abounds most with fish; so that a boat with six or eight men, with hooks and lines, caught every day enough to serve the whole ship's company. Of ducks there is also great plenty, and no less than five different kinds. One cove, which abounds with them, was called "Duck-cove." The most mischievous animals are the small black sand flies, which are very numerous and very troublesome. Wherever they bite they cause a swelling, and such an intolerable itching, which induces a scratching that brings on ulcers like the small-pox. The almost continual rains may be reckoned another evil attending this bay. But though our navigators were perpetually exposed to them, they experienced no pernicious effects. Those who were sick and complaining, when they entered the bay, recovered daily, and the whole crew soon became strong and vigorous. This happy circumstance could only be attributed to the healthiness of the place, and the fresh provisions it afforded; and more particularly to the liberal supply of beer.

The inhabitants of this bay belong to the same race of people with those in the other parts of this country: they speak the same language and observe nearly the same customs. They live a kind of wandering life, and one family seems to maintain no perfect amity with another.

From a great variety of observations made by Mr. Wales, he found that the latitude of his observatory at Pickersgill harbour was 45° 47′ 26½″′ S.; and by the mean of several distances of the moon from the sun, that its longitude was 166° 18′ E. The variation of the needle or compass was found to be 13ʰ 49′ E., and the dip of the south end 70° 5¾′. The times of high water, on the full and change days, he found to be at 10° 57′, and the tide to rise and fall at the former eight feet, at the latter five feet eight inches. Hawkesworth's Voyage, vol. iii. Cook's Voyage, vol. i.

DUSRACH, a town of Persia, in the province of Kerman; 156 miles S. of Sirgian.

DUSSAC, a town of France, in the department of the Dordogne and district of Exideuil; 4 miles N. of Exideuil.

DUSSEL, a river of Germany, in the kingdom of Westphalia, which runs into the Rhine at Dusseldorp.

DUSSELDORF, or Dusseldorp, a very handsome town of Germany, chief city of the grand duchy of Berg, which, since the appointment of its grand duke, Joachim Murat, to the throne of Naples in 1808, has been taken possession of by the French. Dusseldorf is situated on the river Dussel, at the place where this river falls into the Rhine. Till the peace of Luneville it belonged to the elector palatine of Bavaria, now king of Bavaria, to whom it is principally indebted for its embellishments. It is 27 miles N.W. of Cologne, 27 miles N. E. of Juliers, and 75 S.W. of Munster. The streets are wide, regular, and clean; the houses lofty, and the inhabitants extremely industrious. Their number amounts to about 15,000.

Dusseldorf is chiefly remarkable for its celebrated gallery of pictures, which consists of three large and two smaller rooms, bearing each the name of the school to which the pictures belong, *viz.* the Flemish school, Gerrard Dow, the Italian school, Vander Werff, and Rubens.

DUSSENT, Josef, in *Biography*, a Spanish painter, disciple of Vanloo, and one of the competitors in public, at the opening of the Royal Academy of San Fernando, at Madrid, in 1752. Diccionario Historico, &c. de las Bellas Artes.

DUST, minute and almost insensible particles broken off from any hard body.

Those broken from stones, or formed of extremely small stones, are more properly called *sand*. See Sand.

The subtle matter of Des Cartes is a sort of dust produced by the collision of the matter of the second element.

Dust, *Gold* and *Lead*. See the respective articles.

Dust, *Moss*. See Byssus.

DUSZMIANY, in *Geography*, a town of Lithuania, in the palatinate of Troki; 20 miles S.S.W. of Troki.

DUTCH *Coins, Fortification, Monies, Pens, Pink, Telescope, Tyles, Trading Companies, Measures*. See the substantives.

DUTCHESS County, in *Geography*, a county of New York, in America, lying on the east side of Hudson river. It has the state of Connecticut on the E., West Chester on the S., and Columbia county on the N. It is about 48 miles long, and 23 broad, and contains 15 townships, of which Poughkeepsie and Fish-kill are the chief. The number of its inhabitants is 47,775, of whom 1609 are slaves. This county sends seven representatives to the assembly of the state.

DUTCHMAN'S Bay, a bay on the N. coast of the island of Antigua.

DUTCHMAN's *Island*, an island of America, in the Potomack river; 14 miles above Washington.

DUTCHMAN's *Point*, a point of land on the Vermont side of the lake Champlain, about 16 miles S. of the Canada line. It was retained by Britain for some time after the peace of 1783; but it has been since surrendered to the United States.

DUTCHY, an appellation given to the dominions of a duke. See DUKE.

DUTCHY-*Court*. See COURT.

DUTHILL, in *Geography*, a town of Scotland, in the county of Inverness; 20 miles S.E. of Inverness.

DUTKINA, a town of Russian Siberia, in the government of Irkutsch, on the Lena; 16 miles S. of Orlenga.

DUTLINGEN, a small town of the kingdom of Wirtemberg, with a castle and a bridge over the Danube; 36 miles N.E. of Schafhouse, and 40 miles N.W. of Constance, remarkable for some rich iron mines situated in its neighbourhood. N. lat. 47° 55′. E. long. 8° 40′.

DUTY, in a moral sense. See OFFICE.

DUTY *of Marriage*. See MARRIAGE.

DUTIES, taxes, or imposts, levied for the purpose of raising a public revenue. It has been said, that there is no branch of the art of government which is attended with more difficulty, than how to take from the pockets of individuals the sums necessary for the exigencies of the state, without disabling the persons who contribute from enjoying most of the necessaries and conveniencies of life to which they have been accustomed. It is proper that individuals should contribute in proportion to the benefit they derive from government; and this is, in some degree, determined by the quantity of property, in the possession of which they are protected. But, unfortunately, the vast increase of the public expenditure, and the necessity of large and immediate supplies, have furnished modern financiers with a pretext for overlooking these principles; and in the duty imposed expressly on property, different classes of the community are so very differently affected by it, that formerly while duties were professed to be imposed on equitable principles, it would have been deemed very unequal and unjust.

Duties have been levied on property of various descriptions, but particularly on goods imported from other countries, on which the impost appears as a toll for receiving them into protection. It has been the policy of some countries to keep the duties on the importation and exportation of merchandise very low; this was the case in Holland, previous to the revolution, which gave great advantages to the trade of that country, as from the easiness of paying the duties, both strangers and natives were invited to bring great quantities of merchandise there, not only as to a market, but as to a great magazine, where it might be lodged, with little expence, till demanded for other markets; so that Amsterdam and Rotterdam were filled with the produce and manufactures of every part of the world. At Hamburgh, Bremen, and Lubeck, the duties on exportation and importation were very moderate, which contributed materially to the commercial prosperity of those cities. In most countries, a distinction was formerly made between the duties paid by natives and by foreigners, the latter being subject to a much higher rate.

High duties give rise to smuggling, and diminish the consumption of the article on which they are laid. This important financial principle has, however, been frequently disregarded, and the actual produce of an existing duty being thought to furnish the means of computing, with tolerable certainty, the sum to be procured by an augmentation of it, new duties have been added to the old ones, either by separate rates, or a proportion of the former rates, which have not only created much perplexity in the revenue, and trouble to traders, but often diminished the old duty, on the produce of which the computation of the additional revenue had been founded. Before the passing of the Consolidation Act, there were seven duties on ale, six duties on malt, nine duties on foreign spirits, as great a number on the distillery; and on many articles of the customs there were ten, twelve, and even fifteen duties: the abolition of these complex rates, and the substitution of a single duty on each article, contributed materially to the improvement of the revenue; and this simplification of duties has been repeated at several subsequent periods.

The evidence so frequently produced of the encouragement given to smuggling by high duties, has occasionally induced the legislature to lower the duties, with the view of augmenting the revenue. Thus, in the year 1745, when the gross produce of the inland duty on tea was 151,168*l.* 7*s.* 1*d.* the duty was reduced from 4*s.* in the pound to 1*s.* in the pound, and 25 *per cent.* on the price. The consequence of this reduction was, that in the year following, the produce of the duty rose to 249,018*l.* 19*s.* 11*d.*, and in 1747, it was 263,514*l.* 0*s.* 3*d.* But the advantage which evidently flowed from this measure was not long kept in view, the duties being raised again, at different times, till they exceeded their former amount. The revenue committee, in their first report, state, that in the year 1783, the total duties of customs and excise, paid on tea, before it could legally come into the hands of the consumer, amounted, on the lowest kinds of tea, to more than *cent. per cent.* on the prime cost, and on other kinds of tea, on an average, to about 75 *per cent.* It was, therefore, thought proper to recur again to the former principle of lowering the rate of the duties, with the view of augmenting the revenue; in consequence of which, the act, known by the name of the Commutation Act, was passed, by which the duties on tea were reduced to 12½ *per cent.* on the prime cost. Before this period, on an average of ten years, there were very little more than six million pounds weight *per annum*, legally consumed in Great Britain; but within the first twelve months after the act took place, the quantity legally sold exceeded 16 millions of pounds, which has since increased to upwards of 20 million pounds.

For an account of the various duties constituting the permanent public revenue, see CUSTOMS, EXCISE, STAMPS, &c.

DUTY, in the *Military Art*, is the exercise of those functions that belong to a soldier; with this distinction, that mounting guard, and the like, where there is no enemy directly to be engaged, is called duty; but marching to meet and fight an enemy, is called going on service.

DUVAL, VALENTINE JAMERAY, in *Biography*, was born at Artonay, a village of Champagne, in the year 1695, of very poor parents, who died while Valentine was very young, leaving behind them a very numerous progeny, in a state of the greatest indigence. The subject of this article was in a short time taken into the service of a farmer, and employed by him in the care of his poultry. For this kind of business he was ill qualified; and, for want of steadiness of conduct, he was dismissed from his humble station, at the beginning of the severe winter of 1709. Destitute of every resource, and probably without a single friend, he set out, not knowing whither he was to proceed. In walking towards Lorraine, he was seized with the small pox, of which he must have perished, but for the humanity of a shepherd. From this time, till the age of 19, he became an attendant on

on the flocks of the plains, when, being of a contemplative turn of mind, and having, by his own exertions, acquired a taste for reading, he sought protection at the hermitage of St. Anne, not far from Luneville, of which the inhabitants made him an overseer of their rural concerns. Here, besides a most diligent attention to the business in which he was engaged, he learned writing and arithmetic; and, like our own countryman Ferguson, spent his nights in examining the heavens. His observatory he made in the top of one of the highest oaks, which he constructed of oziers, in the form of a stork's nest. His finances, though very trifling, enabled him to purchase a few maps; with these he contrived to gain some knowledge in astronomy and geography, which was introductory to more sublime pursuits. He now found himself in want of money to purchase books and other things necessary to the attainment of knowledge; and to supply his need, he hunted and killed a vast number of wild animals, for the sake of their skins, the produce of which he converted into a fund to supply his literary exigencies. Accident procured him the protection and assistance of an Englishman, Mr. Forster, by whose liberality he obtained a library of some hundred volumes: he began now to be uneasy at his situation in life, which he thought was not that in which he ought to move. Pursuing his studies one day under the shade of a widely spreading tree, with his maps and books about him, he was accosted by a hunting party, who proved to be branches of the royal family, with their tutors. Struck with the novelty of the scene, and having learnt Duval's history, they persuaded him to follow the bent of his inclination at the Jesuits' college at Pont-à-Mousson, under the patronage of the duke of Lorraine, who was so much pleased with his progress in science and general literature, that he afforded him the opportunity of accompanying him to Paris, at the end of the year 1718. Soon after he became a professor of history in the high school of Luneville. His lectures were attended by many foreigners, particularly Englishmen, who happened to be at Luneville at that time, and by whose report the reputation of Duval was greatly increased. In the year 1738, Duval removed to Florence, and became keeper of the ducal library: the study of coins was a favourite object, and he now began to collect all that he could meet with which were valuable on account of their antiquity. Scarcely had he formed his plan, when the emperor Francis I. formed the resolution of establishing at Vienna a cabinet of ancient and modern coins, and invited Duval to that capital to undertake the inspection and arrangement of it. A house was assigned him in the imperial quarter near the palace, and he usually dined with the emperor one day in every week. He was appointed sub-preceptor to Joseph II., in 1751, and was ever held in the highest esteem and veneration by the court. He remained free from the usual infirmities of age till his 79th year, and died in 1775, in the 81st year of his age. After his death, M. de Kock, secretary of legation at Petersburgh, collected and published his works, which, with his life, written by himself, are considered as very interesting, and highly to the credit of the author. He was plain in his dress; simple in his manners; mild and kind in his disposition; and grateful to his benefactors. To the hermits of St. Anne he presented an elegant mansion, with land; and on the spot where he was born, he erected a house, and assigned it as a dwelling for a school-master. Gen. Biog.

Duval, Peter, born at Abbeville, about the year 1618, was nephew of the famous geographer Sanson, and became a teacher of the science in which his uncle had so much excelled. He died at Paris in 1683, leaving behind him various geographical treatises, maps, &c. which have been superseded by better works of the same kind: "La Geographie Françoise, contenant les descriptions, les cartes, et les blasons de France, &c." still bears some degree of reputation. He was the author of chronological tables, and several articles in genealogy and heraldry. Moreri.

Duval, Nicholas, a painter of history; born at the Hague, 1644, where he learned the art of painting; travelled to Italy; became the disciple of Pietro da Cortona, whose manner he imitated. He was recommended to the prince of Orange, (William III.) who employed him in several works at Loo, and afterwards, in England, entrusted him to clean and repair the cartoons of Raffaelle at Hampton-court.

He was appointed director of the academy at the Hague, where he painted the ceiling of the saloon. He died 1732. Pilkington Dict.

DUVENEDE, Marc Van, painter of history, born at Bruges in 1674; went to Italy; and at Rome became a disciple of Carlo Maratti. On his return to Flanders, he painted many great works in the manner of his master, among others, the Martyrdom of St. Lawrence, in the chapel of St. Christopher at Bruges. Pilkington.

DUUMVIR, a general appellation among the ancient Romans, given to magistrates, commissioners, and officers, where *two* were joined together in the same function. So that they had almost as many duumviri as they had officers joined two by two in commission. There were *duumviri* to direct the building, repairing, and consecrating of temples and altars; *capital duumviri*, who took cognizance of crimes, and condemned to death; *duumviri* of the marine, or navy, &c. But the most considerable of the duumviri, and those usually thus called by way of eminence, were the

Duumviri *Sacrorum*, created by Tarquin the Proud, for the performance of sacrifices, and keeping of the Sybils' books. These were chosen from among the nobility, or patricians, and held their office for life: they were exempted from serving in war, and from the offices imposed on the other citizens; and without them the oracles of the Sibyls could not be consulted.

The commission lasted till the year of Rome 387, when, at the request of C. Licinius, and L. Sextius, tribunes of the people, they were changed into decemviri; that is, in lieu of *two* persons, the trust was committed to *ten*, who were half patricians, half plebeians.

Sylla A. U. C. 671, added five more to their number, upon which they became denominated quindecemviri; their body was afterwards much increased, and at length amounted to sixty; yet still it retained the denomination of quindecemviri.

They were entirely abolished under the emperor Theodosius, towards the close of the 4th century, along with the rest of the heathen superstitions. See Paganism.

Duumviri, *The capital, Duumviri Perduellionis*, were not ordinary magistrates; but created only on certain occurrences.

The first commissioners of this kind were those appointed to judge the surviving Horatius, for killing his sister, after vanquishing the Curiatii, in the reign of Tullus Hostilius. See Curiatii.

There were also duumviri in the Roman colonies, who held the same rank and authority in their respective colonies, that the consuls held at Rome. They were chosen out of the body of decuriones, and wore the prætexta, or robe, bordered with purple.

We also read of municipal duumviri, whom Vigenere compares

pares to our ſheriffs, or rather mayors of towns, whoſe authority laſted only five years.

DUUMVIRATE, Duumviratus, the magiſtrature, office, or dignity, of the duumviri. See Duumvir.

DUX, in *Geography*, a town of Bohemia, in the circle of Leitmeritz; 15 miles W.N.W. of Leitmeritz.

DUXBOROUGH, a maritime and poſt town of America, in the ſtate of Maſſachuſetts, and county of Plymouth, incorporated in 1637. This is a healthy town; employs 20 veſſels, moſt of them being from 60 to 90 tons, and contains 1664 inhabitants. It lies N. by W. of Plymouth, 3 miles from it by water, and 8 by land, and 58 S.E. by S. from Boſton. Within the harbour are Clarke's iſland, containing about 100 acres of excellent land, and Suquiſh iſland formerly joined to the Gurnet, which is an eminence at the ſouthern extremity of the beach, having on it a light-houſe, but now inſulated by the water. The Indian name of this town was Mattakeeſet, or Namakeeſet. It was firſt ſettled by Standiſh and his aſſociates, who came to Plymouth with the firſt ſettlers in 1620.

DUXBURY, a townſhip of America, in Chittenden county, Vermont, about 20 miles S E. of Burlington; containing 153 inhabitants.

DUYT, in *Commerce*, a Dutch copper coin.

DUYVELAND, in *Geography*, an iſland of Zealand, ſeparated from the ſouth-eaſt part of Schouwen by a narrow paſſage; its dimenſions being about three leagues by two.

DUZDEB, a town of Aſiatic Turkey, in the province of Natolia; 28 miles W. of Eregri.

DUZEY, a town of France, in the department of the Meuſe and diſtrict of Eſtain; three leagues N. E. of Eſtain,

DWALE, or Dwal, in *Heraldry*, the herb nightſhade; uſed by ſuch as blazon with flowers and herbs, inſtead of colours and metals, for ſable or black.

DWARF. See Pygmy and Stature.

Dwarfs were called nani and nanæ among the Romans; and were held in ſuch requeſt, that artificial methods were uſed in order to prevent the growth of boys deſigned for dwarfs, by inclo ſing them in a box, or binding them with bandages. Auguſtus's niece, Julia, was very fond of one of theſe dwarfs, called Sonopas, who was only two feet and a hand-breadth high.

In the Philoſophical Tranſactions we have well authenticated accounts of two dwarfs; one born in Norfolk, who, at the age of 22, weighed no more than 34 pounds with all his cloaths on, and whoſe height, including hat, wig, and ſhoes, was only 38 inches; and another, in Wales, who, at the age of 15, meaſured no more than two feet ſeven inches, and weighed only 13 pounds; and who, at that early period of life, laboured under all the infirmities and calamities of very old age. Phil. Tranſ. vol. xlvi., p. 67., and vol. xlvii., p. 279.

Dwarf-*trees*, a ſort of diminutive fruit trees, frequently planted in the borders of gardens; thus called from the lowneſs of their ſtature.

Dwarf-trees were formerly very much in requeſt in gardens; but, ſince the introducing of eſpaliers, they are much neglected. The manner however of propagating dwarf pears, which have been found to ſucceed the beſt of any dwarfs, is this: they are to be grafted on a quince ſtock, and that at about ſix inches above the ground; and when the bud has ſhot ſo far as to have four eyes, it is to be ſtopped, to give riſe to lateral branches. Two years after the budding the trees will be fit to tranſplant to the ſpot where they muſt remain. They ſhould be ſet at 25 or 30 feet ſquare diſtance, and the ground between may be ſown or planted for kitchen uſe while the trees are young, only obſerving not to plant too near their roots. There ſhould be ſtakes driven down all round the tree, to which the branches muſt be nailed with liſt while they are young, training them into an horizontal direction, and no branches are to be ſuffered afterwards to croſs one another, and in ſhortening the ſhoots the uppermoſt eye muſt always be left outwards. The ſummer and autumn pears are thoſe which do beſt in dwarfs, for the winter ones never ſucceed well on them.

Apples are alſo ſometimes planted as dwarfs, and are for this purpoſe moſt commonly grafted on paradiſe ſtocks; theſe ſpread much leſs than the pears, and therefore need only be ſet at about eight feet diſtance. Some alſo plant apricots and plums for dwarfs, but theſe being of a more tender conſtitution ſeldom ſucceed well. Miller. See Espalier.

Dwarf-*fern*. See *Dwarf*-Fern.

DWINA, in *Geography*. See Dvina.

DWORZEC, a town of Lithuania, in the palatinate of Novogrodek; eight miles S. of Novogrodek.

DWORZYSZCE, a town of Lithuania, in the palatinate of Wilna; 20 miles S. of Wilna.

DYADIC, *Arithmetic*. See Arithmetic.

DYCK, { Antonio Van, / Philip Van, / Floris Van, } See Vandyck.

DYE, in *Architecture*, the part of a pedeſtal contained between the baſe and the cornice, in the form of a ſquare priſm, approaching frequently to a cube or dye, whence the name originates.

Dye is alſo uſed for a cube of ſtone, placed under the feet of a ſtatue and over its pedeſtal, to raiſe it and ſhew it the more.

DYEING, *Hiſtory of*. The origin of the art of dyeing is involved in that obſcurity which pervades the hiſtory of all thoſe arts connected with the common wants and neceſſities of life. They have originated in times beyond the reach of hiſtory or tradition, and are the offſpring of the natural faculties of man directed by the great primeval wants of food, ſhelter, and raiment: The art of dyeing is, of courſe, poſterior to many of theſe, and is founded leſs on the neceſſities than paſſions of mankind. A love of diſtinction is common to man in every ſtage of civilization, but that paſſion for admiration which is diſplayed in a love of finery and ornament is peculiar to him in his moſt barbarous and uncultivated ſtate. Hence ſavage nations delight in brilliant and gaudy colours, and many paint their ſkins, and adorn themſelves with feathers, ſtones, and ſhells of various hues. Hiſtory has not furniſhed us even with her fables on the origin of dyeing; but from analogy, as well as obſervation of the practice of barbarous nations at the preſent day, we may trace the rude beginnings from whence the art has ſprung. The rich and gaudy plumage of birds, the finely ſpotted ſkins of animals, coloured ſtones, and ſuch other ſubſtances as nature herſelf ſupplies, would afford the firſt materials for ſavage finery and dreſs. The caps and mantles of the chiefs of the South Sea iſlands, ſuch as were brought home by captain Cook, are compoſed almoſt wholly of feathers richly coloured.

It is eaſy to conceive that accident muſt furniſh innumerable inſtances of obſervation even to the eye of a ſavage, that many of theſe colours were capable of imitation, and that ſome ſubſtances readily imparted their colour to others. The bruiſing of a fruit, a flower, or leaf, is one of the moſt natural and obvious occurrences to which we ſhould look for the firſt notion of applying vegetable juices to dyeing, and doubtleſs the knowledge of the tingent properties of various herbs was thus early acquired. The art, however, muſt

muſt have waited the progreſs of induſtry and luxury, before it became extended and improved. Long antecedent, however, to the period when authentic hiſtory begins, it muſt have made conſiderable progreſs. Moſes ſpeaks of ſtuffs dyed blue, and purple, and ſcarlet, and of ſheep-ſkins dyed red. Theſe colours require great ſkill in the preparation, and the knowledge of them implies a very advanced ſtate of the art at that period.

The colour which appears to have been earlieſt brought to perfection, and which was held in ſuch high eſtimation among the ancients, is purple. It was to chance alone, according to the tradition of antiquity, that they owed this diſcovery. A ſhepherd's dog, inſtigated by hunger, having broken a ſhell on the ſea ſhore, his mouth became ſtained with ſuch a colour as excited the admiration of all who ſaw it. They endeavoured to apply it to ſtuffs, and ſucceeded. There is ſome diſcordance in the details of the ancient writers of the circumſtances of this event. Some place this diſcovery in the reign of Phœnix, ſecond king of Tyre, that is to ſay, a little more than 500 years before Chriſt: others, at the time that Minos the firſt reigned in Crete, about 1439 years before the Chriſtian era. But the greateſt number agree in giving the honour of the invention of dyeing purple ſtuffs to the Tyrian Hercules. He gave his firſt trials to the king of Phœnicia, who was ſo jealous of the beauty of this new colour, that he forbade the uſe of it to all his ſubjects, reſerving it for the garments of royalty alone.

Some authors relate the ſtory differently. Hercules's dog having ſtained his mouth with a ſhell, which he had broken on the ſea ſhore, Tyras, a nymph of whom Hercules was enamoured, was ſo charmed with the beauty of the colour, that ſhe declared to her lover ſhe would ſee him no more till he brought her a ſuit dyed the ſame. Hercules thought of a way to ſatisfy his miſtreſs; he collected a great number of the ſhells, and ſucceeded in ſtaining a robe of the colour the nymph had demanded. Such are the different traditions handed down by the ancients of the origin of the purple dye. They are evidently blended with fiction, yet they may ſerve to fix the epoch of this diſcovery, which appears to have been made about fifteen centuries before the Chriſtian era. Whether the purple of Tyre was ſimilar to that mentioned in holy writ, as uſed by Moſes for the veſtments of the high prieſt, and the ornaments of the tabernacle, may admit of ſome diſpute, ſince it is not certain, according to M. Huet, that the word *argaman*, of the Hebrew text, which all the interpreters tranſlate by *purpura*, means in reality that colour.

The teſtimony of Homer confirms the antiquity of this diſcovery. This great poet and accurate obſerver, aſcribes to the heroes of that age, in which we have ſuppoſed it became known, ornaments and cloths of purple.

The ancients had ſuch an eſteem for this colour, that it was eſpecially conſecrated to the ſervice of the deity. Moſes, as we have juſt obſerved, uſed ſtuffs of purple for the works of the tabernacle, and the habits of the high prieſt. The Babylonians gave purple habits to their idols; it was the ſame with moſt of the other people of antiquity. The Pagans were even perſuaded that the purple dye had a particular virtue, and was capable of appeaſing the wrath of the gods.

Purple was alſo the diſtinguiſhing mark of the greateſt dignities from the earlieſt times. We have ſeen that the king of Phœnicia, to whom tradition ſays the firſt eſſays of this colour were preſented, had it reſerved for the ſovereign. Among the preſents which the Iſraelites made to Gideon, the ſcripture makes mention of purple habits found among the ſpoils of the kings of Midian. Homer gives us plainly to underſtand, that it only belonged to princes to wear this colour; and we may remark, that this cuſtom was obſerved by all the nations of antiquity.

It is not eaſy to give a clear and preciſe idea of the proceſs followed by the ancients in the production of this highly valued colour. We find ſome details in the works of Ariſtotle and of Pliny, in whoſe days the practice was very common, but they are not ſufficiently circumſtantial. The purple dye, according to Pliny, was drawn from many ſpecies of ſhell fiſh. The beſt were found near the iſle where New Tyre was built. They fiſhed for them in other parts of the Mediterranean. The coaſts of Africa were famous for the purple of Getulia. The coaſts of Europe ſupplied the purple of Laconia, which was held in great eſteem.

In the 36th chapter of his ſeventh book, Pliny ranges in two claſſes the different kinds of ſhell fiſh which produced the purple. The firſt comprehended the ſmaller ſpecies under the denomination of *buccinum*, from their reſemblance to a hunting horn; the ſecond included thoſe denominated *purpura*. Theſe Fabius Columna conceives to have been alſo diſtinguiſhed by the generic name of *murex*, though others ſuppoſe this to have ſignified all the different ſpecies generally. All theſe ſeveral ſpecies, the chief of which are enumerated by Pliny, appear to have given colours of different ſhades, from which, by mixture of the liquors in various proportions, other varieties of colour were produced. A few drops only of this precious dye were obtained from each fiſh, by extracting a white vein placed in the throat; but to avoid this trouble with the ſmaller ſpecies, according to Ariſtotle and Pliny, the whole fiſh was bruiſed in a mortar, a practice which, according to Vitruvius, was often followed with the larger. The liquor, when extracted, was mixed with a conſiderable portion of ſalt, and ſuffered to remain three days; after which it was diluted with five or ſix times its quantity of water, and digeſted, moderately hot, during ten days, in a lead or tin veſſel, ſkimming it frequently, to ſeparate all impurities. The wool was afterwards put in, being well waſhed, cleanſed, and properly prepared. After ſoaking five hours, it was taken out, carded, and again immerſed in the boiling dye, till all the colour was taken up or exhauſted. To produce particular ſhades of colour, nitre, urine, and a marine plant called fucus, of which the beſt kind is found on the rocks of the iſle of Crete, were occaſionally added.

The Tyrians, by the confeſſion of all antiquity, ſucceeded beſt in dyeing ſtuffs purple. Their proceſs differed a little from what we have related above. They uſed nothing to make their colour but purple ſhells taken out at ſea. They made a bath of the liquor they drew from theſe fiſhes. They ſteeped their wool in this a certain time, and afterwards took it out and ſteeped it in another boiler, in which was nothing but buccina or trumpet fiſh. This is all the ancients tell us of the practice of the Tyrians. Wool, which had received this double Tyrian dye, (diabapha) was ſo very coſtly, that in the reign of Auguſtus, each pound ſold for 1000 Roman denarii, about 36*l.* ſterling. Nor need we wonder at this exceſſive price, when we conſider the tedious nature of the proceſs, and the ſmall quantity of dye afforded by the ſhell fiſh, from each of which not more than a ſingle drop was obtained. For 50lb. of wool they uſed no leſs than 200lbs. of the liquor of the buccinum, and 100lbs. of that of the purpura, or 6lbs. of liquor to 1lb. of wool. We ought not to be much ſurprized, therefore, that this colour vied in value even with gold itſelf. The ancient writers diſtinguiſh many different ſhades of purple. One of them, which was very dark, appears to have been a kind of violet, inclining towards a reddiſh hue. "Nigrantis roſæ colore ſubluceus,"

fublucens," Pliny, lib. 9. fec. 50. Another, lefs efteemed, was a kind of crimfon. "Rubens color, nigrante deterior," lib. 9. fec. 62. The moft valued of all, and in which the Tyrians particularly excelled, was a deep red purple, of the colour of coagulated blood. "Laus ei fumma in colore fanguinis concreti," Pliny, ibid. It is in allufion to this that Homer and Virgil give to blood the epithet *purple*. There was a fourth kind known in later times, very different from thofe we have fpoken of. The colour was whitifh; an account of which may be feen in Perrault's tranflation of Vitruvius.

The purple has been almoft every where a mark of diftinction attached to high birth and dignity. It was an ornament of the firft offices of Rome; but luxury, which was carried to great excefs in that capital of the world, rendered the ufe of it common among the opulent, till the emperors referved to themfelves the right of wearing it. Soon afterwards it became the fymbol of their inauguration. They appointed officers to fuperintend the manufactories, principally eftablifhed in Phœnicia, where it was prepared folely for their ufe. The punifhment of death was decreed againft all who fhould have the audacity to wear it, though covered with another colour. The penalty, fo tyrannically denounced againft this whimfical fpecies of treafon, doubtlefs occafioned the lofs of the art of dyeing purple; firft in the Weft, but much later in the Eaft, where it flourifhed confiderably till the eleventh century.

It appears that fome kinds of purple preferved their colour for a very long time. Plutarch, in his life of Alexander, relates that the Greeks found in the treafury of the king of Perfia a great quantity of purple which had not loft its beauty, though it was 190 years old.

It is commonly afferted, on the authority of moft of the ancient writers, that the purple had a very ftrong and difagreeable odour. It would appear, however, from Pliny, lib. 9. fec. 36. that this was the cafe only with fome particular kinds. After extolling the beauty of the true purple, and allowing that it was juftly an object of ambition, he afks, how it happens that the other kinds of purple, obtained from the fhell-fifh called *conchylia*, fhould be fo high priced, confidering the ftinking difagreeable odour which the ftuffs have that are dyed with them.

After all, the boafted purple of antiquity was a miferable dye compared with many which we now poffefs, and affords a ftrong proof of the imperfect ftate of the art at the period when it was held in fuch efteem. It was, no doubt, the moft rich and brilliant colour then known.

It is a curious fact, that Mr. Bruce, whofe acquaintance with ancient authors ought to have convinced him of the contrary, maintains that the Tyrian purple was produced with cochineal, and that the ftory of its being the blood of a fhell-fifh was invented and propagated by the Tyrians with a view of deceiving other nations, and keeping the art of dyeing this colour exclufively to themfelves. He even adduces this as a proof of the early intercourfe carried on with the new world, in times long antecedent to thofe in which we fuppofe the difcovery of the continent of America was firft made.

The ancients obtained from the *coccus*, now known by the name of kermes, a colour which was almoft as highly efteemed as purple, and which was fometimes mixed with it. Pliny informs us it was employed in the preparation of the imperial robes. It was generally called fcarlet, and was fometimes confounded with the purple. The ufe of the coccus in dyeing is very ancient, fince it appears from the commentators, to be alluded to in Exodus, chap. xxxix. ver. 1. and 28.

Our materials for a hiftory of the art of dyeing, during the ages of claffical antiquity, are very fcanty. Amongft the Greeks the ufeful arts were degraded even in the eyes of philofophers, and this contempt defcended to the Romans; for Pliny, fpeaking of dyeing, avowedly neglects the defcription of operations which are unconnected with the liberal arts. "Nec tingendi rationem omififfimus, fi unquam ea liberalium artium fuiffet."

The art of dyeing among the Greeks appears to have made no great progrefs; the drefs of the people was of cloth which had received no dye, and which might be wafhed. The rich preferred coloured clothes; they efteemed fuch as were dyed fcarlet with the kermes, but they valued ftill more highly thofe of purple.

The few details relative to dyeing into which Pliny has entered in his great work, are almoft wholly confined to the purple, of which we have given an account. The few fcattered facts to be met with, that ferve at all to illuftrate the hiftory of the art, we fhall briefly notice. Some varieties of colour, derived from the purple, and produced by different mixtures of the various kinds of fhell-fifh, and alfo by admixture with the dye of the coccus, or kermes, appear to have been fafhionable in Pliny's time. Thefe originated, according to our author, in the errors and failure of the dyers, who having, in the firft inftance, fpoiled their cloth, endeavoured to hide the defects by giving it another fhade: hence arofe thofe compound twice-dyed colours which were foon held in high repute.

Befides the Tyrian purple, fcarlet, and the varieties and compounds of thofe colours, Pliny mentions yellow as a very ancient dye, and highly efteemed in former times. The veil which the bride wore on her wedding day was of yellow, and none but women were permitted to ufe it. They had alfo a colour refembling the cyanos, or blue-bottle, and another like the golden yellow flower elichryfon. None of thefe colours, fays Pliny, were known, or at leaft in requeft in the days of Alexander the Great; for the Greek writers, who wrote foon after his deceafe, make no mention of them. They are evidently, however, of Greek origin, as appears from their names, which, though Greek, were current in Italy in Pliny's time.

The ufe of vegetable dyes appears to have been in a great meafure unknown to the Romans; though the inhabitants of Gaul, according to Pliny, imitated all colours, even the Tyrian purple and the fcarlet, with the juice of certain herbs. In the eleventh chapter of the thirty-fifth book of Pliny's hiftory, is preferved a valuable notice of the procefs followed by the Egyptians in dyeing linen. They ftained, fays he, white cloth, not with colours, but with certain drugs, which have the property of abforbing them, but which exhibit no appearance of any dye till they have been boiled fome time in a cauldron, from which they are withdrawn painted or ftained of various colours. What is moft extraordinary, fays Pliny, is, that the cauldron containing only colour of one kind fhould impart to the cloth fhades of various hues according to the nature of the drugs which were laid on, and the colours are fo fixed that they can never be wafhed out, but are more durable and fixed than if they had never been immerfed in the boiling dye.

We have here a tolerably accurate defcription of the procefs of calico printing; and the only mention in any ancient author of an art which has exifted for ages paft in the Eaft, and is practifed there at this day, probably with little variation from the mode defcribed by Pliny.

The art of dyeing linen appears not to have been known in Greece before Alexander's invafion of India, where they dyed

dyed the ſails of his veſſels of different colours. The Greeks ſeem to have borrowed this art from the Indians.

We may form ſome idea of the ſtate of the art of dyeing amongſt the Romans, from the enumeration of the different colours which were in uſe, and the ſubſtances employed in producing them. In addition to thoſe enumerated by Pliny, we find, that in the equeſtrian games of the circus, the different diviſions were diſtinguiſhed by the colours *green*, color praſinus; *orange*, ruſatus; *grey*, venetus; and white. We ſhall enumerate, after Mr. Biſchoff, who has minutely examined the ſubject, the ingredients employed at that time in the art of dyeing, in addition to the two important ones already mentioned, the purple fiſh and coccus.

1. Alum. It is probable, from what we ſhall ſtate hereafter, that the ancients were unacquainted with our alum in its ſtate of purity.

2. Alkanet. Suidas ſays, that this ſubſtance was alſo uſed by women as a paint.

3. The blood of birds, which was uſed amongſt the Jews.

4. The fucus; that of Crete was preferred, and it was generally employed as a ground or preparative for valuable colours.

5. Broom.

6. The violet, from which the Gauls prepared a kind of purple.

7. Lotos medicago arborea; ſmall trefoil; the bark was uſed in dyeing ſkins, and the root in dyeing wool.

8. The bark of the walnut-tree and the peel of the ſhell.

9. Madder. We are not certain whether the madder of the ancients was the ſame as ours, or another root of the ſame tribe.

10. Woad (glaſtum). This plant was undoubtedly in uſe among the ancients, but we do not know whether their preparation of it was the ſame as ours.

We are not to infer, however, that theſe were the only ſubſtances employed by the ancients in the art of dyeing; many more being, in all probability, in uſe, of which we have no account. Indigo (indicum nigrum) is mentioned by Pliny, and though ſome doubts have been entertained by his commentators reſpecting the true nature of this ſubſtance, ſome ſuppoſing it to have been Indian ink, yet it is very evident he meant the indigo of the moderns, from the purple ſmoke which he ſays it emitted when ſet on fire, and which we believe is peculiar to indigo. It was never, however, we believe, employed in dyeing, but ſimply as a pigment.

India was the nurſery of the arts and ſciences, which were afterwards ſpread and perfected among other nations. Accidents, which had a tendency to improve the art, could not fail to be multiplied rapidly in a country rich in natural productions, which requires little labour for the ſupport of its inhabitants, and the population of which was favoured by the bounty of nature and the ſimplicity of manners, till it was oppoſed by the tyranny of ſucceeding conquerors. But religious prejudices, and the unalterable diviſion into caſts, ſoon put ſhackles upon induſtry; the arts became ſtationary, and it would ſeem that the knowledge of dyeing cotton in that country was as far advanced in the time of Alexander as it is at preſent.

The beautiful colours which we obſerve in their printed calicoes, would lead us to ſuppoſe that the art of dyeing had then attained a high degree of perfection, yet we find, from the details of thoſe who have witneſſed their operations, that the Indian proceſſes are ſo complicated, tedious, and imperfect, that they would be impracticable in any other country, on account of the difference in the price of labour. The art of printing calicoes has been practiſed in India at leaſt twenty-two centuries; for the hiſtorians of Alexander's invaſion of that ill-fated country ſpeak of their flowered cloths or chintz. If they excelled therefore in the richneſs and brilliancy of two or three colours; it is to be attributed to the ſuperior quality of ſome of their dyes, peculiar to their own country, the effect of which was perhaps heightened by the length and multiplicity of their operations. The knowledge of this art appears to have ſpread over a conſiderable part of Aſia. It was practiſed, and is to this day, by the Perſians; and we have ſeen that in Pliny's time, it was eſtabliſhed in Egypt.

From the fifth volume of the "Memoires concernant l'Hiſtoire, les Sciences, les Arts, les Mœurs, &c. des Chinois," it appears, that wool was never worn in China but as a ſubſtitute for fur, and that cotton and ſilk, being the only ſubſtances ever dyed by the inhabitants, received all their colours from vegetable tingent matters; that their colours were principally red, blue, violet, and what is called a woad colour; and that under the three firſt dynaſties the buſineſs of dyeing was chiefly practiſed by the female part of each family, for its own particular uſe; and it probably continued to be practiſed without any thing like principle or ſcience until near the end of the ſeventh century, when the Chineſe diſcarding their own, borrowed the art and means of dyeing which were then in uſe among the Indians and Perſians; and it is ſaid, that alum and copperas, which the Chineſe did not uſe before, were among the means ſo borrowed; a fact which renders it probable, that there was little, if any thing, in the Chineſe art of dyeing, of which the loſs need now be regretted.

It appears, however, that long before this time a knowledge of the uſes of alum and of iron in dyeing had ſpread from Hindouſtan and Perſia weſtward to Egypt, and thence to Greece and Rome. Bergmann, indeed, and after him, Beckmann, have repreſented the alum of the ancients as different from the cryſtallized ſalt of the moderns; and have ſuppoſed that the varieties of alum mentioned by Dioſcorides, were ſtalactites, containing but little alum, and conſiſting chiefly of calcareous earth. Nature, however, does produce ſome, though but little, cryſtallized alum, particularly in Egypt and ſome parts of Aſia; and it probably was in this ſtate that its good effect in dyeing had been firſt obſerved, before mankind were led to the means and operations ſince employed for ſeparating and collecting it from the various aluminous ores. Bergmann informs us, that the factitious ſalt which is now called alum, was firſt diſcovered in the eaſtern countries, and that among the moſt early works eſtabliſhed for the preparation of alum, we may juſtly number that of *Roccho*, a city in Syria, now called Edeſſa, hence the appellation of *roch alum*. He adds, that Bartholomew Perdix, or Pernix, a merchant of Genoa, who had been at Roccho, diſcovered the matrix of alum in the iſland of Iſchia, about the year 1459, and eſtabliſhed a manufactory there; at the ſame time, John de Caſtro, who had viſited the manufactories at Conſtantinople, diſcovered a matrix at Tolfa, by means of the ilex aquifolium, which he had alſo obſerved to grow in the adjacent mountains of Turkey; and his opinion was confirmed by the taſte of the ſtones. The attempts made by the Genoeſe at Viterbium and at Volaterre ſucceeded extremely well; and the preparation of it in Italy ſoon increaſed wonderfully faſt. The firſt manufactory of alum in England was eſtabliſhed in the reign of Elizabeth, at Giſborough, by one Thomas Chaloner.

In the fifth century all the arts were loſt throughout the Weſt, except a few, which in a ſtate of decay were preſerved in

in Italy; and no traces were left of knowledge, induſtry, or humanity.

Muratori quotes a manuſcript of the eighth century, in which we find a deſcription of ſome dyes, principally for ſkins, and ſome proceſſes connected with the arts; but the Latin, which is almoſt unintelligible, and the chaſms we find here and there, prevent us from being able to form a juſt idea of theſe proceſſes.

The arts were better preſerved in the Eaſt, where articles of luxury were procured by ſome of the great, even ſo late as the twelfth century. During the cruſades, the Venetians derived their power from the barbarous mania of the age: their commerce increaſed; the arts were eſtabliſhed among them, and improved by the induſtry of the Greeks, and ſpread from thence through the other parts of Italy. In the year 1338, Florence contained two hundred manufacturers, who are ſaid to have made from ſeventy to eighty thouſand pieces of cloth, which, as an object of commerce, were worth twelve hundred thouſand crowns of gold.

It is ſaid that archil was accidentally diſcovered by a Florentine merchant, about the year 1300. Having obſerved that urine imparted a very fine colour to a certain ſpecies of moſs, he made experiments, and learned to prepare archil. He kept his diſcovery ſecret a long time; his poſterity, a branch of which ſtill exiſts, according to Dominique Manni, have retained the appellation of Ruccellai, from oreiglia, the Spaniſh term for that kind of moſs.

The arts continued for a long time to be cultivated in Italy with increaſing ſucceſs. In the year 1429, the firſt collection of the proceſſes employed in dyeing appeared at Venice under the name of "Mariegola del' arte dei tentori;" a ſecond edition, much improved, came out in 1510. A certain perſon, named Gioran Ventura Roſetti, formed the deſign of rendering this deſcription more uſeful and extenſive. He travelled through the different parts of Italy, and the adjacent countries, where the arts had begun again to flouriſh, in order to make himſelf acquainted with the various proceſſes employed, and he publiſhed, under the title "Plictho de l'arte de tentori," &c. a collection which, according to Mr. Biſchoff, is the firſt that united the different proceſſes, and which ought to be regarded as the leading ſtep toward the perfection which the art of dyeing has attained. This work was printed at Venice, in 1548; a French tranſlation of it appeared at Paris in 1716. It is remarkable that in the work entitled "Plictho," not a word is ſaid either of cochineal or indigo; from which we may conclude that theſe two dyes were either unknown or not employed at that time in Italy.

The firſt indigo uſed in Europe appears to have been brought from the Eaſt Indies by the Dutch. India was doubtleſs the country where that valuable ſubſtance was firſt produced. The uncivilized inhabitants of other countries have, indeed, diſcovered modes of obtaining colouring matter, very nearly reſembling that of indigo, from other plants, as the iſatis tinctoria, or woad, and the genipa americana, but they obtained theſe matters in a liquid form only, and employed them in their recent ſtate.

The natives of India, however, went farther, they precipitated and collected, in a dry ſolid form, the colouring matter of indigo, and diſcovered the means of afterwards diſſolving and applying it to ſtuffs. In Africa, the Mandingo negroes, according to Mr. Park, dye their cloth of a laſting blue colour, by the following ſimple proceſs. The leaves of the indigo, when freſh gathered, are pounded in a wooden mortar, and mixed in a large earthen jar, with a ſtrong ley of wood aſhes; chamber-lye is ſometimes added. The cloth is ſteeped in this mixture, and allowed to remain until it has acquired the proper ſhade. In Kaarta and Ludamar, where indigo is not plentiful, they collect the leaves and dry them in the ſun, and when they wiſh to uſe them, they reduce a ſufficient quantity to powder, and mix it with the lye as before. "Either way," ſays Mr. Park, "the colour is very beautiful, and equal to the beſt Indian or European blue." The uſe of indigo was known to the Mexicans before the arrival of the Spaniards, and Clavigero, in his hiſtory of that country, gives an account of the method of obtaining it. Hernandes had long before deſcribed the plant as being indigenous in Mexico, and employed by its ancient inhabitants; and Ferdinand Columbus, in his "Life of Chriſtopher Columbus," mentions it as one of the native plants of Hiſpaniola. What the abbé Raynal therefore aſſerts, of its being tranſplanted from the Eaſt Indies to America, can be true only of one ſpecies, the indigofera tinctoria, Linn. The manufacture of indigo, however, was not eſtabliſhed in America till ſome time after the diſcovery of that country; and on the plant which produces it being recognized by the Portugueſe in Brazil as identical with that from which indigo was extracted in the Eaſt Indies. The uſe of indigo, which was a great acquiſition to the art of dyeing, was not eſtabliſhed without conſiderable difficulty. It was ſtrictly prohibited in England in the reign of Elizabeth, as was alſo logwood, which was ordered to be burned if found in any manufactory. This prohibition was not taken off till the reign of Charles II.

In like manner the uſe of indigo was proſcribed in Saxony, in the edict againſt it, which brings to one's mind the edict againſt the employment of antimonial emetics; it is ſpoken of as a highly corroſive colour. This is a ſtriking example of the errors into which an unenlightened adminiſtration may fall, which liſtens to the ſuggeſtions of intereſted individuals. Thoſe who dyed blue, and were accuſtomed to uſe paſtel and woad, repreſented that indigo would deſtroy the ſale of thoſe two articles, which were the produce of the country. Such a reaſon, which would appear ſpecious to many, even in the preſent day, eaſily produced a prohibition which would be ſoon eluded by paying a tribute to the induſtry of other nations. The prejudice againſt indigo was likewiſe communicated to France, and Colbert's inſtructions forbade the uſe of more than a certain quantity in the paſtel vats.

Cochineal was another important acquiſition to the art of dyeing, for which we are indebted to the firſt conquerors of Mexico. The Spaniards, having obſerved that the inhabitants of Mexico employed cochineal in painting their houſes and dyeing their cotton, gave their government an account of the beauty of the colour; and Cortes, in the year 1523, was ordered to promote the increaſe of the valuable inſect from which it is obtained. The natural colour, however, which the cochineal gives, is but a dull colour. Soon after cochineal was known in Europe, a great chemiſt of the name of Kuſter, Kuffler, or Keppler, found out the preſent proceſs for dyeing ſcarlet by means of a ſolution of tin, and carried the ſecret to London in the year 1543. See COCHINEAL and SCARLET.

The ancients applied the name ſcarlet to the colour obtained from kermes, which was much inferior in beauty to the colour we diſtinguiſh by that appellation. We probably know how to employ the kermes to greater advantage than they did, ſince we poſſeſs a pure alum which diſpoſes the ſtuff to receive a more beautiful and durable colour; yet our dyers have almoſt entirely diſcontinued the uſe of it, becauſe they can obtain from cochineal a colour beyond all compariſon more beautiful. The ſuppoſition, that the colour

colour which we obtain from kermes is preferable to that obtained by the ancients, is supported by the testimony of Pliny, who insinuates that it was not a durable colour; now the colour we give by means of kermes to wool prepared with alum, is exceedingly durable. The discovery of scarlet may be considered as the most important era in the art of dyeing, as it introduced to our knowledge the solution of tin, since so variously and happily applied. A Flemish painter, called Gluck, got possession of this secret, and communicated it to Gobelin. The knowledge of the process afterwards spread throughout all Europe. Gluck travelled into the East, where there were still some remains of Grecian industry, and afterwards settled in Flanders, where he spent a long and prosperous life. According to Mr. Francheville, this man, who had been so useful to his country, died about the year 1550.

For a long time Italy, and especially Venice, possessed the art of dyeing almost exclusively; a circumstance which contributed to the prosperity of their manufactures and commerce: by degrees it was introduced into France. Giles Gobelin, to whom the process for making the true scarlet had been communicated, established a manufactory in the place which still bears his name; and this undertaking was deemed so rash, that it was termed *Gobelin's folly*.

The attention of the Royal Society appears to have been early directed to the improvement of the art of dyeing. At a meeting of that learned body on the 30th of April, 1662, Mr. Hook was desired to translate into English, a work on dyeing, which appears to have been that already mentioned under the title of Plictho. On the same day also, sir William Petty, one of its earliest and most active members, in consequence of a previous request from the society, brought in "An Apparatus to the History of the common practices of Dyers," which was afterwards printed in "Dr. Spratt's History of the Royal Society," and seems to have been the first work published in the English language on the processes and operations of dyeing. Nearly two years afterwards Mr. Boyle presented to the society his "Experiments and Considerations touching Colours." And on the 10th of August, 1664, it was ordered by the society, "that the way of *fixing colours* should be recommended to Mr. Howard, Mr. Boyle, and Dr. Merritt." These, and especially the two first, were amongst the most distinguished members of the society; but it does not appear that any thing deserving of notice was done in consequence of this recommendation. However, at a meeting of the society on the 11th of November, 1669, that very ingenious and useful member, Mr. Hook, produced a piece of calico stained after the way contrived by himself, which he was desired to prosecute in other colours besides those that appeared in this piece; and accordingly on the 9th of the following month, Mr. Hook produced another specimen of staining with yellow, red, green, blue, and purple colours, which he said would endure washing with warm water and soap. But from this time it does not appear that any thing considerable was done for nearly the space of a century by men of science in this country towards the improvement of the arts of dyeing and calico printing.

In France, however, the minister Colbert, anxious to extend the commerce and manufactures of his country, which had languished during the stormy administrations of Richlieu and Mazarin, turned his attention particularly to the art of dyeing. He invited the most skilful artists, rewarded their talents, and established many manufactories; and it is curious to remark, that those of Vaurobais and Sedan were called, in the letters patent which were granted them, manufacturers of fine cloth after the Dutch and English fashion. In 1672, he published a Table of Instructions for Dyeing, under the title of "General Instructions for dyeing Wool and woollen Manufactures of all Colours, and for the Culture of the Drugs or Ingredients employed in them." This, however, was not intended merely to diffuse information, but as a legislative act, to controul the dyers in their operations. This work merits attention; we shall first notice the reason which he gives for considering the subject as one of great importance.

"If," says Colbert, "the manufactures of silk, wool, and thread are to be reckoned amongst those which most contribute to the support of commerce, dyeing, which gives them that striking variety of colour by which they resemble what is most beautiful in nature, may be considered as the soul of them, without which the body could scarcely exist. Wool and silk, the natural colour of which rather indicates the rudeness of former ages, than the genius and improvement of the present, would be in no great request if the art of dyeing did not furnish attractions which recommend them even to the most barbarous nations. All visible objects are distinguished and recommended by colours, but for the purposes of commerce it is not only necessary that they should be beautiful, but that they should be good, and that their duration should equal that of the materials they adorn."—But Colbert, though he instituted many useful regulations for the instruction of the farmer and the artist, imposed a system of prohibition and restraint so excessive, as almost to bar all future improvement. He divided the dyers into two classes, to one of which were confined the colours deemed durable and fixed, whilst the other class was allowed only to meddle with those which were considered fugitive. In the dyeing of black cloth he insisted that the operation should be begun by the dyers in grain, or those who gave the durable colour, and finished by those who produced the false one. Each was confined to a certain number of ingredients, and neither were suffered to have Brazil wood, and various other articles. The bad effects of this prohibition were moderated by the facility of eluding it, and by the rewards bestowed on those whose experiments promoted the progress of the art, and whose discoveries were afterwards to be published, and to modify the existing regulations.

French industry lost its pre-eminence by the criminal revocation of the edict of Nantz, which carried desolation into her manufactories, and dispersed her workmen, and the knowledge of her arts, throughout all Europe.

Since that time the department of administration, charged with the superintendence of the arts and manufactures, has constantly sought to repair those errors, and to encourage industry and exertion by the diffusion of knowledge, which, under wise laws, is the most efficacious means that can be employed.

Dufay, Hellot, Macquer, and Berthollet, have been successively charged with the care of improving the art of dyeing; and to their labours all Europe is indebted for most valuable acquisitions.

Dufay amended, or rather superseded, the "Instructions, &c." of Colbert, by the publication of a new one, under the administration of M. d'Orry, in 1739. He appears to have been the first who entertained just, though incomplete, ideas of the true nature of colouring substances, and the cause of their adhesion to stuffs when dyed. In his "Observations physiques sur le melange de quelques couleurs dans le tincture," Mem. de l'Academ. 1737, he observes, that colouring particles are naturally disposed to adhere, more or less firmly, to the filaments which receive them; and he remarks very justly, that without this disposition

ſtuffs would never aſſume any colour but that of the bath, and would always divide the colouring particles equally with it; whereas the liquor of the bath ſometimes becomes as limpid as water, giving out all the colouring matter to the ſtuff, "which ſeems to indicate," ſays he, "*that the ingredients have leſs attraction for the water than for the particles of the wool.*" He alſo noticed, *the difference in the degree of attraction which different ſubſtances, as wool and cotton, exert on the ſame colouring matters*, and which he found ſo great, that a ſkain of each having been in an equal degree ſubjected to the operation for dyeing ſcarlet, the woollen yarn was found to be fully and permanently dyed, while the cotton retained all its former whiteneſs. Yet theſe facts, important as they were, to the foundation of a theory of the art of dyeing, were unproductive in his hands; for though ſatisfied with the explanation they offered of many phenomena, yet they left, ſays he, ſo much to be wiſhed for, that he would relinquiſh it readily, if a more probable one could be found. He appears to have had no idea of the other and more important cauſe of the permanency of colours, that which ariſes from the uſe of mordants, or the interpoſition of a ſuitable baſis, poſſeſſing a particular attraction both for the colouring matter and dyed ſubſtance, and acting as a bond of union between them. He examined, with great ſagacity, certain proceſſes, and eſtabliſhed the ſureſt methods that could at that time be employed for determining the goodneſs of a colour, and this he did in an eaſy and familiar manner. His labours, on the whole, entitle him to the gratitude of poſterity, and he may juſtly lay claim to the merit of having firſt diſcovered and enunciated the facts, and of having drawn ſome partial concluſions from which the true theory of dyeing was ſome years afterwards clearly and luminouſly deduced.

He was ſucceeded by Hellot, to whom we are indebted for one of the beſt practical treatiſes on the art of dyeing wool and woollen cloths now extant. This work is valuable for the accuracy with which the numerous proceſſes are deſcribed: without profiting however by the hints thrown out by his predeceſſors, he ſuffered himſelf to be miſled by a vague and groundleſs hypotheſis, on the cauſe of the adheſion of the colouring particles to the ſubſtance dyed, the action of mordants, and the difference between the true or durable, and falſe or fading dyes. Of his theoretical ideas, and the principles he laid down, ſome judgment may be formed from the following paſſage taken from his work. "I believe it may be laid down as a general principle in the art of which I am now treating, that all the inviſible mechaniſm of dyeing conſiſts in dilating the pores of the body to be dyed, in depoſiting in them particles of foreign matter, and retaining them there by a kind of covering not liable to be affected by water, rain, or the rays of the ſun; in choofing colouring particles of ſuch a degree of fineneſs as to be rendered ſufficiently fixed in the pores of the ſtuff opened by the heat of boiling water, and again conſtricted by cold, and alſo coated by the kind of varniſh which the ſalts, employed in its preparation, had left in thoſe pores; whence it follows that the pores of the fibres of the wool which has been wrought, or is to be wrought into cloth, ſhould be cleanſed, enlarged, coated over, and then conſtricted, ſo that the colouring particles may be retained in them nearly in the ſame manner as the diamond is retained in the collet of a ring." He fancied that he could diſcern in every dyeing proceſs ſome means by which ſulphate of pot-aſh, then called vitriolated tartar, might be formed; and this neutral ſalt not being readily ſoluble by cold water, nor air, nor light, he conceived the whole art of dyeing to conſiſt in firſt dilating the pores of the ſubſtance to be dyed, ſo as to procure a copious admiſſion of colouring matter, divided by a ſuitable preparation into atoms, and then wedging or faſtening theſe atoms within the pores of the dyed ſubſtance, by the ſmall particles or cryſtals of this difficultly ſoluble ſalt. Upon this *mechanical* hypotheſis, he ſuppoſed that alum became uſeful in dyeing, not by the pure clay or alumine which it contains, but by furniſhing ſulphuric or vitriolic acid, to aſſiſt in forming the ſulphate of pot-aſh, which was to perform the important function of wedging or faſtening the colouring atoms. But though nothing could be more groundleſs than ſuch a theory, the learned in all countries appear to have been ſatisfied with it for a conſiderable length of time, it being always leſs troubleſome to believe than to make experiments.—Macquer followed next. He has given us an exact deſcription of the proceſſes employed in dyeing ſilk, and his practical treatiſe, publiſhed in 1763, is held in deſerved eſtimation. He has made us acquainted with the combinations of the colouring principle of Pruſſian blue; he has endeavoured to make an application of it to the art of dyeing, and has given us a proceſs for communicating the moſt brilliant colour to ſilk, by means of cochineal. Macquer intended to have publiſhed a general treatiſe on the art of dyeing, the proſpectus of which he iſſued in the year 1781, but the indiſpoſition which ſo long preceded his death, prevented his engaging in it, and he died in 1784, before he had been able to carry into effect any part of his plan. It is ſurpriſing that Macquer, who was an excellent chemiſt, and amongſt the firſt who entertained correct ideas of the nature of chemical affinity ſhould have been ſeduced by the hypotheſis of Hellot. "I ſhould now," ſays he in his treatiſe on dyeing ſilk, "explain the action of mordants, and unfold the cauſes of durable and fading dyes; but this ſubject has been treated with ſuch ſagacity by Mr. Hellot, that I ſhall refer the reader to him." Bergmann ſeems to have been the firſt who referred the phenomena of dyeing *entirely* to chemical principles. Having dyed ſome wool and ſilk in a dilute ſolution of indigo in ſulphuric acid, he explains the effects he obſerved in the operation, by attributing them to the precipitation occaſioned by the blue particles having a ſtronger attraction for the particles of the wool and ſilk than for thoſe of the acidulated water: he remarks, that this attraction of the wool is ſo ſtrong as to deprive the liquor entirely of the colouring particles, but that the weaker attraction of the ſilk can only diminiſh the proportion of thoſe particles in the bath; and he ſhews that both the durability of the colour, and the degree of intenſity it is capable of acquiring, depend on theſe different attractions. This is the true light in which the phenomena of dyeing, which are purely chemical, ſhould be conſidered. Dufay had advanced thus far, but overlooked the importance of his own ſimple truths, in the ſearch after more recondite and complicated cauſes. But the peculiar action of mordants was ſtill unexplained, except on the wild hypotheſis of Hellot, till our countryman Mr. Keir, the ingenious tranſlator of Macquer's Chemical Dictionary, ſuggeſted, "that in dyeing, the earth of alum was precipitated, and in this form attached to the material prepared or dyed." Macquer ſoon after adopted the opinions of Bergmann and Keir, and in the ſecond edition of his dictionary, under the article *Dyeing*, publiſhed in 1778, treated the ſubject in a more extended manner, and proved that he had formed juſt conceptions of the nature and uſes of alum, and of different metallic ſolutions, as mordants in dyeing. Berthollet ſucceeded next to the place of truſt which had been ſucceſſively held by Dufay, Hellot, and Macquer, a poſt which he has held, and ſtill holds, with diſtinguiſhed honour to himſelf, and

advantage

advantage to his country. In a ſeries of memoirs, inſerted in the Tranſactions of the academy, the Annales de Chimie, and Journal de Phyſique, he has examined various points of chemical theory connected with the art of dyeing, and almoſt all his labours have ſince been directed to this object. In 1791, he publiſhed his elements of the art of dyeing in 2 vols. 8vo. a work which has contributed more to the progreſs of true theory and the general improvement of the art, than any other treatiſe whatever. This work has been tranſlated into Engliſh by Dr. Hamilton, and a ſecond edition of the original, with conſiderable additions, appeared in 1803. Every thing which a liberal and enlightened government could do for the encouragement and progreſs of the art, has been done in France, and this ſolicitude has been crowned with the ſucceſs it merited. Mr. Anderſon attributes the ſuperiority which certain articles of French manufacture maintain over thoſe of other nations, who poſſeſs the moſt beautiful wool, to the perfection of their dyes; and Mr. Home is of opinion, that the French are indebted to the academy of ſciences for their ſuperiority in many of the arts, and eſpecially that of dyeing. Perhaps another cauſe of the alleged ſuperiority of the French over other nations in the art of dyeing, may be diſcovered in the peculiar nature of their manufactures. Silk, of all other ſubſtances, ſeems beſt adapted to the diſplay of fine and brilliant dyes, and it conſtitutes, in all its various forms, a large portion of the manufactures of France. We may look, therefore, to the dye-houſes of Lyons, as well as to the academy of ſciences, for the cauſe of that ſuperiority which is now gradually declining. We have already ſpoken of our countryman Mr. Keir, as the firſt who ſuggeſted the true theory of mordants, which was afterwards extended and improved by Macquer. The worthy preſident of the literary and philoſophical ſociety of Mancheſter, Mr. Henry, ſome time after, read a paper to the ſociety, ſince publiſhed in the 3d volume of their Memoirs, "On the nature of wool, ſilk, and cotton, as objects of the art of dyeing; on the various preparations and mordants requiſite for theſe different ſubſtances, and on the nature and properties of colouring matter." This paper, which is replete with new and ingenious views of the nature and objects of dyeing, may be conſidered as amongſt the firſt attempts in this country to reduce to ſyſtem and theory the ſubject of which it treats: Mr. Henry, in theſe Memoirs, firſt pointed out the peculiar nature of the aluminous mordant of the calico printers; he ſhewed that by double decompoſition an acetite of alumine was formed, and explained the cauſe of its ſuperiority over the ſulphate of alumine, which conſiſts in the ſubſtitution of a volatile vegetable acid in lieu of the ſulphuric.

In the year 1794, Dr. Bancroft publiſhed his "Experimental Reſearches concerning the philoſophy of permanent colours, and the beſt means of producing them by dyeing, calico printing, &c." which may be conſidered as the firſt, and indeed only original work on the ſubject which this country has produced. This work, as the title indicates, is rather an experimental than practical treatiſe: it contains, however, much valuable information, which the practical dyer may apply in many caſes with conſiderable advantage, and is alſo uſeful as containing a hiſtory of all the different ſubſtances of which it treats, and an account of the labours of Macquer, Dufay, Hellot, Berthollet, and others, in this field of ſcience. It is to be regretted, that the work is ſtill imperfect, the firſt volume only having yet appeared. The ſecond, which was intended to comprehend all the remaining adjective colours and colouring matters, not treated of in the firſt, particularly thoſe very intereſting ones which are derived from the tribe of madders, can hardly, after an interval of fifteen years, be looked for with confidence.

Dr. Bancroft firſt pointed out the true action of tartar in the proceſs for dyeing ſcarlet, and clearly proved that the nitro-muriate of tin, or any ſolution of tin alone, produced a crimſon only; and that the addition of tartar produced a ſcarlet, by the converſion of a portion of the crimſon colouring matter of the cochineal, to a pure yellow. On this obſervation he founded an improvement in the ſcarlet dye, which conſiſted in communicating to the cloth, by means of quercitron bark, and any ſuitable mordant, ſuch a ſhade of yellow as would produce, with the crimſon of the cochineal, a true ſcarlet. By this proceſs he expected to ſave all that cochineal which he conceived to be expended in the production of the yellow: the trials on the large ſcale, however, we are informed by Dr. Bancroft, did not juſtify the expectations he had formed, of the importance of the proceſs.

A more important and laſting ſervice, however, he has rendered to the art of dyeing, by the introduction of the quercitron bark, a drug which is now become of ſuch general and acknowledged utility, as to ſuperſede almoſt every other kind of yellow colouring matter whatever. For the hiſtory of this ſubſtance, and other particulars reſpecting its introduction, we muſt refer to the article itſelf, under the head QUERCITRON BARK.

Though we have to record no brilliant diſcoveries or improvements in the practice of dyeing, within theſe few years, yet the art has continued progreſſively to improve, the different proceſſes have been ſimplified and amended; and what ſome years ago was conſidered a matter of chance and uncertainty, is now reduced to fixed principles.

The dyeing of Turkey red is now fully underſtood and practiſed in this country, with a ſucceſs at leaſt equal to that of any other. The proceſs has, with ſome modifications, been applied lately to the dyeing of piece goods, and the red thus produced ſurpaſſes in beauty and durability, all other colours which it is poſſible to fix on cotton. But it is not our intention here to enter into a hiſtory of all the minor improvements that have been made in the art of dyeing; they will be treated of at large, during the progreſs of the work, under their reſpective heads.

DYEING, *the Laws relating to*, are as follow: Dyers ſhall dye both the cloth and the liſt, or forfeit it. 1 R. III. cap. 4. No dyer may dye any cloth with archil, or with brazil, to make a falſe colour in cloth or wool, &c. on pain of twenty ſhillings. Stat. 3 & 4 Edw. VI. cap. 2. Dyers are to fix a ſeal of lead to cloths, with the letter *M.* to ſhew that they are well maddered, &c. or forfeit three ſhillings and fourpence; and not to uſe logwood in dyeing on pain of forfeiting twenty pounds. Stat. 23 Eliz. cap. 9. And penalties are inflicted on dyers, who dye any cloths deceitfully, and not being dyed throughout with woad, indigo, and madder; alſo marks ſhall be put to the cloth dyed, &c. Dyers in London are ſubject to the inſpection of the Dyers' company, who may appoint ſearchers; and out of their limits, juſtices of peace in ſeſſions to appoint them: oppoſing the ſearchers incurs ten pounds penalty, by ſtat. 13 Geo. I. c. 24.

DYEING, in a more extenſive ſenſe, is applied to all kinds of colourings given to bodies of any ſort.

In which ſenſe, dyeing amounts to the ſame with *coloration;* and includes ſtaining, painting, gilding, marbling, printing, &c. The Chineſe are ſaid to practiſe the dyeing of tea with catechu, which gives the worſt ſorts of green tea leaf the colour, and its infuſion the tincture of bohea. Short. Diſſert. on Tea, preſ. p. 15. See TEA and CATECHU.

The

The ſorts of dyeing now commonly uſed in vulgar trades, are 1. Whitening of wax, and ſeveral ſorts of linen, and cotton cloths, by the ſun, air, and reciprocal effuſions of water. See BLEACHING. 2. Staining of wood and leather by lime, ſalt, and liquors, as in ſtaves, canes, marble, leathers, marquetry, &c. 3. Marbling of paper by tempering the colours with ox-gall, and applying them upon a ſtiff-gummed liquor. See PAPER. 4. Colouring, or rather diſcolouring ſilks, tiffanies, &c. by brimſtone. 5. Colouring ſeveral iron and copper works into black with oil. 6. Giving leather a gold colour, or rather dyeing ſilver-leaves like gold, by varniſhes; and in other caſes by urine and ſulphur. 7. Staining of marble and alabaſter, with heat, and coloured oils. 8 Tinging ſilver into braſs with brimſtone or urine. 9. Colouring the barrels and locks of guns blue and purple with the temper of ſmall-coal heat. 10. Colouring glaſs cryſtals, and earthen-ware with the ruſts and ſolutions of metals. See POTTERY, &c. 11. Colouring live hair, as in Poland, both horſe and man's hair; and alſo of furs. 12. Enamelling and annealing. See ENAMELLING. 13. Application of colours, as in the printing of books and pictures; and the making of playing cards, japanning, &c. See PRINTING, CARDS, and JAPANNING. 14. Gilding and tinning with mercury, block tin, and ſal ammoniac. See GILDING and TINNING. 15. Colouring metals, as copper with calamine into braſs, and with zinc or ſalt-petre into falſe gold, or into falſe ſilver with arſenic. See CALAMINE, BRASS, ZINC, ARSENIC, &c. 16. Making painters' colours, by preparing of earth, chalk, and ſlates, as in umber, oker, Cologn earth, &c. out of the calces of lead, as ceruſs and minium; by ſublimates of mercury and brimſtone, as in vermillion; by tinging of white earths variouſly, as in verditer, and ſome of the lakes; by concrete juices or fæculæ, as in indigo, pinks, ſap-green, and lakes: and by ruſts, as in verdigris, &c. See CERUSS, MINIUM, VERMILLION, INDIGO, &c. 17. The applying of theſe colours by the adheſion of ox-gall, as in the marbled paper aforeſaid; or by gum-water, as in limning: or clammy drying oils, as the oils of linſeed, nuts, ſpike, turpentine, &c. See PAINTING, LIMNING, &c. 18. Watering of tabbies. See WATERING, CALENDER, TABBY, &c. Petty. Appar. Hiſt. of Dyeing, ap Sprat.

Glaſs dyed is the common matter of artificial jewels: the tinctures are given with zaffer, manganeſe, feretto, crocus martis, &c. The proceſſes are deſcribed at length in Antonio Neri, de Re Vitrario, lib. i. cap. 12, 13, 14, ſeq. See GLASS, GEM, &c.

The Peruvian women, when grown old, dye their grey hairs black by a very untoward operation, *viz.* holding the head ſome hours with the hair ſopped in a boiling tincture of the root of a tree called *cuchau*, by the Spaniards *maquey*.

DYEING *of Hats*, is done by boiling a hundred pounds of logwood, twelve pounds of gum, and ſix pounds of galls, in a proper quantity of water for ſome hours; after which about ſix pounds of verdigris, and ten pounds of green vitriol are added, and the liquor kept ſimmering, or of a heat a little below boiling. Ten or twelve dozen of hats are immediately put in, each on its block, and kept down by croſs bars for about an hour and an half; they are then taken out and aired, and the ſame number of others put in their room; the two ſets of hats are then dipped and aired alternately, eight times each; the liquor being refreſhed each time with more of the ingredients, but in leſs quantity than at firſt. This proceſs affords a very good black on woollen and ſilk ſtuffs as well as on hats. Com. Phil. Tech. p. 428. See HAT.

DYEING, or *ſtaining of wood, for inlaying, veneering, &c.* *Red* is done by boiling the wood in water and alum; then taking it out, adding brazil to the liquor; and giving the wood another boil in it. *Black*, by bruſhing it over with logwood boiled in vinegar, hot; then waſhing it over with a decoction of galls and copperas, till it be of the hue required. Any other colour may be given by ſqueezing out the moiſture of horſe-dung through a ſieve, mixing it with diſſolved roch alum, and gum-arabic; and to the whole adding green, blue, or any other colour deſigned. After ſtanding two or three days, pear-tree, or other wood, cut to the thickneſs of half a crown, is put into the liquor boiling hot, and ſuffered to remain till it be ſufficiently coloured. Park. Treat. of Japan. chap. xxvii. p. 82.

DYEING *of bone, horn*, or *ivory*. *Black* is performed by ſteeping braſs in aqua fortis till it be turned green: with this the bone, &c. is to be waſhed once or twice; and then put in a decoction of logwood and water, warm. *Green* is begun by boiling the bone, &c. in alum-water; then with verdigris, ſal ammoniac, and white wine vinegar; keeping it hot therein till ſufficiently green. *Red*, is begun by boiling it in alum-water, and finiſhed by decoction in a liquor compounded of quicklime ſteeped in rain-water, ſtrained, and to every pint an ounce of brazil wood added: the bone, &c. to be boiled therein till ſufficiently red. Other methods are given by Salmon. And from him by Houghton. Park. lib. cit. p. 83. Salm. Polygraph. lib. iii. cap. 35. p. 275. Hought. Collect. N° 138. tom. i. p. 361. See BONES, HORN, IVORY, &c. The refuſe of the Bow-dye, given to hogs to feed on, is ſaid to tinge their very bones red.

DYEING *of Leather*. See LEATHER.

DYEING *of marble and ſtones*. See STAINING.

DYEING *of Thread*. See THREAD.

DYER, SIR JAMES, in *Biography*, was born about the year 1511, and received his academical education at Oxford, whence he removed to the Middle Temple, with a view of ſtudying the law, where he diſtinguiſhed himſelf for his aſſiduity and talents. He acted ſome years as a barriſter, and, in 1552, he was, by the king's writ, called to the degree of a ſerjeant at law, and, in the ſame year, was elected ſpeaker of the houſe of commons. He roſe to the office of chief juſtice of the common pleas, an office which he held upwards of 20 years, with a high character for integrity and ability. He poſſeſſed a remarkably placid and even temper; and on the trial of Sir John Throckmorton, he ſcorned to take the ſame ſort of liberties with the priſoner which were taken by the other counſel, Mr. ſerjeant Standford. He died in 1581, at his eſtate of Howton, in Huntingdonſhire, leaving behind him a "Book of Reports" in folio, containing caſes and deciſions occurring in the reigns of Henry VIII., Edward VI., Mary, and Elizabeth; this work is very highly eſteemed for its conciſeneſs and ſolidity, and has been ſeveral times reprinted. He was author of "A Reading upon Statute 32 Henry VIII., c. 1., of Wills, and upon two others for its Explanation." By the ſervices which he rendered his country, as well by his official duties as by his works, he obtained the reputation of being a moſt upright judge and excellent interpreter of the laws. Biog. Brit.

DYER, JOHN, was born in Carmarthenſhire in 1700, but was educated at Weſtminſter ſchool. He was intended by his father, who was an eminent ſolicitor, for the ſame profeſſion as he had long followed himſelf; but the young man felt a repugnance to the law, and, on the death of his parent, determined upon painting as a profeſſion, and became a pupil to Mr. Richardſon. In this he never greatly excelled, nor perhaps roſe higher than an itinerant artiſt. His mind ſeems to have been more inclined to poetry, and in 1727 he made

made himſelf known by his "Grongar Hill," which became very popular, and has been admitted in many collections. After the publication of this piece Mr. Dyer travelled to Italy, by way of improvement as a landſcape painter; but his acquirements in this journey were of more importance to him as a poet than a painter. In the year 1740, he diſplayed his taſte, and the augmentation of his poetical images, by the publication entitled "The Ruins of Rome." "The title of this work," according to Dr. Johnſon, "raiſes greater expectation than the performance gratifies." But a more candid critic ſays, "It contains many paſſages truly poetical, and the ſtrain of moral and political reflection is that of a benevolent and enlightened mind." After this Mr. Dyer took orders, was married, and went to reſide in Leiceſterſhire, where he had a ſmall living; this he exchanged for one in Lincolnſhire, to which another was ſoon added. The county, however, he ſoon found to be ill ſuited to his conſtitution, which had ever been delicate. In 1757 he publiſhed his "Fleece," a didactic poem, of which the theme is the care of ſheep, the labours of the loom, and the arts of trade. The firſt part is paſtoral, the ſecond mechanical, and the third hiſtorical and geographical. The poem has been often publiſhed, and yet it has not been one of our popular poems; there are, notwithſtanding, in it many pleaſing, and ſome grand and truly impreſſive paſſages. Mr. Dyer did not ſurvive this publication many months: he died in 1758, and, in the year 1761, his works were collected and publiſhed in one volume octavo. He lived highly reſpected, and at his death, left the reputation of a good poet, and the character of an honeſt, humane, and good man. Biog. Brit.

Dyer's *Black*. See Black.

Dyer's *Blue*. See Blue.

Dyer's *Broom*, the name of a ſpecies of *Geniſta*; which ſee.

Dyer's *Green*. See Green.

Dyer's *Iſland*, in *Geography*, a ſmall iſland of America, in Narraganſett bay.

Dyer's *Weed*, in *Botany*, the luteola of Tournefort, and a ſpecies of the reſeda in the Linnæan ſyſtem. For the generic characters, ſee Reseda.

It grows in moſt parts of the world. The Greeks, of old, uſed it in dyeing yellow, as we do at this time, and called it cymene, and ſometimes thapſia, the word ſignifying, with them, ſeveral different things which had the property of dyeing yellow. It was called alſo by ſome robia, or rubia; but thoſe who gave it this name have always diſtinguiſhed it by ſome peculiar epithet from the common rubia, or madder. Paulus Ægineta mentions it as an herb uſed in dyeing cloths; and Neophytus, and ſeveral others, give it a place among the things uſed to tinge the hair. See Weld.

Dyer's *Yellow*. See Yellow.

DYHRENFURT, in *Geography*, a ſmall town of the kingdom of Pruſſia, in the duchy of Silesia, on the river Oder, anciently called Prſig.

DYKE, in *Mineralogy*. This term ſeems to have originated among the collieries of the north of England and of Scotland, where it was and is ſtill employed to denote thoſe banks of baſalt (locally named whin) by which the coal ſtrata are frequently divided. The breadth of a dyke varies from a few feet to many yards, and its length and depth are generally of great but unknown extent: its direction is nearly vertical, forming with the plane of the ſtrata that it paſſes through, an angle approaching, more or leſs, to 90 degrees.

By the Scottiſh mineralogiſts, the term dyke is employed as ſignifying a vein, compoſed of any compact earthy mineral; and in this ſenſe is often made uſe of in the controverſial publications, wherein the Hutonian theory is attacked or defended. At preſent, however, the term ſeems, in a good meaſure, ſuperſeded by the more general one of vein.

Dyke, *Offa's*, or *Clawdh Offa*, a famous dyke, conſtructed by Offa the great king of Mercia, towards the cloſe of the eighth century, about A. D. 780; and intended either to mark the boundaries between a colony of Saxons whom he planted in the level country between the Severn and the Wye, and the Welſh whom he had driven out of it, or to defend the former from the hoſtile incurſions of the latter. This dyke extended from north to ſouth, about 90 miles, running along the ſides and bottoms of the hills, from the mouth of the river Dee to that of the Wye near Chepſtow. It is thought to have been an imitation of the ramparts thrown up by Agricola, Adrian, and Severus, to guard the Roman province againſt the incurſions of the northern barbarians; but from ſome remains of it, which are ſtill to be ſeen, and for other reaſons, lord Lyttelton (Hiſt. Hen. II. vol. ii.) concludes, that it was rather intended for a boundary, to ſeparate the territories of the Engliſh from thoſe of the Welſh, than to protect the former, as a fortification. Whatever the intent of ſo vaſt a work may have been, it was probably at this period, that the larger towns and cities, ſituated to the eaſt of the Severn and Dee, were built, for the purpoſe of checking the irruptions of the Welſh by a ſtrong line of frontier poſts. The villages likewiſe, on the eaſt ſide of Clawdh Offa, whoſe names terminate in *ton* or *ham*, were about this time inhabited by Saxons, who were uſually called "Gwyr-y-Mars," or the men of Mercia; though in after-times the Welſh ſettled on each ſide of the dyke. During an interval of peace, Offa finiſhed this dyke; but the Welſh were not inſenſible of the diſhonour and injury done to their country. Accordingly they ſecretly concerted the plan of its deſtruction, and having ſettled a previous agreement with the kings of Northumberland, and of the South-Saxons, with whom they were then in alliance, they ſuddenly beſet Clawdh Offa, in the night of St, Stephen's day, the night itſelf being extremely dark; and aſſiſted alſo by the country people, they broke down the rampart, and in a ſhort time, filled up and levelled the dyke to the length of a bow-ſhot. Early in the morning they aſſailed the camp of king Offa, and ſlew great numbers of his ſoldiers; who, depending on the time, were either aſleep or unarmed, or had given themſelves up to pleaſure, or to the religious obſervance of the feſtival. The labour and charge of this dyke were much greater than the benefit; for ſoon after Offa's death, the Welſh again extended their dominions beyond that dyke, forcing their way, like a rapid torrent, which deſcends from the mountains, and overflows the plain country. We ſhall only add, that the limits of the Welſh from that time, were very uncertain; being often advanced, or ſet back, as the fortune of war happened to change, in favour of them or of the Saxons.

Dyke-*Reeve*, a bailiff, or officer, that has the care and overſight of the dykes and drains in deepening fens, &c. We find mention made of this officer ann. 16 & 17 Car. II. cap. 11. See. Dike.

DYLE, in *Geography*, a river of France, which gives its name to the laſt of the thirteen departments of the firſt region of France, called the region of the countries added to France by the peace of Luneville (des pays réunis.) It has its ſource in a ſmall ſpring near Marbais, paſſes by Wavre, Louvain, and Malines. On coming from the latter, it takes up the Senne and the two Nethes near Rumpel, and flows not far from this place into the river Rupel. Formerly boats uſed to be towed on the Dyle from Wavre to Louvain. Merchant veſſels, however, come up as far as Malines from the

the Scheldt, by means of the tides which flow regularly twice a day.

Dyle, *the department of the*, is the thirteenth department of the first region called la région des pays réunis in France. Bruſſels is its chief city. It is formed of part of the duchy of Brabant, and owes its name to the river Dyle, by which it is irrigated.

The limits of the department of the Dyle, are on the north, the department of the two Nethes; on the eaſt, the departments of the Lower Meuſe and of the Ourthe; on the ſouth, thoſe of Sambre and Meuſe and of Jemmapes; and on the weſt, that of the Eſcaut, (Scheldt.)

Its principal rivers are the Dyle, the Demer, and the Senne; it has alſo two fine canals, that of Louvain and that of Bruſſels. The ſoil is uncommonly rich and fertile. Agriculture in all its branches, grazing, the rearing of cattle, the buſineſs of the dairy, and horticulture, are extremely flouriſhing and well underſtood. The management of ſheep, however, is rather neglected, but great attention is paid to bees. Mineral productions are ſcarce; there is a little iron. The quarries yield ſome very good white free-ſtones, and ſome blue, which are a kind of marble, beſides grind-ſtones, and a ſort of ſmall granite, which makes good roads and keeps them in excellent repair.

There is hardly any manufacture but what flouriſhes in the department of the Dyle, and every one in the higheſt ſtate of perfection. Its trade is in proportion to its abundance of raw and manufactured productions. Induſtry is every where exerted in the higheſt degree, of which it appears capable.

The moſt conſiderable towns, next to Bruſſels, are Louvain, Tirlemont, Niveiles, Dieſt, Wavre, and Halle. The whole territorial extent of the department of the Dyle, is 3137 ſquare kiliometres and a half, or 671,746 arpens, 95,704 of which are covered with foreſts. The population amounts to 363,956 individuals, or about 1978 inhabitants upon a ſquare league. Their average contribution to the expences of the ſtate is about 10*s.* *per* head annually. The department is divided into three diſtricts, Bruſſels, Louvain, and Nivelles, 30 cantons, and 388 communes.

DYMA, or Dyme, in *Ancient Geography*, a town of the Peloponneſus in Achaia, W. of Olené, and at the bottom of a ſmall gulph, having to the north-weſt the promontory Araxum. This town was more anciently called Palea according to Pauſanias, and Strabo ſays, that it was alſo called Stratos. Polybius, when he is ſtating the influence which the Lacedæmonians and the king of Macedonia had on the affairs of Greece, particularly after the death of Alexander, adds, that in the 124th olympiad, 284 B. C. Dyme and Patras, were two of the firſt cities which united to ſhake off the foreign yoke; afterwards, however, as we learn from Pauſanias, it was the only city of thoſe belonging to the Achæans, which took the part of Philip, ſon of Demetrius, when the Romans declared their oppoſition to him. This they honourably did by way of acknowledging the kindneſs of this prince for recovering and re-eſtabliſhing in their city thoſe of its inhabitants, whom the Romans had made priſoners. But Sulpicius, who commanded the Roman army, devoted this city to plunder after he had taken it. In the time of the piratical war, Pompey placed here a number of thoſe pirates, of whom he had cleared the ſea on the coaſt of Cilicia. Auguſtus ſubjected Dyme to the dominion of Patras; the vicinity of this city was famous for ſeveral engagements, and particularly for that which terminated in the entire defeat of the Achæans by the Lacedæmonians, under the conduct of Cleomenes in the year 227 B. C.

Dyma, or *Dyme*, a town of Thrace, ſeated on the eaſtern bank of the river Hebrus, at ſome diſtance from the ſea; called by Ptolemy, and in the Itinerary of Antonine, *Dimi*.

DYNA, in *Commerce*, a kind of Eaſt Indian coin, worth about thirty ſhillings of Engliſh money.

DYNAMICS (from δυναμις, *power*) is the ſcience of moving powers; or of the action of forces on ſolid bodies, when the reſult of that action is motion. *Mechanics*, in its moſt extenſive meaning, is the ſcience which treats of *quantity*, of *extenſion*, and of *motion*. Now that branch of it which conſiders the ſtate of ſolids at reſt, ſuch as their equilibrium, their weight, their preſſure, &c. is called *ſtatics*; and that which treats of their motion, is called *dynamics*. When fluids are conſidered, inſtead of ſolids, then that branch of mechanics which treats of their equilibrium, weight, &c. is called *Hydroſtatics*, and that which treats of their motion, is called *Hydrodynamics*.

An extenſive and varied field of ſtrict inveſtigation, and of ſpeculative diſcuſſion, falls under the denomination of dynamics. Various difficult queſtions are naturally connected with the more evident propoſitions reſpecting viſible effects; and if inſtead of our remaining ſatisfied with facts, we endeavour to reaſon upon the nature of their primitive origin, the long and laborious inveſtigation is ſeldom attended with any uſeful or ſatisfactory reſults. In our preſent ſtatement of this ſcience, we ſhall endeavour to explain the neceſſary definitions, ſo far as to render our meaning unequivocal in the following pages; and we ſhall arrange the general principles with as much additional illuſtration as the nature of the ſubject may ſeem to demand; but we ſhall avoid, as much as it may appear practicable, the diſcuſſion of abſtruſe and ſpeculative particulars.

Matter denotes in general the ſubſtance of which bodies are formed. Thus a man, a ſtone, a tree, &c. are all formed of matter. But we do not mean to aſſert, that the matter which forms the man, the ſtone, the tree, or any other body, is, or is not, all originally of the ſame kind; for we are perfectly ignorant of its original nature.

Volume, *bulk*, or *magnitude*, denotes the ſize of a body with reſpect to the ſpace it occupies. Thus the bulk of a full grown man is greater than that of a new-born child. The bulk of a ball of two inches in diameter, is eight times as great as that of a ball of one inch in diameter, and ſo forth.

Denſity means the proportional quantity of matter which is contained under a given extenſion; and we judge of this quantity of matter by its weight. Thus, a cubic inch of mercury weighs about $13\frac{1}{2}$ times as much as a cubic inch of water; therefore we ſay that the denſity of mercury is to the denſity of water as $13\frac{1}{2}$ to one.

Maſs denotes, at the ſame time, the bulk and the denſity of a body, *viz.* is the product of the bulk multiplied by the denſity. Thus, in the inſtance of the preceding paragraph, the maſs of a cubic inch of mercury is to the maſs of a cubic inch of water, as $13\frac{1}{2}$ to one; the maſs of two cubic inches of mercury is double the maſs of one cubic inch of the ſame fluid metal; but is equal to 27 times the maſs of one cubic inch of water; for it is evident, that if one cubic inch of mercury contains $13\frac{1}{2}$ times as much weight as one cubic inch of water, two cubic inches of mercury muſt contain twice $13\frac{1}{2}$ times; or in general, that the maſs is equal to the denſity multiplied by the bulk.

Motion is a continual and ſucceſſive change of place. It is diſtinguiſhed into *abſolute* and *relative*, according as the motion is performed in abſolute or in relative ſpace. Thus, if a ſhip could remain immoveable in the univerſe, a man ſitting in a part of it, would be abſolutely at reſt; but if the ſhip

Strahan and Preſton,
New Street Square, London.

ſhip be in motion whilſt the man continues ſitting; then this man will be abſolutely in motion with reſpect to the univerſe; but relatively at reſt with reſpect to the parts of the ſhip. If you ſuppoſe, that the ſhip moves equably forward over a diſtance equal to its length, and that at the ſame time the man in his chair is drawn from the fore to the back part of the ſhip, with the ſame equable motion; then the man will be in motion relatively to the parts of the ſhip; yet he would remain in the ſame abſolute place.

Equable motion is that which paſſes over equal portions of extenſion, or of ſpace, in equal portions of time.

Accelerated, and *retarded motion*, is when equal portions of extenſion are paſſed over in portions of time either ſucceſſively ſmaller or ſucceſſively larger. Thus, if a body in motion paſſes over the firſt yard of extenſion in one hour, the ſecond yard in 50 minutes, the third in 40 minutes, and ſo on; then its motion is ſaid to be accelerated. But if a body paſſes over the firſt yard in one hour, the ſecond in one hour and a quarter, the third in one hour and a half, &c. then its motion is ſaid to be retarded.

Velocity is the ratio of the quantity of lineal extenſion that has been run over in a certain portion of time; or it is the ratio of the time that has been employed in moving along a determinate extenſion. For inſtance, if a body A has moved along an extenſion of ten miles in one hour, and another body B has moved along an extenſion of one mile in the ſame time, *viz.* in one hour; then the velocity of A is ſaid to be to the velocity of B as ten to one. Alſo, if the body A has moved along the diſtance of one mile in four minutes, and the body B has moved along the ſame diſtance in two minutes, then the velocity of B is to the velocity of A, as two to one. When both the times and the ſpaces are unequal, then the velocity is equal to the quotient of the ſpace divided by the time; it being evident, that if a body paſſes over two miles in one minute, or four miles in two minutes, or ten miles in five minutes, the velocity is conſtantly the ſame; and, therefore, in order to reduce theſe expreſſions to unity, we muſt divide the 4 miles by 2 minutes, or the 10 miles by 5 minutes, and the quotient is always the ſame, *viz.* 2; meaning two miles per minute. But if the body paſſes over the ten miles in two minutes, then the velocity, when reduced to unity by dividing the 10 miles by two minutes, is 5, meaning five miles per minute. Hence, univerſally, the velocity is repreſented by, or is equal to, the quotient of the ſpace divided by the time. Thus, if a body A paſſes over four miles in 10 minutes, and another body B paſſes over 12 miles in 18 minutes; then the velocity of A is to the velocity of B, as $\frac{4}{10}$ to $\frac{12}{18}$; or as 0.4 to 0.666, &c. In this inſtance, we have taken a minute for the unit of time; but any other portion of time, ſuch as an hour, or a ſecond, &c. may be conſidered as the unit; but then in the ſame computation, the ſame portion of time muſt be conſtantly conſidered as the unit. In moſt mechanical computations, a ſecond is uſually taken for the unit.

A *force* is that which cauſes a change in the ſtate of a body, be it of reſt or of motion. Of the nature of forces we know nothing. Their effects alone come within our knowledge, and it is from the quantity of theſe effects, that we meaſure forces. Thus, if a body is ſet in motion by the action of a certain force, and is enabled by it to move with a certain velocity, and another equal body is ſet in motion by another force, which enables it to move with the double of the above-mentioned velocity; then we ſay, that the former force is to the latter as one to two; or that the latter is double the former.

Some authors are of opinion, that a quadruple force is required to produce a double velocity, and they alledge certain facts which ſeem to corroborate their opinion; but we ſhall in the ſequel mention an argument which to us ſeems concluſive in favour of the above-mentioned ſtatement. It is evident, that if the maſſes are unequal, and the velocities which have been produced by the action of certain forces, are equal, then the forces muſt be as the maſſes; conſequently when both the maſſes and the velocities are unequal, then the forces are as the products of the maſſes multiplied by their reſpective velocities.

The *momentum*, or *quantity of motion*, is the force of a body in motion, and is equivalent to the impreſſion which it would make on another body that ſhould be placed at reſt juſt before it. Therefore, according to the definition of forces, the momentum is equivalent to the product of the maſs of the body multiplied by the velocity; hence forces are equivalent to, or are meaſured by, the momentum, or quantity of motion, they are capable of producing. From this ſtatement then it follows, that if we put Q for the maſs or quantity of matter, M for the momentum, and V for the velocity, the following proportions will ſtand good, *viz.* $Q \propto \frac{M}{V}$ $M \propto Q\,V$, and $V \propto \frac{M}{Q}$, or in other words, the maſs is as the momentum divided by the velocity, the momentum is as the maſs multiplied by the velocity, and the velocity is as the momentum divided by the maſs.

Forces have been uſually conſidered as being of two ſpecies, and theſe eſſentially different from each other. They have been called *preſſures* and *impulſes*. Whatever acts upon a body ſo as to put it in motion, and, by the continuance of the action, accelerates that motion, has been called a *preſſure*, or *preſſive force*; and the force of gravity, which, by conſtantly acting upon deſcending bodies continually accelerates their velocity, is of this kind.

An *impulſe* or *impulſive force*, is that which acts inſtantaneouſly upon a body (according to our perception) and then leaves the body without any farther ſolicitations; and ſuch is the ſtroke of a hammer, or in general of one body ſtriking againſt another body. Thus a ball in motion ſtrikes againſt another ball at reſt, and puts it in motion. The latter, having received the ſtroke, proceeds by itſelf; and its velocity will be uniform as long as it does not meet with obſtructions.

The reaſons which ſeem to prove that an impulſive force is infinitely greater than a preſſure, or that the one is not capable of compariſon with the other, are derived from the effects. For inſtance, a man with the moderate ſtroke of a hammer can drive a nail into a plank, when a weight of ſeveral hundreds gently laid upon the head of the nail will not produce the ſame effect. A pebble, likewiſe, which would ſupport an immenſe weight, is eaſily broken by the ſtroke of another pebble, or of a hammer. This difference of effects has given riſe to a variety of conjectures, of explanations, and of controverſies, which towards the commencement of the laſt century filled up many volumes, and employed the thoughts of the moſt able philoſophers and mathematicians. (See Reid's Eſſay on Quantity in the Phil. Tranſ. vol. xlv. and Dr. Irwin's inquiry into the meaſure of the force of bodies in motion, Phil. Tranſ. for 1745.). Yet upon a due examination of the facts, and of the reaſonings which have been grounded upon thoſe facts, it does not appear, that the gradual communication of motion by a preſſure, and the inſtantaneous communication of it by an impulſe, are clearly proved to be eſſentially different in their nature. Perhaps an impulſe may be conſidered as a powerful preſſure acting for a very ſhort time, and a preſſure may be conſidered as a weak impulſe repeated at infinitely ſmall portions of time. But let the real ſtate of the caſe be as it may, we ſhall, agreeably

agreeably to our plan, omit any farther confideration refpecting the nature of forces; acknowledging to notice merely their effects.

In the examination of thefe effects, it becomes neceffary to ftate, to examine, and to explain the various motions that take place amongft the works both of nature and of art; the general laws to which they are reconcileable; the peculiarities by which they are difcriminated from each other, and in confequence of which they are arranged under diftinct denominations; and laftly, the application of the fame to various ufeful purpofes. The fubject is vaft and intricate; but fince according to the nature of our work, every particular branch of motion muft be explained under the article of its peculiar appellation; there remains very little more for us to arrange in the prefent article, than an enumeration of the various fpecies of motion, a ftatement of their definitions, or of the peculiarities by which they are difcriminated from each other, and that mutual dependence which evidently feems to regulate the whole doctrine of motion. We fhall, at the fame time, refer the reader to other articles for a more ample and fatisfactory explanation refpecting each particular kind of motion.

For the fake of perfpicuity, the examination of the various movements of bodies, has been ufually arranged under the following heads:

1. Uniform rectilinear motion, with what is commonly called the compofition and refolution of forces.
2. Collifion, both direct and oblique.
3. Motions arifing from the actions of central forces.
4. Motions arifing from the joint actions of a central and an impulfive force; *viz.* of a preffure and of an impulfe.
5. Projectiles.
6. Defcent of bodies along inclined planes.
7. Vibrations of pendulums.
8. Curve of fwifteft defcent.
9. Rotation of bodies about fixed axes.
10. Centres of ofcillation, of percuffion, of gyration, &c.
11. Movements of machines.

Each of thefe fpecies of motion has certain peculiarities by which it is difcriminated from the reft, or rather that render a feparate examination of whatever belongs to it, more conducive to perfpicuity. But there are certain rules, laws, or affections, which belong to them all, and which we fhall now ftate. They are three in number, and are commonly known by the denomination of fir Ifaac Newton's laws of motion.

Firft Law. Every body will remain either in a ftate of reft, or of uniform motion in a ftraight line; unlefs it be compelled to change that ftate by forces impreffed.

Second Law. The change of motion is always proportionate to the moving force impreffed, and is always made in the direction of the right line in which that force is impreffed.

Third Law. Action and re-action are always equal and contrary to each other. Or the mutual actions of two bodies upon each other, are always equal and directed contrary ways.

Thefe laws have been eftablifhed by all the facts which have been hitherto obferved, and by the ftricteft reafoning of the moft enlightened philofophers. A careful examination of the particulars will eafily manifeft the evidence and the extent of thefe laws; which at firft fights may perhaps not be eafily comprehended. In order to affift the elucidation of the fame, we fhall add a fhort explanation of thofe parts at leaft, which are more likely to create any difficulty.

That a body at reft fhould continue in that fituation, unlefs it be put in motion by fome force or forces, no perfon will be inclined to deny, it being an idea naturally fuggefted by the refult of common occurrences. But that a body once put in motion, and not afterwards driven by any other force, or oppofed by any obftacle, fhould continue to move on in a ftraight line for ever after is not eafily believed; confidering that all the movements, however rapid, which fall under our obfervation on the furface of the earth, prefently terminate in reft. This apparent difficulty, however, will be eafily removed by confidering that all the movements which fall under our obfervation near the furface of the earth, are performed under the influence of other forces; the principal of which are the force of gravity, and the refiftance of the air, in which the whole earth and all its feparate bodies are involved; the former of which forces continually draws bodies towards the centre of the earth, whilft the latter obftructs all forts of motion. So that a body fet in motion by any impulfive force; for inftance, a bullet thrown horizontally by the difcharge of a gun, would continue to move uniformly in a ftraight line for ever after, were it not drawn downwards by the force of gravity, which, combined with the impulfive force, would oblige it to defcribe a particular curve, which is very nearly a parabola; but the refiftance of the atmofphere, which continually obftructs it, forces it to defcribe another fort of curve, the nature of which is extremely intricate. Therefore it appears that the motion of the bullet, thus impelled by a gun, falls under the condition of the fecond part of the firft law of motion; *viz.* it is compelled to change its ftate of uniform rectilinear motion, by the force of gravity, and by the preffure of an obftructing medium.

But notwithftanding thefe evident caufes of deviation from the direction of the original impulfe, it may ftill be fuppofed, that without them, the bullet would have continued its motion only fome time longer; but that it would ultimately terminate in reft. The anfwer to this is, that as far as obfervations and calculations can reach, the deviation of the bullet from its original motion, or of any other body fet in motion by an impulfive force, is always proportional to the obftructing caufe, or caufes; whence it neceffarily follows, that when the obftructing caufe vanifhes, or becomes zero, the deviation of the original motion in the abovementioned cafes muft likewife vanifh.

Several ufeful confequences are naturally deduced from the foregoing illuftration. Thus, whenever we fee a body in motion, we muft conclude that it has been put in motion by an adequate force. If the direction, and the velocity of that motion be altered, we muft conclude that its alteration has been occafioned by the action of other forces. If the movement continues without any vifible alteration, or if its velocity be increafed, we muft fuppofe, that the body is continually urged by a preffing force; for otherwife it would not, even for a moment, remain uninterrupted in a refifting medium, and under the influence of other exifting forces.

With refpect to the fecond law of motion, it is only neceffary to obferve, that though it be expreffed as if we were acquainted with the nature of the force which produces the change of motion; yet the real meaning is, that we only confider the changes of motion as the meafures of the forces which occafion thofe changes; and we confider the direction of the change as the indication of the direction of the force.

The third law of motion, namely, that action and reaction are always equal and contrary to each other, will be eafily affented to, if the leaft attention be paid to common occurrences. A weight faftened to a horfe by means of a rope, and thus dragged over the ground, produces a refiftance

which

which muſt be overcome by the ſuperior power of the horſe; for the ſtone reſiſts in a direction contrary to that of the horſe. If a ſtone be thrown againſt a glaſs, or a glaſs be thrown again a ſtone, the ſtroke will be equally felt by both bodies; yet the glaſs will be broken by it, and the ſtone will not, becauſe the ſame ſtroke is ſufficient to break the continuity of the former, and not of the latter. When a boat is moved by means of oars upon water, the action of one extremity of each oar againſt the water in one direction, re-acts upon the boat, and impels it in the oppoſite direction.

Thus much may be ſufficient to illuſtrate the laws of motion for the preſent article; but if farther explanation be required, ſee the article, MOTION, *Laws of.*

We ſhall now proceed to define, and to make ſome general obſervations on the different ſpecies of motion according to the enumeration ſtated above.

The ſimpleſt ſtate of motion is that of a body actuated by a ſingle impulſive force, and moving uniformly in a ſtraight line. But ſuch a caſe can exiſt only in our imagination; for, as we have already remarked, all the movements which can come within our obſervation, are performed in reſiſting media, and within the influence of other forces; yet it is from the conſideration of ſuch ſuppoſed ſimple caſe, that we can form uſeful theorems or uſeful deductions. We are alſo led to conclude, that the above-mentioned ſimple caſe would actually take place, if every obſtructing medium, and every other interfering force could be removed, becauſe we find, that, as far as calculation and experiments can aſſiſt us, the deviation of the body's uniform rectilinear motion is proportionate to thoſe diſturbing cauſes.

The particulars which may be remarked, with reſpect to the above-mentioned ſimple motion, are the relations of the time during which a certain linear extenſion is run through; the extenſion itſelf when the time is given, which expreſſes the velocity; the quantity of matter moved; and the momentum. Thoſe relations are eaſily obtained; for, according to the definitions at the commencement of this article, the velocity is as the quantity of linear extenſion run through in a given time: for inſtance, in one ſecond. Hence, of two bodies in motion, that which runs through a greater extenſion during a ſecond of time is ſaid to have the greater velocity. But if the extenſions or ſpaces run through in different times be compared together; then, in order to reduce them to one ſecond, each of the ſpaces muſt be divided by the time in which it has been run through. For inſtance, if a body, A, has paſſed over ten feet in two ſeconds; and another body, B, has paſſed over eighteen feet in three ſeconds; and their velocities are to be compared together, I ſay, with reſpect to the body A, if, in two ſeconds, A has moved along ten feet, how much has it moved in one ſecond? thus, 2 : 10 :: 1 : where, in order to find the fourth proportional, I need only divide the 10 by 2, *viz.* the ſpace by the time, and the quotient is 5. With reſpect to the ſecond body, I ſay, by the very ſame way of reaſoning, 3 : 18 :: 1 : and dividing the ſpace by the time, *viz.* 18 by 3, the quotient is 6. Then the ratio of the velocities of A to B is that of 5 to 6. Therefore it appears that, univerſally, the velocity is as the ſpace divided by the time: hence, putting V for the velocity, S for the ſpace, and T for the time, we have $V \propto \frac{S}{T}$. Then, according to the uſual ſtatement of proportionable and variable quantities, it follows that S is as V T, and T is as $\frac{S}{V}$. Or, in words, the velocity is as the quotient of the ſpace divided by the time; the ſpace is as the product of the velocity multiplied by the time, and the time is as the quotient of the ſpace divided by the velocity. The momentum, according to the explanation which has been annexed to the definition, is as the quantity of matter divided by the velocity. In this caſe of ſimple motion, there is an important obſervation to be made with reſpect to the origin of the motion, the uſe of which in mechanics is very extenſive. What we allude to is, that a body, ſet in motion by two impulſes at the ſame time, will likewiſe move uniformly in a ſtraight line: therefore, when a body moves uniformly in a ſtraight line, it may be ſuppoſed to have been actuated by one impulſe, or by two in certain directions, which, as it will preſently appear, may be varied indefinitely. This theorem is uſually expreſſed in the following manner.

If a body be acted upon by two moving forces at the ſame time, ſo that each of thoſe forces would by itſelf cauſe it to deſcribe the ſide of a parallelogram, uniformly in a given time; the body, in conſequence of their joint actions, will deſcribe the diagonal of that parallelogram uniformly in the ſame time.

Thus, ſuppoſe that the body A, *Plate* XXV. *Mechanics, fig.* 1, be impelled in the direction A D, by a force which would enable it to move at the rate of four feet *per* ſecond; alſo, that at the ſame time the ſame body be impelled by another force, in the direction A B, which would enable it to move at the rate of three feet *per* ſecond. Make A D equal to four, and A B equal to three (inches or feet, or any other meaſure to repreſent feet). Through D draw D C parallel to A B, and through B draw B C parallel to A D, which will complete the parallelogram. Draw the diagonal A C; and this diagonal will repreſent the direction and the velocity of the body, ariſing from the two impulſes which have put it in motion; ſo that at the end of one ſecond, the body will be found at C.

That the body thus impelled by two forces muſt move along the diagonal A C, is eaſily deduced from the ſecond law of motion: for, ſince the change of motion is proportionate to the moving force impreſſed, if from any point *c*, in the diagonal A C, you draw two right lines; *viz. d c* parallel to A B, and *b c* parallel to A D, thoſe two lines will repreſent the deviations of the body's motion from the directions A D and A B; ſince, by the ſecond law, the change of motion is made in the direction of the moving force impreſſed, and thoſe two lines are proportional to the impelling forces, or to the lines A B and A D, which repreſent thoſe forces. If it be ſaid, that the body thus impelled will at any time be found at ſome other place *o*, out of the diagonal A C, draw *o m* parallel to A D, and *o d* parallel to A B; then *o m* and *o d*, which repreſent the deviations, ought to be proportional to the forces which occaſion thoſe deviations, *viz.* to A D and A B. But this is not the caſe, becauſe the parallelogram A *d m o* is not ſimilar to the parallelogram A D B C. Therefore it appears, that the body muſt move along the diagonal A C, and in no other direction.

This theorem is aſſented to, or is acknowledged by all the writers on mechanical philoſophy; and it is from this that we derive the argument mentioned above in our definition of a *force*. Thus, ſuppoſe that the two impulſive forces which put a body A, *fig.* 2, in motion are equal, and that their directions form a very ſmall angle; A D being the direction of the one, and A B the direction of the other. Complete the parallelogram, which, on account of the equality of the impulſive forces, is equilateral, and draw the diagonal A C. In conſequence of the form of the parallelogram, it is evident that the diagonal A C is nearly equal to the ſum of A D and D C, or of A D and A B; *viz.* the velocity repreſented by A C is nearly double the velocity

represented by A D, or A B; that is, the velocity derived from the two impulses is nearly double the velocity derived by one of those impulses. Now if we suppose that the directions of the two forces come so near as to coincide, then the sides of the parallelogram will coincide with the diagonal A C; *viz.* the velocity represented by the diagonal will become exactly double the velocity represented by A D, or A B; and it evidently shews, that a double force produces a double velocity: for the two equal impulses joined together form a double impulsive force; and the velocity A C is double the velocity, which each of those impulses by itself would have generated.

In the above-mentioned case, the forces which would produce the movements along the sides of the parallelogram are called the *simple forces*, or the *constituent forces*; and their compound effect, which actually produces the movement along the diagonal of the parallelogram, is called the *compound force*, or the *resulting force*, or the *equivalent force*.

Now, as this compound effect is determined by finding the diagonal of a parallelogram, whose sides are the movements arising from the simple forces; so, when we have any uniform rectilinear movement of a body, we may consider it as the diagonal of any parallelogram, and may suppose it to be the compound course arising from two simple forces acting in the directions of the sides of that parallelogram. Thus, for instance, let a body A, *fig.* 3, move from A to B in a given time. We may suppose that the body has been impelled by a single force in the direction A B; or by two forces, one of which impelled it in the direction A E, and the other in the direction A F; or by two other forces, one of which impelled it in the direction A C, and the other in the direction A D; and so forth: for A B is the diagonal of the parallelogram A C B D, and of the parallelogram A E B F, and of an infinity of other parallelograms.

This mode of finding a compound course arising from more impulses than one, or of supposing that a given course is the result of more than one impulse, is called the *composition* and *resolution of forces*; and the application of it in mechanics is highly useful and extensive.

Besides the case of two forces, a compound course may arise from the joint actions of three, or four, or more simple forces; or it may be supposed to be the result of several simple forces. But the farther consideration of these more complicated cases, and their applications, &c. will be found under the article *Composition and Resolution of* FORCES.

The next step which demands consideration in the movements of bodies, is the collision of those which happen to go against and strike each other. This is generally reduced to three cases; *viz.* the bodies may run in the same straight line, but in contrary directions; they may run in the same straight line, and in the same direction, but the preceding going at a slower rate, so that the subsequent may overtake it, and strike against it; or, lastly, the two bodies may strike against each other in oblique directions. The effects of those cases differ according as the bodies are elastic or non-elastic. See COLLISION.

The above-mentioned movements arise from the action of simple impulses, and the particulars which belong to them are easily determined; but those which arise from the actions of pressures, or of actions constantly acting are much more intricate. These are called *variable motions*. A body actuated by a single impulse will, according to the first law of motion, continue uniformly in the direction of that impulse; but if, whilst so moving, another impulse acts upon it, then its motion will be altered; and if the direction of the second impulse coincide with that of the first, the velocity of the body will thereby be increased. If the direction of the second impulse be directly contrary to that of the former, then the first velocity will be checked; and, according to the ratio of the two velocities in opposite directions, the body may either proceed in its former direction, but at a slower rate; or, it may be entirely stopped; or, lastly, it may be obliged to go back with the excess of the second velocity above the first. If, instead of the two impulses acting in the same straight line, the direction of one of them be oblique to the other, then a compound motion arises, which must be determined according to the particular circumstances of the case. The body may also receive a third, a fourth, and many other subsequent impulses: these may succeed each other at equal or unequal intervals of time; and they may act either in the same, or in different directions: whence an indefinite variety of cases arises, which can by no means be comprehended under a few general propositions.

When a force acts continually and uniformly upon a body, it is the same thing as if equal impulses were repeated at equal and infinitely small intervals of time. In this case, the velocity of the body undergoes equal changes; and the force thus acting is called a *constant* or *uniform accelerating force*, or a *constant retarding force*, according as it tends to increase or to diminish the velocity of a body actually in motion.

The particulars which demand peculiar consideration, with respect to these forces, are the space described by the body thus set in motion, the time of description, the velocity acquired, the force which produces it, and the variations of those quantities, which arise from the difference of the forces, as well as of the masses upon which they act. The determination of these particulars (which will be necessary for the illustration of the following part of this article) has been concisely demonstrated by Mr. O. Gregory, in the following manner.

"Proposition. *The velocities generated in equal bodies by the action of constant forces, are in the compound ratio of the forces and times of acting.*

"For, when the times are the same, the velocities generated each instant are as the forces of acceleration, and consequently the velocities generated at the end of equal times are as those forces; and if the forces are the same, the velocities generated are as the times wherein the forces act: because, when the force is given, equal velocities are generated in equal times, and consequently the whole velocities required are as the times wherein the given force acts; wherefore, both times and accelerating forces being different, the velocities generated will be as the forces and times of acting, jointly.

"Cor. 1. *The momenta generated in unequal bodies are also conjointly as the forces and their times of action*.—This is evident, because momenta in unequal bodies may be substituted for proportional velocities in equal bodies, throughout the whole reasoning.

"Cor. 2. *The momenta lost or destroyed in any times are likewise conjointly as the retarding forces and their times of action*.—For, whatever momenta any force generates in a given time would an equal force destroy in an equal time, by acting in a contrary direction.

"And the same is true of the increase or decrease of motion, by forces that either conspire with or oppose the motions of bodies.

"Cor. 3. *The velocities generated or destroyed in any times are directly as the forces and times, and reciprocally as the bodies or masses*.—For, since the compound ratios of the bodies and their velocities are as those of the forces and times, the velocities are as the forces and times divided by the bodies.

"Proposition. *In motions uniformly accelerated, when the force*

force and body are given, the space described during a certain time is the half of that which the body, moving uniformly, would describe in an equal time.

"Since the velocities are as the times of description, when the body and force are given, the velocities which a given body is found to have successively for the duration of each consecutive interval form an arithmetical progression, g, $2g$, $3g$, &c. of which the last term is gt, or v, the number of terms being t, that is to say, being marked by the number of solicitations of the accelerating force. And since each of the velocities is nothing else than the space which the body would describe uniformly during the corresponding interval, the total space described during the time t, will therefore be the sum of the terms of this arithmetical progression; which, because g and v are the extremes, and t the number of terms, will be expressed by $\frac{1}{2}t(g+v)$. Or, if s be the total space described by the body, then will $s = \frac{1}{2}t(g+v)$. Conceive now that the accelerating force acts (as by hyp.) without intermission, or, which comes to the same, imagine that the time t is divided into an indefinite number of infinitely small parts, or instants, and that at the beginning of each instant the accelerating force gives an impulsion to the body. Then g being infinitely minute in relation to v, which is the velocity acquired during the indefinite number of instants denoted by t, must be omitted in the equation $s=\frac{1}{2}t(g+v)$, which will become simply $s=\frac{1}{2}tv$, the space actually described.

"This granted, imagine that at the end of the time t the accelerating force ceases to act; then, by the first law, the body will persevere in its motion with the velocity v it has acquired; but in uniform motions, the spaces described are as the times and velocities jointly; therefore the body moving with the velocity v, during the time t, will describe a space $s'=tv$; which is evidently double the space $\frac{1}{2}tv$, described by the body in an equal time, by the constant action of the accelerating force.

"Proposition. *The spaces described by a body uniformly accelerated are as the squares of the times.*

"Since the velocities acquired increase as the time expired, if ϕ be the velocity at the end of one second, then the velocity acquired after a number t of seconds will be ϕt: thus we have $v=\phi t$. The equation $s=\frac{1}{2}vt$, found in the preceding proposition, becomes therefore $s=\frac{1}{2}\phi t^2$. If, in like manner, we represent another space by S, which is described by uniform acceleration during the time T, we shall have $S=\frac{1}{2}\phi T^2$; hence we see, that $s : S :: \frac{1}{2}\phi t^2 : \frac{1}{2}\phi T^2 :: t^2 : T^2$.

"Cor. 1. Because the velocities acquired are as the times, we have also *the spaces described as the squares of the velocities.*

"Cor. 2. *Therefore either the velocities or the times are as the square roots of the spaces described from the commencement of the motion.*

"Cor. 3. All that has been shewn applies equally to motions *uniformly retarded*; provided that by the times, we mean those which are to elapse before the extinction of the velocity; and by the spaces, those which remain to be described until the body is brought to rest." See ACCELERATION.

Of forces acting irregularly, we shall not take any notice in this place; first, because they are not materially illustrative of the general theory; and, secondly, because they are very different from each other: whence they are better examined under other articles, to which they more particularly belong. The unbending of springs, the motion of a vessel upon water, when it first spreads its sails to the wind, &c. are instances of forces acting irregularly.

The principal accelerating forces, which occur in nature, are the *central forces*, *viz.* those attractive forces which are directed to a centre. Thus, the force of gravity, which constantly draws bodies towards the centre of the earth, is of this nature. Such also is the force which retains the planets of our solar system within their orbits, and which is directed to a common centre, situated not much distant from the centre of the sun; and a similar force retains the satellites in due distances from their primary planets.

The great difference between the forces which produce motions uniformly varied, and the central forces, is that the former do not take place in nature, and the latter become more powerful nearer the centre of attraction, and less so farther from it. In short, their power generally is inversely, as the square of the distance from the centre of attraction. Yet we have above added the demonstration of the particulars belonging to the former, because they are more easily understood, and more easily, as well as safely, applied to the phenomena of the ascent and descent of bodies, and to other phenomena upon the surface of the earth, within the limits of our observation, as will be presently shewn. As for the particulars relative to the central forces, comprising their decrease and increase of power, according to the distances, &c. they will be found under the article CENTRAL FORCES.

The observations which shew, that the phenomena of ascending and descending bodies upon the surface of the earth, may be referred to the action of uniformly accelerating forces, are clearly expressed by Mr O. Gregory in the following manner: "Gravity being that force which solicits all bodies to descend in vertical lines, or those which are perpendicular to the surface of the earth, it would follow that, if that surface, as composed of land and sea, were perfectly spherical, the directions of gravity would all concur at its centre. The earth, however, is not perfectly spherical; yet its variation from that shape is so trifling, that, with respect to the objects which fall under our observation, it need not be regarded. We have observed that the directions of gravity may be considered as parallel: that it may be seen to what extent this remark may be applied, let it be considered that a circle whose radius is 20,935,200 feet, will have more than 6000 feet for the measure of a minute of a degree, and upwards of 100 feet for that of a second; so that *the directions of gravity at two places on the earth's surface, a mile asunder, will not vary one minute from parallelism.*"

"As to the magnitude of the gravitating force, strictly speaking, it is different at different distances from the equator, and at different distances from the centre of the earth: but the quantities of those differences, so far as they depend upon the variety of situation on the earth's surface, are very small, and need not yet be attended to; and the differences resulting from different distances from the centre of the earth, will not be sensible in any cases respecting the fall of bodies. Thus, if two bodies were situated, the one at the surface of the earth, and the other at a mile above it, the difference in the attractions to which they would be subjected, would be nearly one part in 2000 of the whole attraction; so that as a mile is greater than any altitude, or any depth from the surface, with regard to which we shall have to trace the effects of falling or rising bodies, we may consider the force of gravity as constant. We consider, therefore, this force as acting incessantly, and acting equally at each instant upon every particle of matter. Now it is clear, that if every particle of a body receive the same velocity, the aggregate of the body will move with the same velocity as would have been impressed upon a single molecule: consequently, the velocity which gravity impresses upon any masses whatever, does not depend upon the magnitude of that mass; but it is the same with respect to the smallest

mass

mafs as the greateft. It is true, we do not, when bodies of different maffes and denfities defcend through the air, obferve them all to fall from the fame heights in equal times; but this is occafioned by the refiftance of the medium, and when that is taken away, as in the receiver of an air-pump, the moft denfe and the moft rare bodies fall through equal fpaces in equal times."

It is therefore evident, that the particulars which have been demonftrated above relative to the effects of forces acting uniformly, may be fafely applied to the afcent and defcent of bodies near the furface of the earth. According to thofe particulars, when bodies fimply fall from a ftate of reft, the velocities acquired are as the times; and the whole fpaces defcribed will be as the fquares of the times. Thus if

the times be as the numbers	1,	2,	3,	4,	5,	6,	&c.
The velocities acquired will be, as	2,	4,	6,	8,	10,	12,	&c.
The whole fpaces, as	1,	4,	9,	16,	25,	36,	&c.
The fpace for each time, as	1,	3,	5,	7,	9,	11,	&c.
Their conftant differences		2,	2,	2,	2,	2,	&c.

Now it has been found by means of accurate experiments, that a heavy body in the latitude of London falls nearly $16\frac{1}{12}$ feet in the firft fecond of time from its quiefcent ftate, and has then acquired a velocity which, if uniformly continued, would carry it over twice $16\frac{1}{12}$, or, $32\frac{1}{6}$ feet, in the next fecond; but the action of gravity upon the body continuing, the motion will be fuch that at the end of the next fecond of time, the body will altogether have paffed over 2^2, or four times $16\frac{1}{12}$, *viz.* $64\frac{1}{3}$ feet, and will have acquired a velocity of twice $64\frac{1}{3}$ feet *per* fecond, and fo forth.

From thefe data, and the particulars demonftrated above, we have the following real fpaces, velocities, &c. defcribed by bodies falling from a ftate of quiefcence near London.

If the times, in feconds, be	1,	2,	3,	4,	&c.
The velocities acquired in feet will be - - - -	$32\frac{1}{6}$	$64\frac{1}{3}$	$96\frac{1}{2}$	$128\frac{2}{3}$,	&c.
The fpaces in the whole times	$16\frac{1}{12}$	$64\frac{1}{3}$	$144\frac{3}{4}$	$257\frac{1}{3}$,	&c.
The fpaces for each fecond	$16\frac{1}{12}$	$48\frac{1}{4}$	$80\frac{5}{12}$	$112\frac{7}{12}$,	&c.

Thefe particulars, however, are fuch as would take place in vacuo; but in the air, the refults are confiderably different; that difference evidently arifing from the refiftance of that medium. The differences which have been obferved between the theoretical calculations, and the refults of actual experiments, may be feen under the article DESCENT *of Bodies*.

It has been fhewn above, that in the cafe of fimple impulfes, when a body receives two impulfes at the fame time, but in directions oblique to each other, the body will thereby be obliged to move with an equable motion along the diagonal of a parallelogram, whofe fides are the directions of the two impulfes. But when one of the forces which impell a body is a fimple impulfe, and the other is a continued preffure, or a force uniformly accelerating, then the body is obliged to move with a changeable velocity, in a curve line; the nature of which differs according to the nature of the acting forces. A bullet fired horizontally out of a gun is an inftance of this cafe; for, the force of the gun-powder impels it horizontally, and the force of gravity draws it downwards with an accelerating velocity; therefore the bullet moves in a curve, which, were it not for the refiftance of the air, would be nearly a parabola, as the great Galileo firft demonftrated.

Any other body projected in any other direction, does likewife move in a curve of a fimilar nature; excepting indeed when it is projected either perpendicularly upwards, or perpendicularly downwards; for in either of thofe cafes the body will evidently move in the perpendicular line, though not with a uniform velocity.

Let a body A, *fig.* 4, be impelled from A towards H, with fuch a force as would enable it to move along the equal fpaces A B, B F, F G, &c. in equal portions of time; for inftance, each of thofe fpaces in a fecond of time. Let at the fame time an accelerative force continually draw the fame body A towards the centre C, in fuch a manner as by itfelf wou'd enable it to defcend along the unequal fpaces A I, I K, K L, in equal portions of time, *viz.* each fpace in a fecond. Then, in confequence of the actions of both thofe forces, the body A will be obliged to move along the curvilinear path A N O P, &c. Through B, draw B C in the direction of the centre of attraction; and through I draw I N parallel to A B. Then it is evident that at the end of the firft *fecond* of time the body will be at N. Now if at this period the attractive force ceafed to act, the body would proceed in the direction N R, by the firft law of motion. But fince the attractive force continues to act, the body at the end of the fecond *fecond* of time will be at O, for the fame reafon as above: at the end of the third *fecond*, it will be at P, and fo forth. The courfe then, A N O P, is not ftraight, but confifts of the lines A N, N O, O P, &c. forming certain angles.

If inftead of finding the place of the body A at the end of every fecond, we had determined it for each thoufandth part of a fecond, then each of the lines A N, N O, &c. would have been refolved into a thoufand fmall lines inclined to each other. But fince the attractive force acts conftantly and unremittedly, therefore the path of the body A is not a polygonal courfe confifting of an infinite number of fides; but a continued curve which paffes through the points A, N, O, P, &c. as is indicated by the dotted line.

Upon thefe principles the movements of projectiles in military affairs are calculated, and are determined within a ufeful difference from the truth; for the variable obftruction of the air, and other interfering circumftances, prevent any very accurate determination of thofe particulars. See the article PROJECTILES.

In the above inftance of the two forces of different kinds acting upon the fame body, we fuppofed that the attractive force was fufficient to draw the body towards the centre of attraction. But if it be fuppofed that the equable motion arifing from the fimple impulfe be fo great in proportion to the attractive force, that the latter, though capable of drawing the body from its rectilinear courfe, is, however, not able to bring it nearer to the centre of attraction, than a certain limited diftance; in that cafe the confequence will be, that the body will continue to move in a curvilinear path round and round the centre of attraction, without actually coming to it. Now this fort of motion is called an *orbital motion*; or that curve path is called an *orbit*; and fuch are the motions of the planets in orbits round the common centre of attraction in our folar fyftem. See the article ORBITS.

The defcent of bodies arifing from the force of gravity is, in many cafes, modified by certain circumftances, which frequently and neceffarily occur, and on which account they are in need of examination. Thus the defcent of bodies upon inclined planes is one of thofe cafes; for inftead of defcending in a ftraight line perpendicular to the furface of the earth, the body is obliged to roll along the furface of the plane in an oblique direction. The vibrations of pendulums are likewife of this kind, and fo on. The principal of thofe cafes will be mentioned in the fequel.

When a body is placed upon an inclined plane, the gravitating power which draws that body downwards, acts with a force fo much lefs than if the body defcended freely and perpendicularly, as the elevation of the plane is lefs than its length.

If a body be placed upon an horizontal plane, the

force of gravity acting in a direction perpendicular to that plane, cannot draw the body one way more than another, therefore the body remains motionless; but if the plane be inclined, then the body will run down along the surface of it, and with greater velocity, in proportion as one end of the plane is more elevated above the horizon. When a plane is inclined to the horizon, and a body is laid upon it, the action of gravity is not entirely, but partially counteracted by the plane. From the centre A of the body, which is laid upon the inclined plane, *fig.* 5, draw A G perpendicular to the horizon, and A F perpendicular to the plane. Then the whole force of gravity, which is represented by the line A E, is resolved into the two forces, A F, and E F, whereof A F being perpendicular to the plane, is that part of the gravitating power which is lost, or which is counteracted by the inclined plane; and E F represents the other part of the gravitating power, which urges the body downwards along the surface of the plane. Therefore the force of gravity is diminished, in the proportion of A E to E F. But the triangles A E F, E D G, and B D C, are equiangular, consequently similar: therefore A E is to E F, as D B to B C; that is, the whole force of gravity is to that part of it which urges the body downwards along the surface of the plane, as the length of the plane is to its elevation.

The extension, which is described by a body descending freely from rest towards the earth, is to the extension which it will describe upon the surface of an inclined plane in the same time, as the length of the plane is to its elevation.

The gravitating force which draws a body downwards along an inclined plane, is only diminished by the intervention of the plane; but its nature is not otherwise altered, so that it still acts constantly; in consequence of which the motion of the body is continually accelerated, and the spaces it describes are also proportional to the squares of the times; but those spaces are shorter than if the body descended freely and perpendicularly; *viz.* they are to the latter as the elevation of the plane is to its length.

A body descending from a certain height to the same horizontal line, will acquire the same velocity, whether the descent be made perpendicularly, or obliquely, over an inclined plane, or over many successive inclined planes, or, lastly, over a curve surface.

It has been shewn above, that the velocity of a body descending freely in consequence of a constantly acting force, is as the product of the force multiplied by the time; and we have just shewn, that, upon an inclined plane, the force of gravity is diminished in proportion of the elevation of the plane to its length; whence it evidently follows, that the time of the body's running down an inclined plane must be increased in the inverse proportion; *viz.* that as the force is diminished, so the body is drawn downwards in longer time; that is, less forcibly.

Now, if the times increase in proportion as the force decreases, it evidently follows, that the product of the time by the force is always the same; *viz.* the velocity which a body acquires by falling from a given height is always the same, whether it falls perpendicularly, or along any inclined plane. And it is evident, that the effect must be the same when the body falls from the same height along a succession of inclined planes, or along a curve; for the whole height may be divided in parts each equal to the altitude of one of the inclined planes, and the same thing may be shewn at the end of each. And as a curve line may be conceived to consist of an infinite succession of inclined planes, the application to it needs no further illustration.

In the preceding explanation of the motion of a body upon an inclined plane, we have supposed the bodies, to be spherical, and the planes, as well as the bodies, to be perfectly smooth. But in practice this is not to be expected; for the smoothest bodies, in moving over one another, are, in some measure, affected by friction. The air, likewise, opposes its usual resistance, &c., in consequence of which, the motions of bodies, upon inclined planes, will be found in practice to differ considerably from the results of theoretical calculations. For farther particulars respecting this subject, see the article INCLINED PLANE.

Treating of the descent of bodies, we shall here barely mention a remarkable property of a curve, which, at first sight, can hardly be believed; for it shews that a body, descending from a superior to an inferior place, not in the same perpendicular, will arrive at the lower place sooner by going along a certain curvilinear path, than along a straight one. In short, *if two points be given in a vertical plane, but not in the same line perpendicular to the horizon, a body will descend from the upper point of the lower in the shortest time possible, if it be caused to move along the arch of a cycloid, which passes through those points, and whose base is an horizontal line that passes through the upper point.*

On this account, the *cycloid* has been called *the line of swiftest descent.* See CYCLOID.

When a body is suspended by a flexible string, or by a pin, which passes through a hole in it, and is fixed to a steady support; or, in short, whenever a body hangs down from any point, so as to be capable of swinging about that point, it is called a *pendulum*, or *pendulous body;* and as pendulums are of a most extensive use in mechanics, their properties have been investigated with great attention, both theoretically and experimentally. In the examination of the chief properties of pendulums, which will now be stated, we must suppose the pendulum to consist of a globular body, fastened to the end of a string, the other end of which is fixed to a pin; the string is supposed to have no weight, and to be perfectly flexible, so that the pendulum may move with perfect freedom about the point of suspension. In its natural situation, such a pendulum hangs straight downwards, in the direction of the centre of the earth; but if it be moved out of that direction, and be then let go, it will begin to swing, going backwards and forwards, and will continue that motion for a considerable time. Each of these motions, from one side to the other, is called a *vibration*, or an *oscillation;* and the particulars which become the objects of examination in pendulums, are the times in which the vibrations are performed under given lengths of pendulums, the velocities, which the pendulum alternately acquires and loses in the course of vibration, the momenta, &c. The propositions which follow will be sufficient to shew the connection between the vibrations of pendulums, and the other kinds of motion which are considered in dynamics. But farther particulars must be sought for under the article PENDULUM.

If a pendulum be moved out of its perpendicular direction C B, *fig.* 6, *to the situation* C A, *and there be let go, it will, of itself, descend towards the perpendicular* C B; *then it will ascend on the opposite side to* C D, *nearly as far from the perpendicular, as the place from which it began to descend; after which it will again descend towards the perpendicular, and thus it will keep moving forwards and backwards for a considerable time; making the vibrations continually smaller and smaller until it stops; which is owing to the obstruction of the air, and a little stiffness of the pendulum-string; for, without these obstructions, the pendulum would continue to perform vibrations of the same length for ever after.*

The body A will descend along the arc A B with an accelerated motion, in the same manner as if it descended over a curve surface A B; for it is evidently the same thing whether a body descends along such a surface, or is confined by the string C A, so as to describe the same curve. By the

the time the body A arrives at the lowest point B, it will acquire the same velocity as if it had descended perpendicularly from E to B, (from what has been said respecting inclined planes.) This velocity (abstracting the resistance of the air, &c.) would carry the body A beyond the point B, with a retarded motion, in an equal portion of time, as far from B as A is from it. The body A will then descend again, with an accelerated motion, towards B, and so on. For, since the velocity of the pendulum in its ascent is retarded by the same uniformly acting power, which accelerates it in its descent; *viz.* by the force of gravity; there must be the same time employed in destroying, as in generating it.

That, *ceteris paribus*, the weight of the pendulum cannot alter its time of vibration, may be easily derived from what has been said above, respecting the fall of bodies; *viz.* that, abstracting the resistance of the air, all kinds of bodies will fall from a state of quiescence, through a given extension, in the very same time.

The velocity of a pendulum, in its lowest point, is as the chord of the arc which it has described in its descent.

Thus, the body A, descending from A to B, will, when at B, have acquired a velocity which is proportionate to the chord of the arc A B, or to E B.

In estimating the length of a pendulum, a peculiar circumstance occurs, which is not obviously perceived, and the determination of which demands peculiar attention. When the pendulum consists of a spherical body, fastened to a string, a person unacquainted with the subject might, at first sight, imagine, that the length of the pendulum must be reckoned from the point of suspension, to the centre of the ball. But this is not the case; for the real length of the pendulum is greater than that distance, the reason of which is, that the spherical body does not move in a straight line, but it moves in a circular arc; in consequence of which, that half of it which is farthest from the point of suspension, runs through a longer space, than the other half which is nearer to the point of suspension; hence, the two halves of the ball, though containing equal quantities of matter, move with different velocities, and, therefore, their momenta are not equal. Now, it is, in consequence of this inequality, that the *centre of oscillation* (for so is the point denominated from which the length of the pendulum to the point of suspension must be reckoned,) does not lie between the two hemispheres; *viz.* in the centre of the ball; but it lies within the lower hemisphere, which has the greatest momentum. It evidently follows, that if the ball of the pendulum could be concentrated in one point, that point would be the centre of oscillation; so that the centre of oscillation is that point wherein all the matter of the body, or bodies, that may be joined together to form a pendulum, may be conceived to be condensed. The method of determining the situation of the centre of oscillation in any pendulum, will be found under the article CENTER *of Oscillation*. See also OSCILLATION.

In a pendulum thus vibrating about a point of suspension as has been mentioned above, whether it be a body fastened to a string, or an oblong solid like a rod, &c. the same point of oscillation is likewise called the *centre of percussion;* for this reason, that if a body be opposed to the pendulum whilst vibrating, at that point, it will receive the greatest stroke possible. And if the obstacle be opposed to any other part of the pendulous body, the stroke will be less powerful. This point does not coincide with the centre of gravity, as one might at first sight be easily induced to believe; nor does it coincide with the centre of oscillation in all cases. In short, the centre of percussion cannot be said to be the same thing as the centre of oscillation; but is that point in a body revolving about an axis, at which, if it struck an immoveable obstacle, all its motion would be destroyed, or it would not incline either way: so that if at the instant of the impact the supports of the axis were annihilated, the body would remain in absolute rest. The method of determining the situation of the centre of percussion in all cases, will be found under the article CENTER *of Percussion*. See also PERCUSSION.

During the preceding illustration of the various species of motion, whether uniform, accelerated, or retarded, and whether rectilinear or curvilinear, the impelling force has been generally considered as if it acted in the direction of the centre of gravity of the body; so that every part of the body might acquire the same velocity; or as if the whole body were concentrated in a single point. But in a great many instances the application of one or more forces is made out of the line which passes through the centre of gravity of the body, or of a system of bodies; in consequence of which that body, or that system, acquires a rotatory motion.

According to the various forms of bodies either single or in connection, and according to the various applications of a force or forces in different parts, a vast variety of cases of this rotatory motion may be easily conceived; and the principal of these cases will be found described in the present work according to the references that follow. In these cases of rotatory motion, the particulars which are principally deserving of mathematical investigation, are the following two points or centres, which we shall barely define in this place.

The centre of gyration, which is that point in a body, or system of bodies, in which, if all their matter were condensed, the same angular velocity would be generated in a given time, that would be generated in the whole body or system, by the same force similarly applied. See CENTER *of Gyration* and GYRATION; and

The *centre of spontaneous gyration*, or of *spontaneous rotation*, which is that point about which a body begins to revolve at the instant in which it is struck by a force acting out of the direction of its centre of gravity. Place a stick upon a smooth horizontal table, with one extremity out of the table. Strike that end in an horizontal direction, and immediately after the stroke, the above-mentioned extremity of the stick will begin to move in the direction of the stroke, whilst its other extremity moves in the contrary direction. Now it is evident, that between those two parts of the stick there must be a point about which those parts begin to revolve; and that is the centre of spontaneous rotation. See CENTER *of Rotation* and *Spontaneous* ROTATION, or *Spontaneous* GYRATION.

The various movements that are produced by the action of forces differently applied, in the endless variety of direction, of combination, of duration, and of power; can only be examined by reducing them into classes, according to the peculiarities which a certain number of them seem to have in common. In this manner we have, in the preceding pages, taken a general view of the whole, and have explained the principal properties of each kind of motion, so far as it seemed necessary to point out their extent and their general connection. But the reader has at the same time been referred to other articles for more ample and more satisfactory information. The only part of the subject which remains to be added for the completion of this article, is the application of the subject to useful purposes; with this view, therefore, we shall now add such general remarks as may suffice to manifest the vast importance of the general application.

Two very remarkable and very extensive objects are answered by the subject of dynamics. It enables the human being to comprehend and to explain the phenomena of nature,

nature, and it furnishes him with useful machines, by the use of which he becomes capable of accomplishing such wonderful effects, as would otherwise be utterly out of his power.

Sir I. Newton first conceived the grand idea of a general connection between the bodies of the universe. He thought that the celestial objects were actuated and connected by a general and mutual gravitation. Willing to prove the truth of the supposition, he first endeavoured to investigate the laws of such forces, or gravitating powers. One truth naturally developed another truth, until an ample demonstrative theory was formed. His next step was to examine how far the astronomical observations were conformable to that theory; and he was delighted to find an admirable coincidence, which confirmed the truth of the supposition. Subsequent mathematical improvements, farther discoveries, and much more accurate observations, have rapidly advanced the whole subject, so much so, that the present generation is thereby enabled to calculate and to foretel the nicest, astronomical phenomenon; whence immense advantages are derived, especially in navigation.

With respect to mechanical application, the reader may be pleased to consider how limited is the power of the bare limbs of a man; how great are the powers of the natural world; and what astonishing effects the human being can accomplish by employing those natural powers in a proper way. The immense force of the wind regularly applied, gives motion to powerful mills, and to other machinery; it drives very large and heavy vessels across the sea, &c. A stream of water is likewise applied to diverse useful purposes, many of which are so common as to be known to every body, So is the force of steam; the expansive force of gun-powder; the strength of animals; and so forth.

The use of machines, then, is for the purpose of applying natural powers to our advantage, or to perform that which the bare application of those powers could not possibly accomplish. A man, for instance, wishes to remove a stone of a ton weight from any particular place; his strength, unassisted by art, is inadequate to the purpose; but he takes a pole, or lever, which being applied in a proper manner, actually enables him to remove the stone. The vibrations of a pendulum are performed nearly in equal portions of time; therefore, by setting a pendulum in motion, and counting the vibrations, a man might measure time; but the motion of the pendulum requires to be renewed at times, and the counting of the vibrations requires a constant attendance, the performance of which would be an insufferable hardship. But all this hardship is removed by the contrivance of a clock, to which a man applies his power all at once, by raising a weight, or winding up a spring; then the power thus imparted to the spring, or weight, is gradually communicated to the pendulum, so as to keep it in motion during a day, a week, a month, and even a longer time. The other parts of the mechanism serve to reckon and to indicate the number of vibrations, under the denominations of seconds, minutes, and hours.

The number of machines that have been invented, that have been used, and that are actually in use, is really immense, and new ones are daily constructed. But all those machines consist of certain parts or simple mechanisms variously combined and connected with each other. Those simple mechanisms are commonly called the *mechanical powers*, and their number is not above six or seven. They are *the lever, the wheel and axle, the pulley, or system of pulleys, the inclined plane, the wedge*, and *the screw*.

Several writers on mechanics reckon the balance amongst the mechanical powers; but other authors do not; for in fact, there is no power gained by the use of the balance; and this gain of power undoubtedly is the characteristic property of the mechanical powers. There are some who exclude the inclined plane from the number of mechanical powers; whilst others consider it as one of the principal, and reckon the wedge and the screw as only species of it.

In each of those simple mechanisms, a force or power is applied at one end, in order to overcome a resistance at the other end. Thus with a lever, a man thrusts the end of a pole under the weight B, *fig.* 7, rests part of the pole, or lever, upon a firm obstacle, or prop, or fulcimer C, and applies his hand to the other end A of the lever. Then by lowering the end A of the lever, the weight will be raised, (supposing that the power of the man and the weight of B are not too disproportionate.) Now in this case the man's hand is the force or moving power, the weight B is the resistance which is to be overcome, and the pole is the lever, or the mechanical power, by which the man is enabled to raise the weight; which effect he could not have produced by the immediate application of his natural strength.

Instead of applying a man's strength to the end A of the lever, a weight may be applied to the same end, which, by a proper adjustment of the lever, may be made to raise the weight B much greater than itself.

If it be asked how it happens, that a small weight at A can lift up a much larger weight at B; the answer is, that by the motion of the lever the weight at A, which acts as the force or power, describes a much larger space than the weight B; and there is this general principle which holds good in all the mechanical powers, and which is demonstrated under the article *Mechanical Powers;* namely, that as long as the product of the weight at A, multiplied by the space through which it moves, exceeds the product of B multiplied by the space through which it moves; A will preponderate, and of course will lift up B. Suppose, for instance, that the weight at A be equal to 40 pounds, the weight B 300 pounds, the length A C twelve feet, and C B one foot. Then, since the arcs which the two extremities of the lever and the two weights describe, are as the distances A C and B C; multiply the weight A, *viz.* 40 pounds, by 12, which is the distance A C, and the product is 480; and multiply the weight B of 300 pounds by the distance B C of one foot, and the product is 300. Now, since 480 exceeds 300, the weight A must preponderate, &c. If the two products had been equal, the whole would have remained balanced and at rest.

The like illustration may be applied to all the other mechanical powers, as well as to machines of all kinds, whether simple or complicated; for in every one of them the following particulars must be indispensably found, *viz.* 1st. One or more bodies must be moved one way, whilst one or more other bodies move the contrary way. One of those bodies, or set of bodies, is called the *power*, and the other is called the *weight;* or they may be called *opposite powers.* 2dly. If the product of the weight of one of those powers, multiplied by the space it moves through in a certain time, be equal to the product of the weight of the opposite power multiplied by the space it moves through in the same time; then the opposite momenta are equal, and the machine remains at rest, or in a state of equilibrium. But if one of those products exceed the other, then the former will preponderate, and the parts of the machine must move in the direction of the preponderating power. In the above computation, however, a deduction must be made on account of friction, imperfection of workmanship, &c. which sometimes amounts to a considerable quantity; but there are no general

neral rules by which such deductions may be made with tolerable accuracy.

The complicated machines, which contain two, or more, and sometimes a great repetition of the simple mechanical powers, cannot conveniently be collected under general and comprehensive classes. Their number, their various uses, the different powers which actuate them, their sizes, and their effects, render the particular description of each machine too extensive and nearly impracticable. Yet it is to be wished that all sorts of machines were regularly described and delineated in a sort of general mechanical repository; for though several of those machines may not have answered the purposes for which they were intended, they are nevertheless of use to mechanical persons, who are contriving other machines for similar purposes.

In the examination of machines, it is peculiarly entertaining to observe how different the powers are from the effects of some of them, and by which means those effects are produced. Certain machines are formed to produce a regular effect from the application of an irregular power. Thus at the Albion Mills, (which were erected some years ago near Blackfriars bridge, and were afterwards unfortunately destroyed by fire,) the alternate strokes of the piston of a steam-engine were made to produce the regular rotatory motion of grinding-mills. In other machines a regular power is caused to produce an irregular, or an interrupted effect. Sometimes a power once applied acts gently during a considerable period of time; and at other times the accumulation of weak powers is made to produce powerful effects at stated times.

It is not only the production of a certain effect from a particular power, that should be observed in machinery; but the manner by which the object is attained should be carefully examined; for the simplicity of the means, the safety, and the durability of the machine, are the particulars which form the beauty of the contrivance, and upon which the skill of the contriver principally rests.

DYNAMOMETER, (from δυναμις, *power*, and μετρεω, *I measure*, meaning a measurer of power,) is the name of an instrument intended for measuring the muscular strength of men and other animals. An instrument of this kind was, some years ago, invented by Mr. Graham, and was afterwards improved by Dr. Desaguliers; but it was too bulky, and too limited in its use; so that it was soon neglected. Mr. Le Roy of the Academy of Sciences at Paris, constructed, soon after, a much more useful instrument for the same purpose. It consisted of a metal tube about a foot long, placed vertically on a foot like that of a candlestick, and containing in the inside a spiral spring, having above it a graduated shank terminating in a globe. This shank, together with the spring, sunk into the tube more or less, in proportion to the weight which pressed upon the globe at the top of the shank, and the graduation of the latter indicated the quantity of it. Therefore, when a man's strength was to be tried by means of this instrument, the man needed only press upon the above-mentioned globe with all his power, and the graduation of the shank indicated the quantity of that power, *viz.* it shewed the number of pounds weight to which it was equivalent.

Mr. Regnier, at Paris, at the instigation of Messrs. Buffon and Gueneau, contrived another sort of dynamometer. It consisted chiefly of an elliptical spring a foot long, and rather narrow. It was covered with leather, that it might not hurt the hand which compressed it. The strength of this spring was such as to exceed that of any animal to which it might be applied; and it contained an index with a mechanism which indicated how much it was compressed; or, which is the same thing, it indicated the quantity of the power which compressed the spring. Therefore, when a person wished to measure his power by means of this machine, he was obliged only to compress the elliptical spring with all his force, and to observe the quantity of that force as pointed out by the index of the machine. (See le Journal de l'Ecole Polytechnique, vol. ii.) Both the use and the construction of the last described machine were much extolled; but, upon a strict examination, it does not appear that it was superior to Le Roy's contrivance.

Since the above was made public, nothing peculiarly useful has been offered for the purpose of measuring the strength of animals. Yet upon the whole it seems, that the common well known spring steelyard, though not intended expressly for that purpose, is the best instrument for measuring the strength of men and other animals. In principle, it is nothing more than Mr. Le Roy's contrivance; but under a much more commodious form. It has a ring at one end, and a hook at the other. By endeavouring to pull those parts from each other, a graduated rod comes out of the external tube, and shews the force which has been applied to it. Therefore, by fastening the ring to an immoveable object, and the hook to a man, or horse, &c. by means of a rope or otherwise, the strength of the man or other animal may be easily ascertained. See SPRING STEELYARD.

It certainly is a desirable thing to know the various muscular power of men and animals, especially of such as are to be employed for work of various kinds; and upon the whole a pretty good estimate may be obtained from the use of the above-mentioned machine. Yet, it must be observed, that a determination of this kind is influenced by a variety of circumstances, which tend to render the result inaccurate or equivocal. For instance, a man is much stronger than another man in his hands, whilst that other man is much stronger than the former in his legs. One can carry a great weight upon his head; another can pull a great weight after him, that is, drag it over the ground, and so forth. Nearly the same thing may be remarked with respect to other animals. But the most material circumstance is the duration of the exertion, *viz.* certain men, and especially such as are young and well fed, but not much used to work, are capable of immense exertion during a minute, or an hour, or even a day; but they are incapable of enduring a longer duration of labour; whilst others go on with a uniform daily exertion during weeks and years. The same variety in the length of the exertion takes place in other animals, especially such as are more commonly used for labour, *viz.* horses, mules, oxen, camels, &c.

Fig. 1. *Plate* XXVI. *Mechanics*, represents one of the whippletrees, to which two horses or oxen can be applied, the cover of the mechanism being removed to explain its internal structure. A A is the main whippletree, having a hook at *a* to back it to the plough, &c., and two others to connect it with two short whippletrees B, B, by which the cattle draw; the hook *a* is fastened to a straight bolt *b*, sliding freely through holes in two pieces of iron plate *d*, *f*; a pin is put through the end of the bolt to prevent it being drawn quite through at *e*; a circular plate of iron is pinned fast upon the bolt *b*, between which, and the fixed plate *d*, a spiral steel spring is placed, which has a strong tendency to elongate itself, and draw the hook to the machine: *h* is a short rack fastened to the iron plate *e*, and turning a small pinion on the back of the index *i*, which points out the divisions on the arc *k*. The divisions are made by suspending weights from the hook *a*; these compress the spring in proportion to their weight, and the rack moves the index *i*; the value of each weight being marked on the arc *k* at the place pointed out by the index:

of

of courſe, when the horſes are harneſſed to the whippletrees B, B, and the plough, or carriage, to the hook *a*, the motion of the index denotes the force of their draught.

Fig. 2. is another machine on the ſame principle as the laſt, but is contrived ſo as to require a very delicate ſpring, which is found to be more ſenſible than a large one, and to keep its elaſticity longer: this is accompliſhed by having the hook *a* formed into two eyes at the other end, to receive the pivots of the lever *b*, whoſe fulcrum, or fixed centre, is at *d*; at the other end of the lever it is connected by a ſhort iron link *e*, to a ſecond lever *f*, of which *g* is the fulcrum: *h* is the ſpring barrel, exactly the ſame as the other machine, but much ſmaller, being only to weigh about 50*lb.* inſtead of 5 *cwt.*; its ſpindle is attached to the lever *f*, and is moved thereby when the hook *a* is drawn: the ſpindle of the ſpring has a rack *i* faſtened to it, which moves a ſmall pinion, on whoſe arbor the index to the dial-plate is fixed: the dial plate is in this machine a whole circle, deſcribed in the figure by a dotted circle, with large diviſions for hundred weights, and ſubdiviſions for the quarters. By means of the levers the power exerted on the hook is ſo far diminiſhed, that the ſmall ſpring of 50*lb.* will ſerve to weigh a quantity equal to 6 *cwt.*; and by increaſing the ſpring a little, and altering the levers, by throwing the hooks nearer the centres, and lengthening the levers, it may be made to do for 12 *cwt.* The mechaniſm is covered over with an iron box, to defend it from injury.

This machine is the invention of Mr. Robert Salmon, Woburn, Bedfordſhire, and they are now manufactured by Mr. Shepherd, implement-maker, Woburn.

This article is alſo the moſt proper place to deſcribe a method, employed by Mr. Salmon, to meaſure the force requiſite to give motion to a threſhing and flour mill at Woburn-Park farm, belonging to the duke of Bedford. The mill was originally worked by a horſe-wheel, adapted for eight horſes or oxen, though it is now worked by a ſteam-engine; but the horſe-wheel ſtill remains. It is repreſented in *fig.* 3, where A A is the main vertical ſhaft, having pivots at both ends, one of which works in a braſs ſocket, ſupported on beams, *a*, *a*, laid on the ground; and the other in a braſs bearing, bolted to the *a* beam, which is framed between two girders, B, B, of the floor above. D is the rim of the wheel, containing the cogs; it is compoſed of three thickneſſes faſtened together, and is ſupported by ſixteen arms, F, from the enlarged part of the ſhaft at E, and braced by ſixteen beams, L, extending from the lower part of the ſhaft to the middle of the arms. The horſes or oxen draw from upright pieces of wood, *a*. *a*, bolted to the arms, F, and braced by long iron bars from the adjoining arms. Eight of the arms are furniſhed in this manner, for the oxen to work the wheel: they walk upon a circular road at G G, on the level of the ground, while the ſhaft is ſunk in a pit walled round, to give a greater length of ſhaft, that the oblique braces may have more effect.

The method in which Mr. Salmon applied a dynamometer to this wheel was as follows: a piece of board, *b*, was extended between and nailed to the two uprights, *a*. *a*, by which the oxen drew; in the middle of the board a large pulley, *g*, was fitted, turning very freely, and upon as ſmall a pivot as was conſiſtent with ſtrength; another pulley, *d*, was ſuſpended from the arm of the wheel near the centre; a ſmall ſilk rope was paſſed over both pulleys, hanging ſtraight down from the pulley, *d*, and terminating in a double hook, and after paſſing round the pulley, *g*, was tied to the middle of a ſhort round ſtick. Four of the arms were fitted up in this manner, and two men were placed at each, holding the ſtick in their hands behind them. Mr. Salmon placed himſelf in the pit, being provided with a number of weights, ſome of which he hooked on the hooks at the end of the rope. He then directed the men to proceed forwards, in the track formed by the feet of the cattle, drawing the rope after them. Their action raiſed the weights, and cauſed the wheel to follow; but where the weights were drawn up towards the pulley *d*, Mr. S. added more weight, until it was ſo adjuſted that the wheel moved round with its proper velocity, without the weights riſing or falling above any point at which they were placed. The ſum of theſe weights now ſhewed the power required to move the mill; and the motion might be continued as long as was neceſſary to obtain a fair reſult. By this method, any ſudden jerk or exertion, which the men might make, would not be communicated to the wheel, as it would only draw up the weights, which would deſcend again, when the men relaxed their ſtrain.

The mill was employed in threſhing; and as this is a very unequal kind of work, it was often neceſſary to hook on more weights, to overcome the reſiſtance occaſioned by feeding the machine: for it muſt be obſerved, that no more power could be applied to the wheel than the ſum of the weights, as it was only through the medium of horſes that the men exerted any power at all upon the wheel.

The velocity of the wheel alſo depended upon the weights, for the heavier they were the quicker it would follow the men, who were directed to move at ſuch a pace, as the wheel ſeemed to take, that the weights might not deſcend by their going too ſlow, or aſcend by their going too faſt. The wheel's velocity was meaſured by a watch which Mr. S. had in his hand; and each turn of the wheel was denoted to him, by a nail which was drove in the rim of the wheel ſtriking a piece of tin plate nailed up againſt the wall. If he found by the watch the wheel was moving too ſlowly, he applied more weight, or *vice verſâ*, until the proper weight was found. Mr. Salmon made many experiments in this manner, on the force required to thraſh different kinds of corn, of which we ſhall give the reſults under THRESHING MILL.

DYNASTY, a term in *Hiſtory*, ſignifying a race, or ſucceſſion of kings of the ſame line, or family. The word is formed from the Greek, δυναστις, or δυναστυω, *to be powerful, to be king.*

We find frequent mention in ancient hiſtory of dynaſties of Perſians, Aſſyrians, Medes, &c. The ancient Chronicon of Egypt mentioned by Syncellus, gives us an account of three different dynaſties; that of the gods, that of the demigods or heroes, and that of men or kings. The two former are repreſented as continuing thirty-four thouſand two hundred and thirty-one years, in order to favour the high antiquity of the Egyptians; the laſt as commencing with the reign of Menes, the firſt king of Egypt, and terminating with Nectanebus II. under whom the kingdom was conquered by Artaxerxes Ochus; and this is ſaid to have laſted two thouſand three hundred and twenty-four years. Manetho has left us an hiſtorical chronology of Egypt, divided into thirty dynaſties, comprehending a ſpace of more than five thouſand three hundred years to the reign of Alexander: but it is certain, that theſe were collateral and not ſucceſſive.

DYOTA, in *Chemiſtry*, from δις, *double*, and ους, *ωτος*, a pelican, or circulating veſſel, with two ears, in ſhape reſembling a man ſtanding with his arms bent outwards, and with his hands on his ſides.

DYPTYCHA, or rather DIPTYCHA. See DIPTYCHA.

DYRAS, in *Ancient Geography*, a river which had its ſource in mount Oeta, and diſcharged itſelf into the Malian gulf, between Anticyra and Antheïe.

DYRNITZ, or TYRNITZ, in *Geography*, a town of Germany, in the archduchy of Auſtria; 17 miles S. of St. Polten.

DYRRACHIUM, now DURAZZO, in *Ancient Geography*, a town of Illyria, with a port on the Adriatic ſea, oppoſite to Brunduſium. It was formerly called Epidamnus, but the Romans changed it to Dyrrachium. (Pliny, iii. 26.) According to Strabo, this city was founded by a colony of Corcyræans. It is mentioned by Cicero, Pliny, Pauſanias, Pomponius Mela, &c. Its port was much frequented in the time of the Romans, by all thoſe who had occaſion to paſs from Brunduſium to Greece. At the mouth of the Adriatic gulf, the ſhores of Italy and Epirus incline towards each other; and the ſpace between Brunduſium and Durazzo, the Roman paſſage, is no more than 100 miles: at the laſt ſtation of Otranto, it is contracted to 50; and this narrow diſtance had ſuggeſted to Pyrrhus and Pompey the extravagant idea of a bridge. The city, being the weſtern key of the empire, was, previouſly to its ſiege, A. D. 1081, guarded by fortifications, and alſo by George Palæologus, a patrician, victorious in the oriental wars, and a numerous garriſon of Albanians and Macedonians, who had, in every age, maintained the character of ſoldiers. Accordingly, the courage of Robert Guiſcard was aſſailed, in the proſecution of his enterpriſe, by every form of danger and miſchance. His fleet was ſcattered by an unexpected ſtorm; and the diſaſter was ſo ruinous, that both his ſailors and ſoldiers were much diſpirited. Unſucceſsful in their firſt naval engagement, a ſally from the town, to which they laid ſiege, carried ſlaughter and diſmay to the tents of the Norman duke. A ſeaſonable relief was conveyed to the town; and as ſoon as the beſiegers had loſt the command of the ſea, the iſlands and maritime towns withdrew from the camp the ſupply of tribute and proviſion. The camp was ſoon afflicted with a peſtilential diſeaſe; 500 knights periſhed, and the liſt of burials comprehended 10,000 perſons. Under theſe calamities, the mind of Guiſcard alone was firm and invincible; and while he collected new forces from Apulia and Sicily, he battered, or ſcaled, or ſapped the walls of Durazzo. The beſieged were equally valiant and induſtrious in concerting meaſures of ſelf-defence. A moveable turret, ſufficient for containing 500 ſoldiers, had been rolled forward to the foot of the rampart; but the deſcent of the door or draw-bridge was checked by an enormous beam, and the wooden ſtructure was inſtantly conſumed by ardent flames. In the mean while the emperor Alexius, the founder of the Comnenian dynaſty, made a haſty peace with the Turks, and undertook in perſon the relief of Durazzo. Guiſcard, unalarmed, waited in battle-array the nearer approach of the enemy. Alexius, contrary to the advice of his wiſeſt captains, reſolved to riſk the event of a general action, and exhorted the garriſon of Durazzo to aſſiſt their own deliverance by a well-timed ſally from the town. After the firſt attack, the army of Guiſcard was reduced to 15,000 men. Many of his troops betook themſelves to flight; but when the Norman duke was on the verge of ruin, his wife, Gaita, by her ſingular valour and addreſs, ſucceeded in rallying the flying troops, and gave a turn to the battle, which rendered Robert completely victorious over an army five times more numerous than his own. After this deciſive battle, the ſiege of Durazzo was diligently proſecuted. At the dead of night, ſeveral rope-ladders were dropped from the walls; the light Calabrians aſcended in ſilence; and the Greeks were awakened by the name and trumpets of the conqueror. Yet they defended the ſtreet three days againſt an enemy already maſter of the rampart; and nearly ſeven months elapſed between the firſt inveſtment and the final ſurrender of the place, A. D. 1082. Gibbon's Hiſt. vol. x.

DYRZELA, a town of Aſia, in Piſidia. Ptolemy.

DYSÆ, in *Mythology*, inferior goddeſſes among the Saxons, being the meſſengers of the great Woden, whoſe province it was to convey the ſouls of ſuch as died in battle to his abode, called *Valhal*, *i. e.* the hall of ſlaughter; where they were to drink with him and their other gods *cereviſia*, or a kind of malt liquor, in the ſkulls of their enemies. The Dyſæ conveyed thoſe who died a natural death to Hela, the goddeſs of hell, where they were tormented with hunger, thirſt, and every kind of evil.

DYSÆSTHESIÆ, in *Medicine*, from δύς, *ægrè*, and αἰσθάνομαι, *ſentio*, implying an imperfect faculty of perception or ſenſation, is a term employed by Sauvages to deſignate the firſt order of the ſixth claſs of his noſology; and by Cullen, as the denomination of the firſt order of the fourth claſs in his arrangement of diſeaſes. In both theſe ſyſtems the ſame diſeaſes are included under the term, *viz.* thoſe maladies of the organs of ſenſe, which impede their functions: ſuch as cataract, amauroſis, &c. producing *blindneſs*; the varieties of *deafneſs*, depraved *taſte*, *ſmell*, and ſo forth.

DYSART, in *Geography*, a royal borough, in the ſhire of Fife, Scotland, was incorporated about the beginning of the 16th century; at which time it is mentioned as one of the principal trading towns in the ſhire. Its traffic declined about the commencement of the laſt century; but began to recover in the year 1756, and is now very extenſive; 36 veſſels being employed from this port in foreign trade. About 750 looms are worked here in the manufacture of checks, of which 795,000 yards are annually made. Ship-building alſo is carried on to a conſiderable extent: and upwards of 17,000 buſhels of ſalt are made yearly. But the principal trade is the exportation of coal, which abounds in this neighbourhood: upwards of 20,000 tons are annually raiſed, of which nearly 5000 are ſent to Denmark and Holland, whence wood is imported in return. The borough, with the three villages of Porthead, Galaton, and Borland, contain nearly 5385 inhabitants; the lower claſſes of whom are moſtly employed in making nails; ſome are engaged in the weaving, &c. of check-cloth, and ſome are occupied in ſhip-building. The ground on which the town ſtands, riſes gradually from the ſea for about a mile in extent, when it ſlopes again to the river Orr. Near Porthead, on a freeſtone rock, ſtand the ruins of an ancient fortification called *Raven's Craig*, the property of which has belonged to the family of St. Clair ever ſince the time of king James II.—Sinclair's Statiſtical Account of Scotland, vol. xii.

DYSCINESIÆ, in *Medicine*, from δύς, and κινέω, *moveo*, *I move*, ſignifying impeded or depraved motions, ariſing from diſeaſe in the moving organs, is the denomination given by Sauvages and Cullen to the third order of the ſixth claſs and the fourth claſs of diſeaſes in their reſpective noſological ſyſtems. The diſeaſes of *ſtammering*, *loſs of voice*, *dumbneſs*, *ſquinting*, and other *local* diſorders of motion, are included under Dr. Cullen's order, to which are added paſſy, *hemiplegia*, and *paraplexia* in the order of Sauvages.

DYSCRASY. See CRASIS.

DYSECÆA, from δύς and ἀκούω, *I hear*, the ſame with DEAFNESS, which ſee.

DYSENTERY, the *Flux*, or *Bloody Flux*, *dyſenteria*, from δύς, and ἔντερον, *inteſtinum*, the *bowels*, is a diſeaſe principally characterized by frequent mucous or bloody diſcharges from the inteſtines, while the proper fæces are retained, together with griping, and ſtraining at ſtool, and ſome fever.

The

The word *dysentery*, as used by the ancients, had no very precise signification. Originally its import was *an affection of the bowels* in general, and we find Hippocrates using it, not only to signify all ulcerations, but all hæmorrhages of the intestines (even those which are critical and salutary), and likewise every kind of flux, with or without blood. (Prorrh. 2. et Epidem. lib. ii.) It would seem, however, that, after his time, some of the other Greek authors, whose works are lost, were sensible of this want of precision, and therefore restricted the meaning of the word to an *ulceration* of the bowels, attended with gripes and *tenesmus*, (or straining,) and with mucous and bloody stools. For a disease with these symptoms Celsus calls *tormina*, and says it is the *dysenteria* of the Greeks; and Cœlius Aurelianus, retaining the Greek name, describes the dysentery much in the same manner with Celsus. (See Cels. De Med. lib. iv. cap. xv.—Cœl. Aurel. de Morb. Chron. lib. iv. cap. vi.) Yet Galen returns to the looser acceptation of the word, sometimes defining a dysentery, *an ulceration of the bowels*, at other times mentioning four species of that distemper, all with bloody stools; but of which only one agrees with the *tormina* of Celsus, or the dysentery of the moderns. Aretæus confines the term to an *ulceration* of the bowels. But, although this notion of the constant ulceration of the bowels, in conjunction with dysenteric symptoms, prevailed in all medical writings until the time of Sydenham and Willis; and although it be true, that the bowels are liable to be ulcerated in the true dysentery; yet it has been fully ascertained, by the dissections of the moderns, that ulceration is accidental, and not essential to the disease; and that instances even of fatal dysentery, (consequently of the disease in its most severe and protracted forms,) in which the intestines were found, are more numerous than those accompanied by ulceration. For this assertion, we have the authority of Morgagni, Bonetus, Cleghorn, and Pringle; the first of whom alleges, and it is now generally understood, that ulceration takes place only in the advanced or chronic states of the disease.

Dysentery appears to be the same disease under all circumstances of its occurrence, except in the degree of violence; which, as in other diseases, necessarily varies with the season, the constitution of the patient, and the degree of exposure to the exciting causes. Sir John Pringle affirms, that all the epidemic dysenteries, which he witnessed in the army, were the same; and that he was assured by Dr. Huck, and other army physicians, that this disease appeared, in different countries and climates, in Germany, Minorca, America, and the West Indies, with the same symptoms, and yielded to the same remedies; and, farther, that the epidemic described by Sydenham, as having occurred in London, in 1669 and the following years, was similar to the rest, as well as to the sporadic cases which he had met with in private practice, both in England and Scotland. The following is a detail of the symptoms and progress of the disorder.

The dysentery sometimes begins, as Sydenham observes, with cold shiverings, succeeded by heat, and other febrile symptoms; but in other cases these severish sensations are not felt, but a griping and twisting of the bowels, or stitches in the sides, or only a pain about the pelvis, with a constant fruitless straining to stool, and much flatulence, while the body is costive; sometimes, though more rarely, some degree of diarrhœa is the first appearance. In whatever way the disease begins, it soon puts on its characteristic appearances. The disposition to evacuate the intestines becomes more frequent and urgent, but in indulging it, little is voided, except a watery or slimy matter, and the *tenesmus* becomes considerable. From this time, until the favourable turn of the complaint, formed and natural excrements seldom appear, except when a purge operates well, and carries them down, and then they are in the form of *scybala*, or hardened, separate balls. When these are voided, whether by the efforts of the constitution, or by the interference of art, a remission of all the symptoms, and more especially of the frequent stools, griping, and *tenesmus*, succeeds. These *scybala* are of a firm texture, and round shape, having been formed in the cells of the *colon*, or great intestine, where they have lain in all probability from the beginning. The excrementitious discharges most commonly consist of a mucous matter, streaked or mixed with blood, and often with a serous or watery fluid, and fragments of a membranous appearance, consisting of coagulated lymph, but often taken for abrasions of the internal coat of the bowels: sometimes a pure and unmixed blood is voided in considerable quantity. The *serum*, sir J. Pringle observes, is perhaps one cause of the irritation, and descends from the higher parts of the intestines, whilst the *mucus* is mostly secreted from the *rectum*, or lower gut, in straining. Streaks of blood, he adds, denote the opening of some small vessels at the end of the *rectum*, but a more intimate mixture is a sign that the blood comes from a higher source. If the disease advances into a chronic form, a purulent, and sanious matter is often discharged, proceeding from ulcerated or gangrenous parts. The stools are all along distinguished by a peculiar smell, different from that of common excrements; it is faint, and not rank at first, but towards the end, when the bowels begin to mortify, the fœtor is cadaverous and intolerable.

When the disease is formed, sickness and vomiting frequently come on, and the appetite is generally lost. Some degree of fever is always present; which is various in its kind. Sometimes it is manifestly of an inflammatory nature; and, especially in warm climates, it is often of a remittent kind, and observes a diurnal or tertian period. Frequently, indeed, a flux in the beginning will have the appearance of the autumnal fever, and the patient will be feverish, with some disorder in the stomach and bowels, for two or three days before the dysenteric lax comes on; but after that, the fever sensibly gives way. This obvious diminution of the fever upon the appearance of the looseness, seemed to justify the expression of Sydenham, when he called the dysentery "the fever of the season turned in upon the bowels." But patients are besides liable to a low fever, which sir J. Pringle says, was commonly brought on by neglect of the case in the beginning, or by the use of opiates and other astringents before evacuations. But the most fatal sort of fever, which so often attends the dysentery of the army, though not essential to it, is the hospital or gaol fever, which at all times infects foul, ill-ventilated, and crowded wards. This fever, combined with the bloody flux, is generally mortal. These febrile states continue to accompany the disease during its whole course, when it terminates soon, in a fatal manner. In other cases the febrile condition almost entirely disappears, while the proper dysenteric symptoms remain for a long time after.

Under these modifications, the dysentery is of various durations in different instances. When the fever attending it is of a violent inflammatory kind, or when it is of a putrid nature, the disease often terminates fatally in a very few days, with all the marks of a supervening gangrene. When the febrile state is more moderate, or disappears altogether, the disease is often protracted for weeks, and even for months, and even then it often terminates fatally. More frequently, especially when occurring out of camps, and military hospitals, it ceases gradually, after proper treatment, the frequency and slimy composition of the stools, the griping and tenesmus, all ceasing, and natural stools returning. In other cases,

cases, the disease, with moderate symptoms, continues long, and ends in a diarrhœa, sometimes accompanied with lienteric symptoms.

In general the dysentery terminates at the lower extremity of the gut, or, as Sydenham says, "the disease at last is driven to the *rectum*, where it ends in a *tenesmus*;" *i. e.* the colon remains longer diseased than the smaller intestines, and the rectum is generally the last part that recovers. But the same physician observes, that the tenesmus remaining at the end of a flux, is not owing to an ulceration of the rectum; but that part he supposes to be the last depositary of the irritating mucus of the intestines. But sir J. Pringle explains it more rationally by ascribing this remaining tenesmus to the soreness of a part, which has been so much excoriated and inflamed during the course of the disease, and which, by the constant irritation of passing excrement, is still kept from recovering.

It is the sign of a bad case, says the last mentioned physician, when the first vomit and purge do not relieve; when the hectic fever increases; when the disorder of the stomach is obstinate; when the countenance alters much; when the pulse sinks and intermits; when the patient is restless without complaining of gripes. In the beginning a hiccup is little to be dreaded; but in the low and advanced state, if obstinate, it is commonly a sign of a mortification. The disease, when fatal, ends in a prostration of strength, a sore throat, or *aphthæ*, involuntary and cadaverous stools.

In the army, he adds, in the most favourable event, those men, who have been sent to an hospital, can be of little more service for the rest of the campaign; for no ailment is more apt to return upon errors in diet, or exposure to cold. Not that these returns are so much relapses into the true dysentery, as they are diarrhœas, but with more of the dysenteric symptoms than are common in the white-flux.

The *proximate cause*, or the actual condition of the intestines, upon which the symptoms above detailed depend, appears to be an inflammatory state of the mucous membrane, which lines the intestines, especially the great gut, together with a preternatural constriction of their muscular fibres. The existence of these two circumstances is sufficient to explain the symptoms. The retention of the natural fæces in the cells of the colon, especially in an inflamed state internally, will account for the non-appearance of natural excrement, and the constant desire to go to stool, for the pain and griping, and straining; which last will explain the production of streaks of blood, and in part the secretion of mucus, which the inflamed lining membrane so copiously pours out.

Accordingly *dissection* has generally discovered considerable constrictions in the colon, where gangrene had not destroyed the texture and form of the parts; and the proofs and consequences of inflammation were invariably detected. These are a preternatural thickening of the coats of the intestines; internal ulcerations in the colon and rectum; and abrasion or rather corruption of the villous coat into a slimy greenish substance; gangrene of the rectum and colon, sometimes extending the whole length of both; and occasionally a sort of pustular appearance, resembling the small-pox, in those parts. The small intestines are generally found inflated, but seldom in a diseased condition in any other respect.

Dysentery is to be distinguished from *diarrhœa*, chiefly by the *tenesmus*, or fruitless and distressing efforts at stool, by the absence of natural feculent matter in the discharges, and the smallness of the evacuation and frequent attempts; as well as by the febrile condition, which accompanies these symptoms, in the acute and early stages. From *colic* and *cholera*, in both which there is pain and griping, and in the latter, fever, it is easily discriminated; by the constipation and acuteness of pain in colic, and by the profuse evacuations of bilious matter by stool in cholera, without tenesmus.

The *exciting causes* of dysentery have been differently stated by different physicians. The army physicians have attributed the disease to the combination of heat and moisture, or an alternation of these with cold; because it usually appears in camps and in warm countries towards the end of summer and in autumn, after great and continued heats, and at the same time with the autumnal remittent and intermittent fevers. Willis observes, that the summer of 1670 (which preceded the autumn in which the flux was at its greatest height) was remarkably hot; and sir J. Pringle states, that in the summer of 1762, the heat and drought were of long continuance, and in the autumn the dysentery prevailed in London extensively, so that he believes more cases then occurred, than in all the sixteen years that he had previously resided here. He farther remarks, that when, at that period of the year, the men are exposed to night-damps and fogs, especially after a hot day, or lie wet upon the ground, or in wet clothes, part of them will be seized with the autumnal fever, and part with the dysentery, and perhaps some of them will have a disorder compounded of both.

Dysentery, however, is *contagious* in camps and hospitals. "In the camp," says Dr. Pringle, "the contagion passes from one, who is ill, to his companions, in the same tent, and from thence perhaps to the next. The foul straw becomes infectious. But the greatest sources of infection are the privies, after they have received the dysenteric excrements of those who first sicken. The hospitals likewise spread it; since those who are admitted with the flux, not only give it to the rest of the patients, but to the nurses and other attendants of the sick." This is most conclusive evidence of its strongly contagious nature, under those circumstances. But we have also evidence of the limited extent of the influence of this, as of other contagious *effluvia*. (See CONTAGION.) "In general the contagion does not suddenly spread. For whole towns and camps are never seized at once, from the impurity of the atmosphere, but the infection is carried from one to another by the *effluvia*, or clothes, or bedding, &c. of the tainted person, as in the case of the plague, small-pox, and measles." At Nimeguen, the Jews, who had little intercourse with the rest of the people, escaped the epidemic dysentery. (See Degner. Hist. Dysent. biliosо-contagios. cap. i. § 55.) Dr. Cullen has asserted that dysentery is always contagious; he believed that cold never produced the disease, except when the contagion had been previously received; and that a specific contagion was the sole exciting cause of dysentery. (First Lines, § 575.)

This position we are disposed to consider as erroneous. Sydenham makes no mention of any contagion, attending the epidemic dysentery, which he has described; and Willis, who speaks of the same epidemic, expressly asserts that it was not infectious. It is a common disease in this metropolis, in a sporadic form, and during the last autumn (1808) was prevalent to a considerable extent; yet we do not recollect to have once observed it to pass to a second person in any family; while its origin could be often satisfactorily traced to exposure to cold and moisture. In this respect, too, the analogy of CATARRH corroborates the notion of its being under one form contagious, and under another simply the effect of the operation of cold. The common sporadic examples of catarrh, which we witness every day, are so notoriously the effect of this agent, that the disease itself is denominated *a* COLD, by a figure of speech. Yet there can

can be little doubt, that, under the form of INFLUENZA, the catarrh is an infectious disease.

Many writers have ascribed the dysentery to the use of fruit, or to the overflow of bile, or to both these causes. But their opinions have erroneously arisen from the circumstance, that the season of the prevalence of dysentery is usually that, in which fruit is abundant, and bilious diseases occur; namely, the end of summer, and the autumn. Sydenham, however, who considers fruit as a cause of CHOLERA, never mentions it as the occasion of the dysenteries, which were epidemic in London in his time; and Degner, another diligent observer, expressly says, that fruit had no share in producing the flux which raged some years ago at Nimeguen. Sir J. Pringle is decided in his denial of the effects of fruit in exciting dysentery. He observes that the soldiers could not afford to procure fruit; and besides he states that the worst flux, which prevailed in the army, in which he served in the Low Countries and in Germany, began in the end of June, when there was no other fruit but strawberries, which the men never tasted; and that it nearly ceased about the first of October, when the grapes were ripe, and so plentiful in open vineyards, that the men eat what quantity they pleased. As to the bile, it is certain that occasionally a cholera terminates in a dysentery; but this is very rare, and is often to be attributed to the unseasonable interruption of the discharge by astringents, and strong opiates. Where the bowels are very irritable, any unusual determination to them may bring on dysentery.

Cure.—It has been justly observed, that there are few acute diseases less indebted to the natural efforts of the constitution for a cure, or in which the apparent indications are more deceitful, than dysentery. The constant flux seems to require the administration of strong astringents, and the great pains and gripings in the bowels appear to demand the free use of opiates: and yet these remedies, unless employed with much caution, or corrected by others, tend much more to confirm than to remove the disease. On the other hand, purges and emetics, under such a state of irritation and perpetual discharges, would appear to be inadmissible, and have been condemned; yet later experience has shewn them to afford the chief means of cure.

We shall follow sir J. Pringle in treating of the method of cure, under three different states of the disease: namely, first, in the *acute* state of the disease, or while it is recent; secondly, in the *chronic* state, or when the disorder is of a bad kind, has continued long, and has much impaired the strength, injured the intestines, and induced a hectic fever; and, thirdly, when the patient, although recovering, is kept low by a *tenesmus*, or some other remains of the disease, or becomes subject to frequent returns of a looseness, from the weakness of his bowels.

I. In the *acute* state.—In very strong habits, and where inflammatory symptoms, either accessory, or belonging to the disease itself, run high, a moderate bleeding may be permitted. This, however, is very rarely necessary, especially in sporadic cases; and the repetition of it may be considered as generally unnecessary or hurtful. The principal object of cure, in a recent case of dysentery, is to obtain a full evacuation of the intestinal canal, by which means the *scybala*, or hardened excrement, or the morbid secretions into the canal, may be removed; at the same time to take care that the inflammatory condition of the mucous membrane, lining the passages, be as little affected by the irritation of the process as possible. This evacuation indeed is sometimes contrary to the inclinations of the patient, who conceives that his bowels are already too much griped and purged; and *à priori* it might justly be supposed, that any additional irritation, from a purgative substance, would be hurtful, did we not recollect that we thus remove a much greater irritation, the hardened fæces, which actually cause or keep up the disease.

It is desirable, therefore, to adopt the mildest means of evacuation, which are adequate to the full effect. Emetic substances, especially antimonial preparations and ipecacuanha, have been much employed for this purpose, administered in such a way as to act upon the bowels. The *vitrum ceratum antimonii, glass of antimony*, or vitrified oxyd of antimony melted with wax; was strongly recommended (see Edin. Medical Essays, vol. v.) as a cure for dysentery, and used by sir J. Pringle, and many other practitioners, with success. It always occasioned vomiting, and generally purging, with which last operation its success was observed to be particularly connected. But the uncertainty and occasional violence of the effects of this medicine have caused it to be generally laid aside by practitioners. A vegetable emetic was introduced by PISO, as a specific against dysentery, namely, the ipecacuanha root. He relied on its purgative quality, however, though he adds, that it still had a better effect when it vomited also. (See Gul. Piso. Hist. Nat. et Med. Indiæ Occid. lib. ii. cap. ix.) Sir John Pringle used this as his first medicine in the commencement of dysentery, and found it most certainly successful, when given in divided doses, of five grains each, at the intervals of an hour. Three doses generally brought on a purging; no drink being allowed until that effect was produced, and then some gruel was taken to promote it.

But since it has been clearly ascertained, that the salutary operation of these and similar medicines, consists entirely of their cathartic effects, and that those substances, which possess a purgative quality only, are equally efficacious and more certain in their operation, the latter are now generally employed. Various cathartic medicines have been adopted upon theoretical principles, or from observation, in the treatment of dysentery. Rhubarb was formerly much used, because its purgative operation was followed by an effect of astringency, upon which principle, by the way, PISO recommended the ipecacuanha; but, on the contrary, it seems desirable that we should use a purgative, which may leave the body open. Among the mildest and most certain means of procuring evacuations from the bowels, are the neutral salts, especially the soluble tartar, or *tartrite of potass*, and the Epsom salt, or *sulphate of magnesia*, well diluted, and with the addition of cinnamon, or peppermint water, in divided doses of a ʒ; or two drachms every hour or two, till an evacuation is procured. The castor oil, *oleum ricini*, *senna*, and *manna*, have been used with success; and calomel alone, or with rhubarb, is an efficacious medicine: sir J. Pringle used to administer five grains of calomel with thirty of rhubarb. But he justly observes, "that we are to attend less to the dose than to the effects, which are not to be judged of by the frequency, but by the copiousness of the stools, and by the relief which the patient finds from the gripes and *tenesmus* after the operation; and that, as on the one hand, the physician ought to avoid all the rough and stimulating purges, so on the other he is not to spare those of a lenient kind, especially rhubarb, which is commonly under-dosed." Rhubarb, however, is much condemned by other writers.

But it is necessary to remark, that the cure cannot always be readily effected by purgatives alone. The irritation which they occasion, under the tender state of the internal coat of the intestines, in dysentery, tends, in many instances, to counteract the good effects of the removal of the *sordes*. It has been the custom, therefore, with practitioners in general, to give an opiate in the evening, after the purgative operation

operation was accomplished; to repeat the purgative, at the interval of a day or two, interposing opiates, especially in the evening of the day of purgation; or to alternate purgatives and opiates, until the state of the bowels become natural. It is singular, that our great physician, Sydenham, recommends the interposition of cathartics only in the epidemic dysentery, when the disease assumes a more severe form; and used opiates alone for the cure of the milder or sporadic cases of the disorder. This is certainly inconsistent with the observation and experience of succeeding physicians: for even in the mildest instances of dysentery, opium, while it gives a temporary relief to the pain and tenesmus, is observed but to postpone their severe occurrence, and to protract the complaint, which it rather confirms than removes, by retaining "the enemy within the bowels." In the more usual forms of the disease, the general voice of experience has decided, that opiates, given previous to or without purgation, aggravate the disease. Indeed sir George Baker, and some other authors, strongly condemn the use of opiates, until the stools have become natural, in consequence of the full evacuation of the bowels: they affirm that opiates, like other astringent medicines, gives rise to *tympanites*, by retaining the fæces and morbid secretions within the intestines.

We are satisfied, however, from observation, and we have no less authority in our favour than the practice of the late Dr. Warren, (see Medical Transactions of the Coll. of Phys.) that opiates may be used, from the first appearance of the disease, with advantage, provided an evacuation be procured at the same time, by the combination of purgative medicines with them. The conjunction of opium with cathartics is an useful practice in extremely irritable conditions of the bowels; it retards, but scarcely diminishes, the operation of the purgatives, the irritation of which it in a great measure prevents. We have known instances of dysentery, which had received but a temporary removal from the alternation of cathartics and anodynes, yield at once to the combination of them, especially of opium with calomel. Dr. Cleghorn, after mentioning two modes in which dysentery begins, observes, "in both cases, when other means have failed, six or seven grains of calomel, with a grain of opium at night, (after the use of the *semicupium*,) and a purging apozem, made of senna, manna, and sal catharticum, the next day proved successful, and brought off a prodigious quantity of round, hard, fœtid lumps, to the great relief of the patient: nor is it easy to conceive," he adds, "how so much had been collected, or where it had lodged so long, as in some cases I have observed; the patient having eat nothing for two or three weeks that could furnish much excrement, and during that time had taken several glysters and common cathartics, which brought away liquid stools." (On the Diseases of Minorca, chap. v. p. 252.) In such cases, it is clear that the opiate aided, instead of impeding, the operation of the cathartic; probably by relaxing the constriction of the muscular fibres of the bowels, which we have already noticed as constituting part of the disease, and which retained the hardened excrement, in spite of the operation of cathartics alone.

II. But if medicines have been altogether neglected, or improperly or unsuccessfully administered, during the early and acute stage of the disease, the fever becomes more of a hectic form; the pulse more feeble and small; the strength is considerably impaired; and the body more or less emaciated; while the griping and tenesmus remain, and the stools continue small, frequent, and slimy; with various other appearances of the fæces, which require attention, as indicating the probable degree and mode in which the intestines are disordered; such as simply slimy or mucous evacuations, those streaked or tinged with blood, or containing ragged membranous appearances, scybala, or purulent and sanious matter.

In this stage of the disease, evacuation of the offending matter from the bowels is still the leading object of medicine; with this difference, that the mildest means are now more requisite, and that it may be particularly useful to sheathe the inflamed intestines from the acrimony of morbid and acrid secretions; to aid the operation of laxatives, by means of bland, mucilaginous, or oleaginous fluids; and to procure a respite from pain and spasm by anodynes. For the former purposes, the castor oil has been particularly recommended, or any mild oil combined with tincture of rhubarb. Manna, and the mild neutral salts, sometimes combined with oil or manna, have likewise been successfully employed; and the neutral salts, with mucilaginous diluents, and opiates in conjunction, are well adapted to these purposes. Emollient and anodyne glysters were found beneficial by sir John Pringle in this stage of the dysentery; such as a decoction of linseed, or of starch, or fat mutton broth, in the quantity of from four to eight ounces, according as more or less could be retained. When the irritability of the lower bowels and tenesmus were so great, that those glysters were rejected, the tincture of opium was added. But sir John acknowledges, that the parts were often so tender, as to render it impossible to adopt that practice. And in fact it not unfrequently happens, that the introduction of the pipe into the *anus* cannot be borne, in consequence of the inflamed and excoriated state of the *rectum*. In such cases, a pill of opium may be sometimes introduced within the gut with great relief to the frequency of the motions, and to the griping and tenesmus.

The food and drink should be contrived of a bland and demulcent nature. With this view, the diet may consist chiefly of rice or barley-gruel, of sago, arrow-root, panada, light pudding, or preparations of milk. Animal broths were at first allowed by sir J. Pringle, when the patients were but slightly feverish; but experience taught him, that animal food in any form was in general improper. Objections have been made to the use of milk diet in dysentery, in consequence of an observation of the author just named, that some white substances, passed in the stools, and which have been called *corpora pinguia*, were found, in a case examined by Dr. Huck and himself, to be pieces of *cheese*. But it is much less difficult to suppose, that these cheesy matters were the remains of that indigestible substance, which had lain in the intestines since the commencement of the disease, like the *scybala* mentioned by Dr. Cleghorn, than to believe that an actual cheese-making process goes on in the alimentary canal, from the milk that is swallowed. We cannot but deem a milk-diet the most favourable to recovery, while the hectic fever is kept up in consequence of slow inflammation, or ulceration, in the internal coat of the lower intestines.

For drink, in this stage of the disease, rice or barley-water, toast and water, linseed tea, or a decoction of starch with gum-arabic, seasoned with some simple cinnamon water and sugar, have been employed; and preparations of wax have been long in repute for their virtues in dysentery. Bates recommended a solution of it in spirits, and Diemerbroeck praises it when dissolved in milk. In a spirituous form it is to be strongly deprecated; and the oily and mucilaginous demulcents appear to be on the whole preferable to wax. M. Senac, physician to the French army, informed sir J. Pringle, that after bleeding and administering an emetic of tartarised antimony, he succeeded in curing dysentery by giving one grain of that antimonial, dissolved in a pint of common whey or chicken-water, every day, in divided draughts,

draughts, which ſerved for all food, drink, and medicine, till the patient recovered.

For mitigating the griping pains, and relieving flatulency, ſtimulant *carminatives*, as they have been called, ought not to be employed. Fomentations or the warm bath are often ſerviceable for this purpoſe; but the ſymptoms are moſt effectually relieved by a free evacuation of the bowels, from a laxative combined with an opiate. Where morbid acidity prevails in the firſt paſſages, with heartburn, the abſorbent earths, ſuch as chalk and magneſia, are beneficial.

When the flux continues till the ſtrength is much impaired, and the pulſe ſinks, while the hectic heats remain, the danger is great: though there are ſtill hopes, as long as there are neither involuntary ſtools, nor *aphthæ*, nor a hiccup, and while the patient does not complain of great loweneſs and anxiety about the *præcordia*. If theſe ſymptoms are preſent, the caſe is moſt unfavourable, and ſcarcely admits of palliatives; ſince opiates have but little effect in eaſing the pain, or checking the frequency of the ſtools.

III. But if the general ſymptoms of the diſeaſe are removed, and the patient is chiefly kept low by the irritation of a teneſmus, or by frequent returns of a diarrhœa, from the weakneſs of his bowels, opiates, aſtringents, and bitters will be uſed with advantage. The teneſmus, in this caſe, is occaſioned principally by the increaſed ſenſibility and tenderneſs of the bowels, eſpecially of the *rectum*, which renders the paſſing of every matter, even the proper ſecretions, painful. The introduction of a pill of opium, with or without the extract of *cicuta*, is often in ſuch inſtances particularly uſeful. Sir J. Pringle recommends a preparation of mutton ſuet in milk, with a little finely powdered ſtarch, to be taken internally as food, under the ſame circumſtances. When the ſtomach and bowels are ſo enfeebled, that a *lientery* is occaſioned, the food being carried off imperfectly digeſted, the aſtringent vegetable ſubſtances, ſuch as logwood, *catechu*, *ſimarouba*, &c. with opiates, muſt be adminiſtered. Diaphoretic medicines, by tending to reſtore the exhalation from the ſkin, and thus to alter the determination of fluids to the inteſtines, are alſo frequently beneficial.

During this aſtringent courſe, attention to the diet will ſtill be requiſite. It ſhould ſtill be of a light, eaſily digeſtible, and nutritious quality, conſiſting much of milk, vegetable ſtarches, ſuch as ſago, ſalep, and arrow-root, rice, and the common *farinacea*; greens, and other laxative and flatulent articles, being ſparingly uſed or avoided. It has been remarked by the beſt writer on this ſubject, ſo often quoted, (Pringle,) that he has often known a cure obtained, when aſtringents have been of no avail, by a milk and farinaceous diet, without them.

Together with the uſe of theſe remedies, exerciſe in the open air, regularity of life in reſpect to the hours of eating, ſleeping, and riſing, and every other means of reſtoring the functions, ſhould be adopted: and nothing is more conducive to prevent relapſes of the flux, or of the diarrhœa, than warm clothing, eſpecially the uſe of flannel worn next the ſkin. See Pringle on Diſeaſes of the Army, p. iii. c. 6. Cleghorn on the Diſ. of Minorca. Cullen Firſt Lines, § 1067. See alſo an ample liſt of references in Cullen's Noſology, gen. 41.

DYSMENORRHŒA, painful menſtruation.

In ſome women, more eſpecially about the period of puberty, the diſcharge of the catamenia is preceded and accompanied by pain, ſometimes in a very violent degree, about the loins and pelvis, and other parts connected with the uterus. The ſtomach often ſympathiſes with this morbid condition of that organ, and nauſea, loſs of appetite, and even vomiting take place; and there is a general languor of the whole frame, ſometimes amounting to actual fainting. This diſorder occurs moſt commonly in delicate females, and the health is uſually indifferent in the intervals; occaſionally there is a ſlight diſcharge of the nature of *leucorrhœa*. Very rarely it has been obſerved that this pain and diſorder have attended every period of menſtruation through life.

The patient ſhould be kept quiet, or confine herſelf to bed, when the period returns; the bowels ſhould be kept gently open, and warm diluent drinks uſed freely. The two expedients, which afford the moſt effectual relief, are the uſe of opium, either internally or by glyſter, or both; and the warm bath, or ſemi-cupium, the good effects of which are partially obtained by fomentations to the lower region of the abdomen, and to the lower extremities. Dr. Hamilton, the preſent profeſſor of midwifery at Edinburgh, recommends the free uſe of the inſpiſſated juice of the hyoſcyamus, as a preferable narcotic in this painful complaint. He orders from two to four grains every hour, till the pain is mitigated. The earlier the medicine is adminiſtered the better, and the ſmaller the doſe of the medicine required to produce relief. Opium, however, has ſeldom failed, under our obſervation, to alleviate the diſorder. The following are the obſervations of Dr. Fothergill upon this topic.

Let the patient have by her a few pills of the *extractum thebaicum*, one grain each, made ſoft with a little of any kind of conſerve. She is to take one of theſe pills the moment ſhe finds the pain attending this diſcharge coming on. A pill may be taken every hour till the pain goes off; they ſeldom require more than two of theſe pills; one is often ſufficient, if given early; and it ought to be a conſtant rule obſerved in adminiſtering anodynes, to give them, when they are plainly indicated, early. It requires much leſs of an opiate to obviate pain than to quiet it when acute.

When the time is paſt, a courſe of chalybeate bitters, in ſmall doſes, may be continued till within a few days of the return; and the belly ſhould be kept open by ſome proper laxative: two or three grains of the *cathartic extract*, with half the quantity of *calx antimonii illota*, taken every night, will often ſucceed perfectly well. The anodyne muſt ſtill be in readineſs to take when the pain comes on, and to be taken to ſuch a quantity as to mitigate the pain, be the doſe what it may.

This excruciating pain ſeems to be ſpaſmodic, and to proceed from the extreme irritability of the uterine ſyſtem: the blood naturally determined hither, in order to its being diſcharged, by diſtending the very irritable veſſels, occaſions the ſpaſm; this produces a conſtriction of the veſſels; they become impervious, and the *niſus* to the diſcharge continuing, the pain becomes exquiſite and general, till the patient, worn out with the ſtruggle, is debilitated and ſunk; the fluids are then diſmiſſed, ſome eaſe ſucceeds, but the patient is often ſo reduced, as not to recover her uſual ſtrength before ſhe has another conflict to undergo.

Dr. Fothergill remarks that the *fluor albus* is frequently the conſequence of this ſtruggle, and that it would ſeem as if the uterus itſelf was ſo far a ſufferer as to be rendered by degrees leſs fit for fecundation. I think it has been obſerved by other phyſicians, he adds, as well as myſelf, that few of thoſe who have ſuffered much in the manner here deſcribed, have borne children. See Medical Obſervations and Inquiries, vol. v.

DYSODA, in *Botany*, from Δυωδία, *fœtid*, a name given by Loureiro to the *Lycium fœtidum*, which he rightly ſeparated from *Lycium*, but which Juſſieu has called *Seriſſa*, and the latter is now adopted. See Seriſſa.

DYSODIA, in *Medicine*, from δύ; and ὄζω, ὀζέω, is a genus

genus of diſeaſe conſtituted by Sauvages, including the variety of fœtid exhalation or bad ſmells ariſing from the body, as from ſores, bad breath, &c. See his Noſol. Meth. claſs ix. g. 35.

DYSOPIA, is the title of a *genus* of diſeaſe in Dr. Cullen's arrangement, ſynonymous with the *amblyopia* of Sauvages, and comprehending thoſe varieties of depraved or imperfect viſion, which require a particular quantity of light, a particular diſtance, or poſition of the objects. The term includes the *hemeralopes* and *nyctalopes* of authors, or thoſe who are blind except in twilight or in the broad day-light, and alſo the *ſhort ſighted*, &c.

DYSOREXIA, from δυς and ορεξις, *appetite*, or *deſire*, ſometimes uſed as ſynonymous with ANOREXIA, or loſs of appetite for food. Dr. Cullen has adopted the term, as the title of the ſecond order of his fourth claſs of *local* diſeaſes, including the deranged or erroneous appetites and deſires, as well as thoſe which are defective; ſuch as *Bulimia*, or canine appetite; *Polydipſia*, or exceſſive thirſt; *Pica*, or appetite for things not eatable; *Satyriaſis*, *Nymphomania*, *Anaphrodiſia*, &c.

DYSORUM MONS, in *Ancient Geography*, a mountain, which, in the time of Herodotus, ſeparated Thrace, towards the coaſt of the ſea, from Macedonia. It was at a ſmall diſtance from the lake Praſias, and from a ſilver-mine, which had ſometimes yielded a talent *per* day. Herod. l. v. 17.

DYSPEPSIA, DYSPEPSY, in *Medicine*, from δυς and πεπτειν, *to digeſt*, or *concoct*, a weakneſs or derangement of the function of digeſtion. See DIGESTION.

This weakened condition of the digeſtive power in the ſtomach is connected with a variety of complaints, which, together or ſeparately, mark its preſence in different inſtances: ſuch as NAUSEA; VOMITING; heart-burn, or CARDIALGIA; pain of ſtomach, or GASTRODYNIA; FLATULENCE; PYROSIS, or water-braſh; &c. which ſee reſpectively.

It is alſo often a prominent feature in what are denominated NERVOUS *diſeaſes*, in HYPOCHONDRIASIS, and ſome caſes of MELANCHOLY, of all which, in fact, the derangement of the digeſtive organs is frequently the exciting or proximate cauſe. It is alſo generally the precurſor of the paroxyſm of regular GOUT. See INDIGESTION, and the articles here alluded to.

DYSPERMATISMUS, from δυς, and σπερματισμος, *ſeminatio*, a flow, impeded, and inſufficient emiſſion of the ſeminal fluid, in the generative act.

The cauſes by which this impediment is induced may be arranged under a few heads. 1. Diſeaſes of the urethra, which narrow the canal; as thickening of the parietes, ſtrictures, ulcers with elevated edges, caruncles, or excreſcencies, fungous enlargements of the corpus ſpongioſum, &c. (See Sharpe's Critical Enquiry, chap. 4.) conſtituting the dyſpermatiſmus *urethralis* of the noſologiſts. 2. Nodes, or hard tumours, in the corpora cavernoſa (D. *nodoſus*.) 3. A contraction of the prepuce (D. *præputialis*, or *phymoſicus*.) (See Arantius de Tumor præter natur.) 4. Mucus lodged in the urethra (D. *mucoſus*.) 5. A too rigid extenſion of the virile member, contracting the canal of the urethra. (See Edin. Med. Eſſays, vol. i. art. 35.) (D. *hypertonicus*.) 6. A general epileptic convulſion (D. *epilepticus*.) 7. An imperfect extenſion of the member. (D. *apractodes*.) (See Etmuller de Morb. virorum. cap. 2. p. 469. Veſlingii Epiſt. et Obſ. Ep. 38. Foreſt. lib. xxvi. obſ. 18 and 19.) 7. The fluid being directed towards and flowing into the bladder. (D. *refluus*.) (See Petit. in Act. Acad. Chirurg. tom. i. p. 434.) This reflux of the ſemen into the bladder Mr. Sharpe aſcribes generally to a ſchirrus, or ſometimes a ſpongy enlargement of the verumontanum, with or without ulceration, or to an obſtruction in ſome part of the urethra. This ſpecies of the diſeaſe under conſideration is not very uncommon. See Sharpe *loc. cit.*. Sauvages Noſol. Method. claſs. ix. gen. 31.

DYSPHONIA, from δυς and φωνη, *voice*, a difficulty of ſpeech.

DYSPNŒA, from δυς, and πνεω, *I breathe*, a difficulty of breathing.

Difficulty of breathing originates from a great variety of cauſes, and is a ſymptom connected with a great number of diſeaſes. Whatever impedes the entrance of the air into the cells of the lungs, obſtructs the circulation of the blood through them, prevents their free expanſion, or narrows the cavity of the cheſt, will neceſſarily be an impediment to the act of reſpiration. When the difficulty of reſpiration is ſo great, as to render it neceſſary for the patient to maintain the erect poſture, it is termed ORTHOPNŒA.

1. Among the impediments to the free paſſage of the air into the cells of the lungs, which occaſion dyſpnœa, may be enumerated, the thickening of the membranes of the paſſages from inflammation, and the conſequent effuſion of mucus, or coagulable lymph, as in CATARRH, and CROUP, in which a frequent cough is excited by the irritation of theſe ſecretions, which enables the lungs to diſlodge them. In the *chronic catarrh* of old people, in the *Baſtard* PERIPNEUMONY, and in ASTHMA, theſe mucous ſecretions are moſt copious, and, by filling up the cells and tubes of the lungs, occaſionally produce actual ſuffocation. In the paroxyſm of aſthma, the difficulty of breathing appears to be augmented by a ſpaſmodic contraction of the *glottis*, which ſtill farther impedes the free paſſage of the air. Inflammation of the lungs, both in the form of PLEURISY and PERIPNEUMONY, is accompanied by dyſpnœa in conſequence of the congeſtion of blood, and the effuſions of ſerum, blood, or lymph, into the cells of the lungs, which, when the diſeaſe is violent, uſually enſue; and often deſtroy the patient by a fatal interruption to the breathing.

The cells of the lungs are compreſſed, and the admiſſion of air therefore prevented, by tumours, and collections of fluids, in their ſubſtance; hence dyſpnœa is occaſioned by the preſence of *pus*, conſequent on acute inflammation of the lungs, in the form of VOMICÆ; and by the preſence of tubercles, hydatids, ſteatomatous, or other tumours, and of ſerum effuſed into the cellular membrane, conſtituting the *anaſarca*, or *hydrops pulmonum*. See DROPSY *of the Lungs*.

2. Whatever obſtructs the pulmonary circulation to a conſiderable extent alſo occaſions dyſpnœa. If the blood is prevented from flowing freely back to the heart, a congeſtion is produced in the lungs, which neceſſarily compreſſes the cells and air-tubes; and if, on the other hand, the blood is impeded in its way to the air cells, then it is imperfectly changed by the influence of the air, and the ſenſation of ſuffocation, and laborious reſpiration equally enſue. Polypous concretions about the heart, aneuryſms of the heart or great veſſels, oſſification of its valves, &c. contribute to produce theſe morbid ſtates of the circulation. See CARDIOGMUS and ANEURYSM.

3. Whatever prevents the free expanſion of the lungs neceſſarily impedes the function of reſpiration. Thus dyſpnœa, often orthopnœa, is a conſtant attendant on *hydrothorax*, when the water, effuſed into the cavity of the cheſt, occupies that portion of the cavity, which the expanded lungs would otherwiſe fill. (See DROPSY *of the Cheſt*.) When *vomicæ* burſt, and their purulent contents are poured into the ſame cavity, the effect produced on the lungs is the ſame as that of *hydrothorax*, but the dyſpnœa is not augmented by this proceſs, ſince the compreſſion of the lungs, by

by the ſame quantity of matter internally, was nearly the ſame previouſly. (See EMPYEMA.) In a ſimilar way DROPSY *of the pericardium* compreſſes the lungs, and induces dyſpnœa: and BRONCHOCELE, or ſwelling of the thyroid gland, by externally compreſſing the *trachea*, or wind-pipe, ſometimes is accompanied with difficulty of breathing.

4. Whatever narrows and diminiſhes the cavity of the cheſt, neceſſarily likewiſe prevents the free expanſion of the lungs, and therefore produces the ſame effects on the reſpiration. Hence dyſpnœa is occaſioned by any large tumour, or fluid collection in the cavity of the abdomen, which preſſes the diaphragm upwards: ſuch as a copious ſecretion of fat in the *omentum*, and other parts, (ſee CORPULENCE); or ſchirrus, ſteatomatous, or other ſolid tumours; the gravid uterus, in the latter ſtages of pregnancy; *aſcites*, or DROPSY *of the belly*; TYMPANITES, or the diſtenſion of the abdomen by flatus; HYDATIDS, &c.

The dyſpnœa, occurring from theſe various cauſes, will require the different remedies for its relief, which are adapted to alleviate the diſeaſes, of which it is a part; and its nature will be diſcriminated by an accurate obſervation of the trains of ſymptoms, with which it may be accompanied, and which characterize thoſe diſeaſes, to which therefore we refer reſpectively.

DYSTŒCHIASIS, (from δυς, *bad*, στοιχος, *order*,) an irregular arrangement of the eyelaſhes.

DYSU'RIA, (from δυς, *difficultly*, and ουρον, *the urine*,) a difficulty of diſcharging the urine.

DYTISCUS, in *Entomology*, a genus of COLEOPTERA, of the aquatic kind, diſtinguiſhed by having the antennæ ſetaceous; feelers ſix in number, and filiform; hind legs formed for ſwimming, fringed on the inner ſide, and nearly unarmed with claws. The ſpecies are inhabitants of ſtagnant waters, and from the peculiar ſtructure of their legs are able to ſwim extremely well; they are ſeldom obſerved on the wing, except in the night time, when they fly abroad in ſearch of other waters. The males have a horny concave flap or ſhield on the fore legs. The larvæ ſubſiſt on worms, aquatic inſects, and the fry of fiſh, the latter of which they deſtroy in vaſt numbers when firſt hatched from the egg. They ſeize their prey by means of their ſtrong forcipated jaws, and deſtroy it by ſucking out the moiſture. Linnæus included under the generic name of dytiſcus, the inſects which later writers comprehend under the two genera dytiſcus and hydrophilus. It is underſtood that Linnæus, aware of the impropriety of uniting thoſe two diſtinct natural families, intended afterwards to ſeparate them into two genera. Fabricius has ſince divided them; the character of his genus hydrophilus conſiſts in having four filiform feelers; the maxilla bifid; lip horny, and ſub-emarginate; and the antennæ clavated and perfoliated; and his dytiſcus ſix filiform feelers; the lip horny, truncated and entire, and the antennæ ſetaceous. Gmelin adopts the genus hydrophilus in his edition of the Syſtema.

Species.

LATISSIMUS. Black; margin of the wing-caſes dilated, with a yellow line. Linn. Fn. Suec. 768. Fabr. Spec. Inſ. *Dytiſcus ampliſſimus*, Müll. *Scarabæus aquaticus*, &c. Friſch.

Native of Northern Europe; the female ſulcated, male ſmooth and poliſhed.

COSTALIS. Black; band on the head; margin of the thorax, and coſtal ſtreak on the wing-caſes ferruginous. Fabr.

The head is black, and marked above the mouth each ſide with an impreſſed dot; wing-caſes ſmooth, with three remote punctured ſtriæ. In the female the colours more obſcure. Inhabits Surinam.

MARGINALIS. Olivaceous black; margin round the thorax and exterior margin of the wing-caſes yellow. Linn. Donov. Brit. Inſ. *Le Ditique noir à bordure*, Geoffr. *Hydrocantharus noſtras*, Ray.

Native of Britain, and other parts of Europe.

ROESELII. Greeniſh; ſhield, with the margin of the thorax and wing-caſes white, the latter glabrous, with three punctured ſtriæ. Fabr. *Dytiſcus diſpar*, Roſſo.

Inhabits waters in France.

PUNCTULATUS. Black; ſhield, margin of the thorax and wing-caſes white; wing-caſes with three rows of dots. Geoffr. *Dytiſcus punctatus*, Olivier.

Found in waters in England and Germany. The head is black with a brown frontal ſpot; body beneath black; legs teſtaceous.

LIMBATUS. Black; exterior margin of the thorax and wing caſes yellow; the latter very ſmooth. Fabr.

A native of China, in the Bankſian cabinet. The legs in this ſpecies are black, with the thighs of the anterior pair ferruginous; the abdomen black.

RUFICOLLIS. Black; front and thorax fulvous; wing-caſes with the exterior edge and ſtreak at the baſe teſtaceous, Fabr.

Inhabits Siam. The head fulvous with the margin black; wing-caſes glabrous; anterior legs yellow. Bankſian cabinet.

SULCATUS. Wing-caſes brown, with ten longitudinal villous grooves. Linn. Donov. Brit. Inſ. &c.

Native of Europe. The head is black; the mouth and eyes yellow; thorax black, with margin and character on the back yellow; margin of the wing-caſes yellowiſh; body beneath with the legs black.

FASCIATUS. Wing-caſes yellow, with two black bands and a black dot at the tip. Fabr.

Inhabits waters in India. The head is yellow; thorax yellow with a black dorſal line, and two ſmall red ſpots on the back; wing-caſes ſmooth with black ſuture.

STRIATUS. Brown; thorax yellow, with an abbreviated black band; wing-caſes finely ſtriated tranſverſely. Linn.

Common in waters in Europe.

FUSCUS. Deep brown; margin of the thorax yellow; wing-caſes very finely ſtriated tranſverſely. Linn.

Found in waters in Europe. Reſembles ſtriatus, but is rather leſs. The head is black; wing-caſes impreſſed with two ſtriæ of dots; body black; legs ferruginous; thighs black.

LANIO. Black; mouth, two dots on the crown, and margin of the thorax rufous; wing-caſes brown. Fabr.

The head is brown; wing-caſes marked with two lines of impreſſed dots. Native of Madeira, deſcribed from the Bankſian cabinet.

CICURUS. Black, ſmooth; mouth, dot on the crown and margin of the thorax rufous; wing-caſes ſtriated with yellow. Fabr.

Found by Vahl at the Cape of Good Hope. The head is deep black, the ſpot between the eyes large; eyes ſilvery dotted with brown; thorax with a rufous dorſal line; body black.

VITTATUS. Black, ſmooth; wing-caſes with a yellow marginal fillet, and black ſpot at the baſe. Fabr.

Deſcribed from the Hunterian muſeum as a native of India. The head is black; mouth yellowiſh; thorax black; ſpot at the baſe of the wing-caſes large and oblong.

CINEREUS. Aſhy; margin of the wing-caſes and half the thorax yellow. Linn. *Le Ditique à corcelet à bandes*, Geoffr.

Common in waters in Europe. The head is black, mouth yellow,

yellow, body beneath black with yellow ſpots on the ſides; legs black and yellow; antennæ yellow.

Griseus. Cinereous; wing-caſes with an indented black band. Fabr.

A native of India. The head is yellow with a tranſverſe frontal black ſpot; thorax grey with two tranſverſe black ſpots on the back; body beneath yellowiſh.

Sticticus. Paliſh; wing-caſes grey with an oblong impreſſed lateral ſpot of black. Linn.

Inhabits Africa. Wing-caſes marked with two very obſcure lines of brown dots.

10-Punctatus. Black and glabrous; wing-caſes with five white dots. Fabr.

Native of New Holland, deſcribed from the Bankſian cabinet. The antennæ are ſhort and ferruginous; head black with the front paliſh; thorax with a pale marginal ſpot each ſide; legs fuſcous.

Fuliginosus. Black; mouth and margin of the wing-caſes ferruginous; head immaculate. Fabr.

Inhabits waters in Germany. Body black; mouth and legs ferruginous.

Bipustulatus. Smooth, deep black; head with two red ſpots behind. Linn.

Native of the North of Europe. The red ſpots on the head are very minute.

Cinctus. Head and thorax yellow; wing-caſes black; margin entirely white. Fabr. An American ſpecies.

Bipunctatus. Deep black, thorax yellow, with two dots of black; wing-caſes varied with yellow and fuſcous. Fabr. Donov. Brit. Inſ.

Found in waters in Germany, and alſo in England. The head is black, the mouth ſubferruginous; the thorax yellow, with two black dorſal ſpots; wing-caſes ſmooth, glabrous, and fuſcous; and body black with ferruginous legs.

Fenestratus. Beneath ferruginous, above black; wing-caſes with two tranſparent dots. Fabr.

Deſcribed by Fabricius from a ſpecimen in the cabinet of Schulz, found in the vicinity of Hamburgh. The ſpecies has been ſince taken by Panzer in Auſtria, and in England. See Marſh. Ent. Brit. The head is black; mouth, antennæ, and two dots at the baſe ferruginous; thorax black with ferruginous margin.

Hybneri. Smooth, deep black; mouth and margin of the thorax ferruginous; wing-caſes with a marginal yellow line. Fabr.

Diſcovered in Germany by Hybner.

Stagnalis. Smooth, black; anterior part of the thorax ferruginous; wing-caſes brown with yellow lines. Fabr.

Inhabits ſame country as the former.

Transversalis. Deep black; anterior part of the thorax ferruginous; margin of the wing-caſes, and abbreviated ſtreak at the baſe yellow. Müll.

Found in Northern Europe.

Calidus. Deep black; wing-caſes as the baſe and exterior margin ferruginous; ſternum advanced and compreſſed. Fabr.

Native of South America, diſcovered by Smidt. The head is black; antennæ and mouth dull ferruginous; wing-caſes ſpeckled with yellowiſh.

Hermanni. Gibbous; head, thorax, and wing-caſes ferruginous at the baſe; wing-caſes truncated. Fabr. *Dytiſcus tardus*, Act. Berol.

The head is dull ferruginous, with the orbits of the eyes black; wing-caſes ſmooth; abdomen ferruginous with black tip. Found in Alſace.

Abbreviatus. Black; wing-caſes, with an abbreviated ſtreak at the baſe, and two dots yellow. Fabr.

Native of Germany.

Gibbus. Gibbous, ferruginous; wing-caſes black with pointed tips. Fabr.

Taken in ſtagnant water in Kiel by Schedſtedt. The head is ferruginous, and rather blackiſh at the baſe; the thorax ferruginous, with the poſterior edge black; wing-caſes ſmooth, the baſe and margin obſcurely ſpotted with ferruginous; body and legs ferruginous; and the abdomen black at the tip. There is a variety with the head and thorax entirely ferruginous.

Uliginosus. Deep black and gloſſy; antennæ, legs, and exterior edge of the wing-caſes ferruginous. Linn.

Found in waters in Europe.

Irroratus. Teſtaceous, ſpeckled with black; head and breaſt black. Fabr.

Inhabits America. The head is black, with teſtaceous mouth; thorax gloſſy, ſmooth, and ſhining; abdomen and legs teſtaceous.

Agilis. Black; mouth, thorax, margin of the wing-caſes, and the legs ferruginous. Fabr.

Native of Germany.

Maculatus. Black; thorax with pale band; wing-caſes black, ſpotted with white. Marſh. Linn. &c.

Found in waters in Europe.

Erythrocephalus. Ovate-oblong; head and legs rufous. Linn.

Native of Sweden and Denmark.

Planus. Ovate-oblong, flat, black; the ſhanks entirely rufous. Fabr.

Inhabits waters in Denmark. Lund.

Varius. Thorax rufous; wing-caſes ſtriated with cinereous and black. Fabr.

Diſcovered in Patagonia. The head is black; mouth and antennæ rufous; wing-caſes with numerous black ſtreaks, variegated with cinereous and black, and black ſuture. Cabinet of ſir Joſeph Banks.

Notatus. Fuſcous, with yellow thorax, and four black dots; wing-caſes with futural yellow ſtriæ. Fabr. *Dytiſcus notatus*, Bergſtr.

Native of waters in Germany.

Bicolor. Above deep black; wing-caſes ſtriated; beneath ferruginous. Fabr.

Found in Guinea.

Rufipes. Black; head and anterior part of the thorax ferruginous; wing-caſes black, with ferruginous ſtriæ. Fabr.

A ſmall ſpecies. The body is black; legs rufous.

Depressus. Thorax ferruginous, with two black dots at the baſe; wing-caſes fuſcous, with ferruginous ſpots.

Native of Sweden.

Dorsalis. Head, margin of the thorax, ſpot at the baſe of the wing-caſes, and unequal margin, ferruginous. Fabr.

Inhabits Kiel, and reſembles the following ſpecies.

Sexpustulatus. Deep black; head ferruginous; wing-caſes with three rufous ſpots; that at the baſe larger. Fabr.

A minute ſpecies found in the waters of Sweden.

Palustris. Smooth; wing-caſes with two lateral white blotches. Linn.

Native of Europe; the thorax is ferruginous.

Ovatus. Ovate, fuſcous; head and thorax ferruginous. Linn. *Dytiſcus ſphæricus*, Degeer.

An European ſpecies.

Picipes. Black; anterior part of the thorax ferruginous; wing-cases lineated with yellow. Fabr.

This is a native of Germany. The head is black; the mouth ferruginous; body black; legs pitchy.

Liturratus. Black; wing-cases with a pale blotch at the tip and base. Fabr.

An Italian insect. The body is small, depressed, and black; and the legs pitchy.

Chrysomelinus. Above cinereous, beneath black. Fabr.

A species of small size, found in Germany.

Signatus. Black; head and thorax rufous, with black marks. Fabr.

Native of Patagonia, described by Fabricius from the Banksian cabinet.

12-Pustulatus. Testaceous; wing-cases black, with six testaceous spots. Fabr.

The head and antennæ are testaceous; the thorax testaceous; with the front and posterior margin black.

8-Pustulatus. Black; front, sides of the thorax, and four marginal dots on the wing-cases, ferruginous.

A species of moderate size, found in Sweden.

Halensis. Black; thorax rufous; the base black in the middle, with a rufous dot; wing-cases cinereous, striated with black. Fabr. Hybner, &c.

A small insect, of a flattish form; the head rufous, and immaculate; black streaks on the wing-cases numerous, confluent, and approximate. The species inhabits Germany.

Rufifrons. Black; head, thorax, and margin of the wing-cases, with a dot at the base ferruginous. Fabr.

Inhabits France.

Granularis. Black; wing-cases with two yellowish lines; legs rufous. Linn. *Dytiscus minimus*, Scop.

Native of Northern Europe.

Confluens. Black; head and thorax ferruginous; wing-cases pale, with four black lines on the disk. Fabr.

Inhabits Kiel in Germany. The legs in this species are yellowish.

Obliquus. Ferruginous; wing-cases with five oblique brown spots. Fabr. *Dytiscus laminatus*, Schulz.

The head, thorax, and body, ferruginous; the exterior fuscous spot bamate; legs ferruginous.

Impressus. Oblong, yellowish; wing cases cinereous, with streaks of impressed dots. Fabr. *Dytiscus impresso-striatus*, Act. Hal.

Native of Europe. The body oblong, and tapering before.

Semipunctata. Oblong, ferruginous; head of the base black; wing-cases dusky, at the tip punctured. Fabr.

Inhabits the East Indies, and is of a small size.

Crux. Oblong, deep black; the whole body ferruginous with a black cross. Fabr.

Found in Italy. This species is very small, and glossy-black.

Geminus. Oblong, deep black; two dots on the thorax, two lines at the base, and dot at the tip white.

A minute species, found in Saxony.

Lineatus. Ferruginous; wing-cases brown, with yellowish lines. Fabr.

Native of Alsace.

Inæqualis. Ferruginous; wing-cases black, unequally ferruginous at the sides. Fabr.

The head is ferruginous, with black orbits; thorax ferruginous; behind black; wing-cases smooth and black; body beneath ferruginous.

Inhabits Sweden.

Pygmæus. Ferruginous, wing-cases black; margin ferruginous. Fabr.

Native of Denmark. A small species.

Reticulatus. Ferruginous; disk of the wing-cases black, reticulated with ferruginous. Fabr.

Small. Its native place unknown.

Crassicornis. Fuscous; head and thorax yellow; antennæ thick in the middle. Müll. Zool. Dan.

The antennæ of this species are curious; the colour yellow; with the middle joints thickened, and apparently cleft; wing-cases brown; with the base yellowish.

Flavipes. Flat, deep black; base of the wing-cases, and the legs ferruginous. Fabr.

A small species found in the East Indies.

Pictus. Ferruginous; thorax black; wing-cases pale; suture and lateral spot black. Fabr.

Native of Germany. Hybner.

Nigrita. Deep black and immaculate; antennæ and legs ferruginous. Fabr.

Inhabits Germany. This species is very minute, broad, deep black, and immaculate; antennæ and legs large, and ferruginous.

Pusillus. Deep black; thorax and wing-cases margined with white. Fabr.

Native of Italy.

Parvulus. Gibbous, black; thorax with a ferruginous band on the fore-part; wing-cases with ferruginous spots. Fabr.

Inhabits Denmark, and is a small species. The head is black; front and antennæ ferruginous; wing-cases punctured with numerous rufous spots; body black; legs rufous.

Ovalis. Wing-cases fuscous, with pale lines; thorax ferruginous; abdomen deep black. Thunberg.

Native of Upsal.

Intricatus. Yellowish; above black-green; wing-cases with excavated striæ, edged and tipped with yellow; thorax yellow. Schall. Abh. *Dytiscus semisulcatus*, Müll.

Found in Saxony. In size and appearance resembles the species punctulatus.

Versicolor. Fulvous; wing-cases with oblong black spots. Schall.

Inhabits Saxony.

Schalleri. Black; head, thorax, and legs, ferruginous; wing-cases fuscous; outer margin rufous. Schall.

Native of Saxony, where it appears to be not very uncommon.

Laminatus. Fulvous; wing-cases striated with black dots; abdomen with two plates at the base. Schall.

A rare species, found in Saxony.

Aciculatus. Margin of the thorax and wing-cases, and three spots on the abdomen yellow; wing-cases with hollow decussating striæ. Herbst.

An inhabitant of India.

Fusculus. Black; wing-cases smooth and brown; legs dull testaceous. Schranck.

Found in Upper Austria by Schranck, and by Geoffroy in France.

Oculatus. Head cinereous; posterior margin, and two triangular spots in front black; wing-cases piceous, edged with yellow. Herbst.

Inhabits the environs of Berlin, and measures less than half an inch in length.

Ornatus. Black, beneath piceous; mouth, spots on the wing-cases, and two round ones between the eyes, with the thorax and antennæ ferruginous. Herbst.

Native

Native of the vicinity of Berlin, and rather ſmaller than the laſt.

Unilineatus. Black; divided margin of the wing-caſes, and line half-way down yellowiſh. Schrank.

Inhabits Germany.

Dispar. Black, ſmooth; mouth yellow; wing-caſes variegated, and with the thorax piceous. Herbſt.

Inhabits Pruſſia, and with the ten following ſpecies has been met with in the vicinity of Berlin.

Sordidus. Black; antennæ ferruginous, with black tips; legs piceous; wing caſes deep-black. Herbſt.

Aquaticus. Cheſnut; eyes, wing-caſes, thorax, and belly black; margin of the thorax and band acroſs the middle cheſnut; wing-caſes obſcurely.

Parvulus. Beneath piceous; head and thorax fulvous; wing-caſes black; the margin and two ſtriæ half-way down yellow. Herbſt.

Piceolus. Beneath black; head and thorax cheſnut; wing-caſes piceous, with an obſcure fulvous margin. Herbſt.

Simplex. Black; head, margin of the thorax, and wing-caſes, with the antennæ and legs piceous. Herbſt.

Capricornis. Yellowiſh; belly and eyes black; middle joints of the antennæ much broader; wing-caſes brown with hollow dots. Herbſt.

Variolosus. Yellowiſh; beneath brown-yellow; eyes black; wing-caſes yellowiſh-green variegated. Herbſt.

Orbicularis. Black, ſmooth; antennæ and legs ferruginous; thorax and wing-caſes yellow-brown, pellucid with obſolete black ſpots. Herbſt.

Pedicularius. Smooth; beneath, thorax, and wing-caſes brown; head black; legs piceous. Herbſt.

Marginellus. Black; thorax edged with yellow; wing-caſes yellowiſh, regularly punctured with obſolete blackiſh ſpots. Herbſt.

Seminulum. Black, ſmooth; wing-caſes pellucid, cheſnut tipt with red; legs ferruginous. Herbſt.

Oblongus. Dull-black; head, antennæ, and legs ferruginous. Herbſt.

Zeylonicus. Black; thorax and wing-caſes margined with yellow; ſternum unarmed. Gronov.

Inhabits Ceylon.

Glaber. Brown; wing-caſes glabrous; belly and legs ferruginous. Forſt.

Native of England.

Nebulosus. Livid clouded with black; antennæ and legs ferruginous; belly black, edged with ferruginous. Forſt.

Inhabits England, and is the ſame ſize as the ſpecies uliginoſus.

Exsoletus. Livid; antennæ, head, thorax, abdomen, and legs pale. Forſt.

Inhabits England.

Danicus. Black; outer margin of the thorax, and the wing-caſes yellow. Müll.

This and the twenty following ſpecies are natives of Denmark.

Müllerl. Wing-caſes pointed, glabrous, and marked with two dots at the tip.

Lacustris. Yellowiſh; thorax edged with yellow; wing-caſes ſprinkled with dots.

Piceus. Black; body beneath, and margin of the thorax, and wing-caſes ferruginous.

Fœtiolus. Ferruginous; above black; exterior margin of the thorax and wing caſes yellow.

Comma. Yellowiſh; above braſſy-black; wing-caſes with the outer edge and line yellow.

4-Punctatus. Ferruginous; wing-caſes black, with a white band, ſpot, and four dots.

Biocellatus. Rufous; wing-caſes braſſy, with white ſpots diſpoſed longitudinally.

Erythromelas. Black; antennæ and tarſi rufous.

Roridus. Yellow; thorax with a black ſpot in the middle; wing-caſes ſpeckled with black

Rufripes. Black bronzed, poliſhed; antennæ, and legs, tip of the wing-caſes, and two dots ferruginous.

Quadricolor. Ovate, rufous; middle of the thorax black; wing-caſes brown; the lower margin and dot at the baſe yellow.

Cimicoides. Greeniſh; wing-caſes with a white lower margin, and a few white ſpots.

Velox. Ovate, rufous; wing-caſes with eight brown ſtriæ.

Nanus. Black; thorax yellow on the fore-part; wing-caſes with an abbreviated groove; legs piceous.

Rufifrons. Black; thorax yellow each ſide; wing-caſes yellow at the baſe and ſides; head and legs rufous.

Tricolor. Rufous; wing-caſes yellow, with a common black ſinuate ſpot on the diſk.

Exilis. Ovate, black; baſe of the antennæ and legs ferruginous; wing-caſes ſmooth.

4-Pustulatus. Black; wing-caſes with four longitudinal ſpots; legs rufous.

Flavicans. Black; above yellowiſh; thorax black behind; wing-caſes with black ſtriæ and ſpots.

Nævius. Fulvous, with ſcattered ſpots of black. Geoffr.

Native of France.

Fimbriatus. Brown; wing-caſes yellow anteriorly, and at the outer ſide. Geoffr.

Same country as the former.

4-Maculatus. Black; thorax yellow; wing-caſes ſmooth, with yellow ſpots and border. Geoffr.

This and the following ſpecies are natives of Europe.

Unistriatus. Black; ſpots, border, and ſingle ſtria on the wing-caſes yellow. Geoffr.

Bilineatus. Wing-caſes brown; body beneath fulvous; thorax fulvous with a double black line.

Seminiger. Body beneath entirely black; thorax and wing-caſes dull-brown, edged with rufous. Degeer.

Nubilus. Black; above with grey ſpots and ſtreaks; legs reddiſh-brown. Degeer.

Hyalinus. Greeniſh; wing-caſes hyaline with lateral whitiſh ſpots. Degeer.

Virescens. Teſtaceous, above greeniſh; outer edge of the thorax and wing-caſes yellow, the latter ſtriated; poſterior legs thicker. Degeer.

Testaceus. Teſtaceous, front and poſterior margin of the thorax brown, the middle livid; wing-caſes with a livid ſutural line and marginal ſpecks. Linn.

Niger. Black; margin of the wing caſes livid and longitudinally dotted with ferruginous.

Bilobus. Oblong-ovate; black; mouth bilobate; ſpot on the crown, thorax, ſutural line on the ſhells, baſe, and margin yellow.

Ferrugineus. Ferruginous; head and poſterior margin of the thorax black; anterior part of the two ſpots between the eyes, thorax, ſutural line and margin of the wing-caſes yellow.

Flavus. Yellow; mouth, two dots between the eyes,

and outer margin of the thorax, and wing-cafes ferruginous.

Tricoloratus. Ferruginous; head, thorax, and wing-cafes rufty-brown; between the eyes two ferruginous fpots; mouth and edges of the thorax and wing-cafes pale.

Denigratus. Black; mouth, two dots between the eyes, and abdomen yellow; the fegments with a black fpot each fide; wing-cafes brown, with fpecks, and exterior edges livid.

Unipunctatus. Black; antennæ ferruginous; wing-cafes with a teftaceous dot each fide behind the middle.

Biguttatus. Black; legs, tip of the abdomen, antennæ, mouth, two dots between the eyes, thorax, and wing-cafes teftaceous; wing-cafes fpotted with brown; thorax with two black dots in the middle.

8-Maculatus. Livid; thorax greenifh; wing-cafes brown-livid, each with four connected livid fpots and ftreaks behind the middle.

Lividus. Livid; head narrow; thorax narrower before; wing-cafes with brown dots difpofed in rows.

4-Lineatus. Black; wing cafes deeply punctured; brownifh with four yellowifh branched lines, and outer margins; legs ferruginous.

Denticulatus. Piceous; mouth and antennæ ferruginous; fhells glabrous, with pale bidentated band at the bafe; three fpots and outer margin, with the anterior part of the thorax and legs pale.

Politus. Piceous, gloffy, with paler wing-cafes. Marfh. Ent. Brit.

Inhabits England. The antennæ are rufo-ferruginous; head and thorax piceous, the latter paler at the fides; legs fame colour as the antennæ.

Humeralis. Head and thorax black; wing-cafes with an obfolete ferruginous fpot on the exterior margin at the bafe. Marfh.

Found in England. The head and thorax deep-black and opake; antennæ filiform, black, and rufous at the bafe; fpot at the bafe of the wing-cafes variable in fize.

Melanocephalus. Black, and very glabrous; antennæ and legs piceous. Marfh.

Difcovered by the bifhop of Carlifle in a garden at Ealing. The antennæ are filiform, black, and at the bafe rufous; legs rufo-piceous.

Ovalis. Ferruginous; wing-cafes fufcous with ferruginous margin. Marfh.

This and the remaining fpecies are natives of Britain.

Frontalis. Fufcous; margin of the wing-cafes yellowifh; head and thorax yellow fpotted with black. Marfh.

Conspersus. Grifeous; head black, with two red fpots behind. Marfh.

Paraplfurus. Smooth, black; front and margin of the thorax ferruginous; margin of the wing-cafes yellow with black dots. Marfh.

Nigro-Æneus. Smooth, dull-braffy; mouth and margin of the wing-cafes brown. Marfh.

Assimilis. Rufous; wing cafes ftriated yellow-grifeous, with fix black fpots. Marfh.

Interpunctatus. Rufo-ferruginous; wing-cafes with numerous black fpots placed obliquely. Marfh.

Flavicollis. Rufous; wing-cafes yellow, teftaceous, clouded with black; poftcrior legs very long. Marfh.

Sparsus. Oblong-convex, ferruginous, and nitid; back of the thorax, and common difk above dull; wing-cafes with fcattered impreffed dots. Marfh.

The antennæ, head, and legs rufous-ferruginous; thorax fame colour, with fometimes a fufcous fpot on the back; wing-cafes fufcous, with paler margin; body beneath ferruginous.

DZAR Gurban, in *Geography*, a river of Ruffian Tartary, which runs into the Irtifch, 20 miles E. of Semipolatnoi.

DZIEWIENISZKI, a town of Lithuania, in the palatinate of Wilna; 30 miles S.S.E. of Wilna.

DZIWATOW, a town of Lithuania, in the palatinate of Wilna; 4 miles W. of Wilkomierz.

DZOHARA, in *Mythology*, an Arabian goddefs, fuppofed to be the fame with Venus.

DZOHL, an Arabian deity, fuppofed to be Saturn.

DZONMUREN, in *Geography*, a river of Ruffia, which runs into Angara; 24 miles N. of Irkutfch.

DZURA, a Tartarian village of Ruffian Siberia, in the government of Irkutfch. N. lat. 56° 4′. E. long. 124° 24′.

DZWINGROD, a town of Poland, in the palatinate of Kaminiec; 20 miles S.W. of Kaminiec.

E.

E, The fifth letter of the alphabet, and the second vowel.

E is a letter that admits of some variety in the pronunciation, in most languages; whence grammarians usually distinguish several E's, or kinds of E. In English, E has two sounds; long, as, *scēne*, and short, as *mĕn*. It is always short before a double consonant, or two consonants, as *vĕx*, *blĕssing*, *fĕll*, *dĕbt*, &c. E final has the peculiar quality of lengthening the preceding vowel, as *can*, *canē*; yet there are some instances in which it has not this effect; as *gōne*, *gĭve*, *lĭve*, &c. It serves also to modify the foregoing consonants; as *sĭnce*, &c. It is also sounded at the end of proper names, as *Penelope*, and in monosyllables that have no other vowel, as *the*; but in every other case it is mute. It was formerly used much more generally at the end of words than at present, and had probably a soft sound like the French E feminine; and afterwards was made vocal or silent in poetry, as the verse required, till at last it became universally silent. Camden calls it the silent E. Johnson.

The Greeks have their short and long E, *viz.* ε and η, epsilon and eta. The Greek η, or H, *eta*, or *ita*, was no original letter; but was added to the alphabet in after times. Of this we have proofs still extant in the ancient monuments; particularly the Farnese columns, brought to Rome from the Via Appia, where the *epsilon*, E, is used in lieu of the H: *e. gr.* ΔΕΜΕΤΡΟΣ ΚΟΡΕΣ, for ΔΗΜΗΤΡΟΣ ΚΟΡΗΣ. This letter is said to have been added by Simonides.

The pronunciation of the η seems to have been varied; it having been sometimes the same with the Latin E, sometimes with I. Terentianus assures us of the former; and the Greeks themselves for many ages have only used the latter. From the name of an animal of the Lutra species, denominated ΕΝΗΥΔΡΙΣ, that occurs on the Prænestine pavement, the η, *eta*, evidently serves as an aspirate to the υ, *upsilon*; and if this be authentic, the late learned professor Porson concluded, that this inscription affords an additional proof that the η, *eta*, was anciently used and pronounced as we do our H. In reference to this subject, Mr John Jones, author of the Greek grammar, &c. observes, that such letters were formerly aspirates, as they derived their origin from the strong gutturals, which the Greeks borrowed from the Oriental tongues; and hence he traces the origin of the Æolic digamma. (See the letter F.) It is the tendency of every guttural, says this ingenious writer, when become habitual, to soften down in the rapidity of utterance into a mere aspirate; of this he has given several instances. He adds, that the guttural, when softened into an aspirate, is apt to be dilated into a long vowel. Hence the reason why η, *eta*, in the ancient Greek, seems to have been accompanied with an aspirate, as in ἡμερᾳ, though formerly as in the ΕΝΗΥΔΡΙΣ on the Prænestine pavement, it expressed the full power of H, as professor Porson has remarked. On the same principle that a guttural softened into an aspirate, the aspirate often melts into a gentle breathing, or becomes in pronunciation quite quiescent. See Dr. Adam Clarke's Narrative of the last illness, &c. of professor Porson, p. 12, &c.

The Latins have an opener E, called *vastius*; such was the second E, in the word *here*, *master*; and another closer, as that in the adverb *here*, *yesterday*. This latter E they frequently used promiscuously with I. Thus for *here*, they wrote *heri*; and, in diverse places, we meet with *sibe*, *quase*, &c. for *sibi*, *quasi*, &c.

The Roman E was likewise sometimes written, by corruption, æ; for which reason, F. Hardouin takes that medal of Gallienus, GALLIENÆ AUGUSTÆ, not to be any satirical medal, as others have imagined: nor to be a dative feminine, but a vocative masculine, *Galliene Auguste*, wrote with the æ.

It has been much disputed how the Latins render the η in their language. The common opinion is, that they render it by an E; as in Δημητριος, Βητα, Ημερα, Θησευς, Θησαυρος, &c. which they rendered *Demetrius*, *Beta*, *Hemera*, *Thesеus*, *Thesaurus*, &c. Though there are persons exceedingly well versed in antiquity, who hold that they pronounced it like an *i*. Lud. de Dieu, one of the most learned grammarians of his age, observes as much in his animadversions on Genesis, vi. 24. Adding, that it is for this reason, that the Hebrews, *e. gr.* the paraphrast Jonathan, expresses it by a *Hhirek*; מְסַטֵר. J. Rod. Wettstein proves the same in his learned oration on the true pronunciation of the Greek tongue, from an infinity of instances. To this purpose he cites a manuscript Psalter of the eighth century, where all the η's are expressed by *i*'s. In effect Wettstein shews, not only that the Latins pronounced and wrote it as an *i*, which might happen from its being so easily confounded in writing with an *i*; but also that they rendered it by an *e*, and *ai*; that it was often used for Υ and ΕΙ; and that in the time of Plato this letter has a kind of intermediate sound between the ε and ι. See that author, and Vossius de Idolol. lib. ii. cap. 16.

The French have, at least, six kinds of E: the first pronounced like *a*; as in *emporter*, *orient*, &c. The second, a final mute, in the last syllable of divers words not pronounced at all; as in *bonne*, *donne*, &c. The third, an imperfect mute, pronounced so much like the diphthong *ea*, &c. as in *je*, *de*, *te*. The fourth *e ferme*, or *e masculine*, marked at the ends of the words with an accent *é*. The fifth is *e ouvert*, or *long e*, having the same sound with *ai*, as in *mere*. *fête*, &c. In the middle of words it is sometimes marked with a circumflex,

circumflex, and in the end, with an accent *é*. The sixth is an intermediate *e*, between the *ouvert* and *ferme;* as in *cabaret, lettre*, &c. Some add a seventh kind of *e*, not reducible to any of the former, as that in *grammarien, historien*, &c. And others admit of only three kinds, *viz.* the mute, open, and shut; but they make variations therein, which amounts to the same thing.

As to the figure of the letter E, we borrow it from the Latins, who had it from the Greeks, and they from the Phœnicians, by Cadmus, who first brought it them. Now the Phœnicians had the same characters with the Hebrews. Accordingly, the form of the ancient Hebrew *He* was the same with that of our E, as may be seen in the Hebrew medals, and the Jesuit Souciet's Dissertation thereon, p. 143. All the difference between them consists in this, that the Hebrews, reading from right to left, turn their letters that way; whereas the moderns, reading from left to right, write their letters accordingly.

The little *e* was formed of the great one, by writing it fast, and making the cross strokes at top and bottom without taking pen off paper, and then adding the stroke in the middle.

E, on the keys of an organ, or harpsichord, denotes the tones, *E, mi, la.*

On the compass in sea-charts, &c. it makes the east point, or wind. E. east; E.S.E. east-south-east; N.E. north-east, &c.

In the calendar, E makes the fifth of the Dominical letters.

Among authors, *e. gr.* stands for *exempli gratia, for instance.* In several dictionaries we find it noted, that the letter E, among the ancients, was a numeral letter, signifying 250, according to the verse.

" E quoque ducentos & quinquaginta tenebit."

But it has already been observed, that this use of numeral letters was unknown among the earliest people. Isidore Hispalensis, an author of the seventh century, says as much in express terms, in the first book of his Origines, cap. 3. In effect, it was first introduced in the times of barbarism and ignorance.

EACHARD, John, in *Biography*, was descended from a respectable family in the county of Suffolk, and born about the year 1636. He finished his studies at Catherine hall, Cambridge, where he took his degrees, and was admitted fellow of his college. This was in the year 1658, and in 1670 he published, but without his name, a treatise which passed through many editions, entitled, " The Grounds and reasons of the contempt of the Clergy and Religion enquired into; in a letter to R. L." This work was attacked by Dr. John Owen, on account of the author's representations and uncandid remarks levelled at dissenting ministers. In the following year he published " Mr. Hobbes's State of Nature considered, in a dialogue between Philautus and Timothy, &c." In a short time afterwards he published some further remarks on the writings of Mr. Hobbes, in " A second Dialogue between Philautus and Timothy." Mr. Eachard was a powerful opponent when his weapons were those of wit and raillery, but his talents were ill calculated for serious argument, which caused the remark of Dr. Swift, " I have," says he, " known men happy enough at ridicule, who upon grave subjects were perfectly stupid; of which Dr. Eachard of Cambridge, who writ 'The contempt of the Clergy,' was a great instance." Mr. Eachard was chosen master of Catherine hall in the year 1675, and in the following year he was created doctor of divinity by royal command. He died in the year 1697, having twice sustained the honourable office of vice-chancellor of the university. A complete edition of his works was published in 1774, in three vols. 12mo. Biog. Britan.

EADISH. See Eddish.

EAGER Wine. See Wine.

EAGLE, in *Architecture*, is a figure of that bird anciently used as an attribute, or cognizance of Jupiter, in the capital and friezes of the columns of temples consecrated to that god.

EAGLE, *Aquila*, in *Astronomy*, is a constellation of the northern hemisphere, having its right wing contiguous to the equinoctial.

For the stars in this constellation, see Aquila and Constellation.

There are also three several stars, particularly denominated among the Arab astronomers; *Nasr*, *i. e.* eagle. The first, *Nasr Sohail*, the Eagle of Canopus, called also *Sitareh Jemen*, the star of Arabia Felix, over which it is supposed to preside; the second *Nasr Althair*, the Flying Eagle; and the third *Nasr Alvake*, the Resting Eagle.

Eagle, in *Heraldry*, is the symbol of royalty, as being, according to Philostratus, the king of birds; and for that reason dedicated, by the ancients, to Jupiter.

The eagle is the arms of the emperor, the king of Poland, &c. It is accounted one of the most noble bearings in heraldry, and, according to the learned in that art, ought never to be given, but in consideration of singular bravery, generosity, &c. On which occasions, either a whole eagle, or an *eagle naissant*, or only the head, or other parts, agreeable to the exploit, may be granted.

The eagle is sometimes represented with one head, and sometimes with two, though never more than one body, two legs, and two wings opened, or stretched out, in which posture it is said to be *spread* or *displayed:* such is that of the empire, which is blazoned a spread eagle, sable, diademed, langued, beaked, and membered, gules.

The reason why eagles are generally given in heraldry displayed, is partly, because, in that posture, they fill up the escutcheon better, and partly, because it is imagined a posture natural to the eagle, when it plumes its feathers, or faces the sun. However, there are eagles borne in other postures; and some monstrous ones, with human, or wolves, heads, &c. The late authors only say *displayed* to express the two heads; and say *an eagle*, without any addition, when it has but one. The kingdom of Poland bears gules, an eagle argent, crowned and membered, or.

The eagle has been borne, by way of ensign, or standard, by several nations. The first who seem to have assumed the eagle, were the Persians, according to the testimony of Xenophon. Afterwards it was taken by the Romans; who, after a great variety of standards, at length fixed on the eagle, in the second year of the consulate of C. Marius; till that time, they used, indifferently, wolves, leopards, and eagles, according to the humour of the commander.

Several among the learned maintain, that the Romans borrowed this custom from Jupiter, who had appropriated the eagle as his own badge, in commemoration of its supplying him with nectar, while he lay concealed in Crete, for fear of being devoured by his father Saturn. Others hold that they borrowed it from the Tuscans, and others from the Epirots. The Roman eagles, it must be observed, were not painted on a cloth, or flag; but were figures in relievo, of silver or gold, borne on the tops of pikes; the wings being displayed, and frequently a thunderbolt in their talons. Under the eagle, on the pike, were piled bucklers, and

and ſometimes crowns. Thus much we learn from the medals. See Fefchius in his Diſſert. de Inſignibus. And Lipſius, De Militia Romana, lib. iv. dial. 5.

Conſtantine is ſaid to have firſt introduced the eagle with two heads, to intimate, that though the empire ſeemed divided, it was yet only one body. Others ſay, that it was Charlemagne, who, reſuming the eagle as the Roman enſign, added to it a ſecond head; but that opinion is deſtroyed, by an eagle with two heads, noted by Lipſius, on the Antonine column; as alſo by the eagle's only having one head on the ſeal of the golden bull, of the emperor Charles IV. The conjecture, therefore, of F. Meneſtrier appears more probable, who maintains, that as the emperors of the Eaſt, when there were two on the throne at the ſame time, ſtruck their coins with the impreſſion of a croſs, with a double traverſe, which each of them held in one hand, as being the ſymbol of the Chriſtians; the like they did with the eagle in their enſigns; and, inſtead of doubling their eagles, they joined them together, and repreſented them with two heads: in which they were followed by the emperors of the Weſt.

F. Papebroche wiſhes, that this conjecture of Meneſtrier were confirmed by ancient coins; without which, he rather inclines to think the uſe of the eagle with two heads to be merely arbitrary; though he grants it probable that it was firſt introduced on occaſion of two emperors in the ſame throne.

The eagle on medals, according to M. Spanheim, is a ſymbol of divinity and providence; and, according to all other antiquaries, of empire. The princes, on whoſe medals it is moſt uſually found, are the Ptolemies and the Seleucides of Syria. An eagle with the word "conſecratio," expreſſes the apotheoſis of an emperor.

Eagle, *Aquila*, Αετος, in *Ornithology*. See Falco.

Eagle-*Flower*, in *Botany*. See Balsamine.

Eagle, *Black*, in *Heraldry*, was an order of knighthood inſtituted in 1701, by the elector of Brandenburgh, on his being crowed king of Pruſſia.

The enſign of this order is a gold croſs of eight points, enamelled blue; in the centre of which are the letters F. R. in cypher; and in the four angles the eagle of Pruſſia, enamelled black. On collar-days it is worn pendent to a rich collar of gold, compoſed of round pieces of gold, each enamelled with four cyphers of the letters F. R.; in the centre of the piece is ſet a large diamond, and over each cypher a regal crown, richly chaſed, intermixed with eagles diſplayed, enamelled black alternately, and holding in their claws thunderbolts of gold. The croſs is worn on ordinary days pendent to a broad orange-coloured ribbon, which is paſſed ſcarf-wiſe from the left ſhoulder to the under part of the right arm. The knights alſo have, embroidered on the left breaſt of their coats and upper garments, a ſtar of ſilver, ſhaped like that of the enſign of the order; and in its centre is an eagle diſplayed black, holding in his dexter claw a chaplet of laurel, and in the other a thunderbolt, with this motto round it; *Suum Cuique*.

Eagle, *Red*, a very ancient order in Bareith, of which the margrave is ſovereign. It is eſtabliſhed both for military and civil perſons, but is generally conferred on officers who have obtained the rank of lieutenants-general. The badge is a medal of gold, of a quadrangular form, enamelled white, upon which is an eagle diſplayed red. It is worn ſcarf-wiſe, pendent to a broad red watered ribbon, edged with yellow.

Eagle, *White*, an order of knighthood, inſtituted in Poland by Uladiſlaus V. ſurnamed Lokter, in the year 1325, on occaſion of the marriage of his ſon Caſimir, to the princeſs Ann, daughter of Gedinin, duke of Lithuania. This order was revived in 1705, by Frederic Auguſtus I. king of Poland, in order to conciliate the principal nobility, ſeveral of whom inclined to Staniſlaus. The badge of this order, worn by the knights, is a gold croſs of eight points, enamelled gules, bordered argent, cantoned with flames of fire; charged in the middle with a white eagle, bearing on his breaſt a croſs of the ſame, environed with the arms and trophies of the electorate of Saxony; and on the other ſide is a cypher of the king's name, with this motto, Pro Fide, Rege, Lege. The whole ſurmounted with a ſmall crown of diamonds. The collar is compoſed of golden eagles, crowned and chained. On all days, beſides ſtate-days, the knights wear the croſs at the extremity of a broad blue ribbon ſcarf-wiſe. They have it alſo embroidered on the left ſide of their cloaks and coats.

Eagle *Iſland*, in *Geography*, an iſland in the Atlantic, near the weſtern coaſt of Ireland, and county of Mayo. N. lat. 54° 17′. W. long. 9° 54′.

Eagle *Iſland*, an iſland on the N.E. coaſt of New Holland, ſo called by lieutenant Cook, in 1770. It is low and ſandy, and covered with trees; and abounds with birds, chiefly ſea-fowl. An eagle's neſt was found upon it, and alſo that of another bird, of an enormous ſize, built with ſticks upon the ground, and no leſs than 26 feet in circumference, and two feet eight inches high. The Indians viſit this iſland, probably to eat turtle, many of which were obſerved upon the iſland. N. lat. 14° 40′. W. long. 214° 30′.

Eagle-*Owl*, in *Ornithology*. See Strix.

Eagle, *Sea*, in *Ichthyology*. See Raja *Aquila*.

Eagle-*Stone*, in *Natural Hiſtory*. See Ætites.

Eagles, in *Coinage*, a name found very frequently in the ancient hiſtories of Ireland, and uſed to expreſs a ſort of baſe money that was current in that kingdom in the firſt years of the reign of Edward I., that is, about the year 1272. There were, beſides the eagles, lionines, roſades, and many other coins of the ſame ſort, named according to the figures they were impreſſed with. Simon's Hiſt. Coins.

The current coin of the kingdom was at that time a compoſition of copper and ſilver, in a determined proportion, but theſe were ſo much worſe than the ſtandard proportion of that time, that they were not intrinſically worth quite half ſo much as the others. They were imported out of France, and other foreign countries. When this prince had been a few years eſtabliſhed on the throne, he ſet up mints in Ireland for the coining of ſufficient quantities of good money, and then decried the uſe of theſe eagles, and other the like kinds of baſe coins, and made it death, with confiſcation of effects, to import any more of them into the kingdom.

EAGLET, or Eaglon, a diminutive of eagle, properly ſignifying a young eagle.

The eagle is ſaid to prove his eaglets in the brightneſs of the ſun; and if they ſhut their eye-lids, he diſowns them. In *Heraldry*, when there are ſeveral eagles on the ſame eſcutcheon, they are called eaglets.

EAHEINOMAUWE, in *Geography*, the moſt northern of the two iſlands of which Staaten Land, or New Zealand, conſiſts; the other being called Tovy Poenammoo. Theſe iſlands are ſituated in the South ſea, between the latitudes of 34° and 48° S., and between the longitudes of 181° and 194° W.; and they are ſeparated from each other by a ſtrait, or paſſage, which is about four or five leagues broad. Eaheinomauwe has a much better appearance than Tovy, or

or Tavai, Poenammoo; for though it is not only hilly but mountainous, even the hills and mountains are covered with wood, and every valley has a rivulet of water. The foil in thefe vallies, and in the plains, many of which are not overgrown with wood, is in general light, but fertile. Thofe who vifited it with lieutenant Cook in 1770, were of opinion, that all kinds of European grain, plants, and fruit, would flourifh here in the utmoft luxuriance. The winters are fuppofed, from the ftate of vegetation, to be milder than thofe in England, and the fummer was experienced not to be hotter, though it was more equally warm. The country appears to be capable of fupplying, in great abundance, not merely the neceffaries, but the luxuries of life. In Eaheinomauwe there were feen no quadrupeds but dogs and rats, the latter of which are very fcarce. The fpecies of birds are not numerous; and of thefe no one kind, except, perhaps, the gannet, is exactly the fame with thofe of Europe. Infects are not more plentiful than birds. But every creek of the fea fwarms with fifh, which are not only wholefome, but equally delicious with thofe in our part of the world; the higheft luxury of this kind, with which the Englifh were gratified, was the lobfter, or fea cray-fifh. The forefts in this ifland are of vaft extent, and are full of the ftraighteft, cleaneft, and largeft timber Mr. Cook and his friends had ever feen. The plants were very various, as well as numerous. Of about 400 fpecies, there were not many which have hitherto been defcribed by botanifts. There is one plant, which ferves the natives inftead of hemp and flax, and which excels all that are applied to the fame purpofes in other countries. For other particulars, we refer to the article NEW ZEALAND.

EALDERMAN, or EALDORMAN, among the Saxons, was of like import with earl among the Danes. Camden's Britan. p. 107.

The word was alfo ufed for an elder, fenator, or ftatefman. Hence, at this day, we call thofe aldermen, who are affociates to the chief officer in the common-council of a city, or corporate town. See ALDERMAN.

EA-OO-WEE, or MIDDLEBURG, in *Geography*, one of the Friendly iflands, in the South Pacific ocean, firft difcovered by Tafman in January 1642-3, and by him called Middleburg. This ifland, and Tor-ga-ta-bu, or Amfterdam, are fituated between the latitude of 21° 29′ and 21° 3′ S., and between the longitude of 174° 40′ and 175° 15′ W. Ea-oo-wee, which is the fouthernmoft, is about 10 leagues in circuit, and of a height fufficient to be feen 12 leagues. The fkirts of this ifle are moftly taken up in the plantations, and efpecially the S.W. and N.W. fides. The interior parts are but little cultivated, though, fays captain Cook, very fit for cultivation. The want of it, however, greatly added to the beauty of the ifle; for here are, agreeably difperfed, groves of cocoa-nut and other trees, lawns covered with thick grafs, here and there plantations and paths leading to every part of the ifland, in fuch beautiful diforder, as greatly enlivens the profpect. The anchorage, named by Cook "Englifh road," (being the firft who anchored there,) is on the N.W. fide in S. lat. 21° 20′ 30″. The bank is a coarfe fand, extending 2 miles from the land, on which are from 20 to 40 fathoms water. The fmall creek before it affords convenient landing for boats, at all times of the tide; which here, as well as at the other iflands, rifes about 4 or 5 feet, and is high water on the full and change days about 7 o'clock. Van Diemen's road, where captain Cook anchored, is under the N.W. part of the ifland, between the moft northern and weftern parts. This ifland, as well as Ton-ga-ta-bu, is guarded from the fea by a reef of coral rocks, which extends from the fhore about 100 fathoms. The produce and cultivation of this ifle is the fame as at Ton-ga-ta-bu or Amfterdam (which fee); with this difference, that a part only of the former is cultivated, whereas the whole of the latter is. The lanes or roads neceffary for travelling are laid out in fo judicious a manner, as to open a free and eafy communication from one part of the ifland to the other. Here are no towns or villages, the houfes being moftly built in the plantations, which are neatly conftructed. The floor is a little raifed, and covered with thick ftrong mats; the fame fort of covering ferves to enclofe them on the windward fide, the other being open. Before moft of them are little areas, which are generally planted round with trees, or fhrubs of ornament, whofe fragrancy perfumes the air in which they breathe. Their houfehold furniture confifts of a few wooden platters, cocoa nut fheils, and fome neat wooden pillows, fhaped like four-footed ftools or forms. Their common clothing, with the addition of a mat, ferves them for bedding. For further particulars we refer to the article FRIENDLY *Iflands*.

EAR, in *Anatomy* and *Phyfiology*, the organ which, by a fenfation peculiar to itfelf, renders us capable of being affected by found. By this term we underftand, therefore, not only that part which is prominent from the head, but the whole of the organ of hearing. Adapted in an eminent degree to the purpofes it is defigned to execute, it offers an inviting fubject to fuch as are difpofed to inveftigate the minute mechanifm of an organ, which contributes remarkably to fome of our moft exquifite and refined enjoyments. Whoever has witneffed and attentively obferved the diftreffing effects arifing from a lofs, or diminution of its fenfibility, will readily acknowledge that fuch deprivation throws us at a diftance from our fellow-creatures, and, in the prefent ftate of fociety, renders us more folitary beings than the lofs of fight itfelf. Though the rapid glance of the eye, the immenfe diftance to which it enables us to carry our perceptions, and the extended circle it embraces, have given rife to fome of our moft pleafurable and magnificent fenfations; though it has brought us acquainted with objects which feemed ever placed far beyond our reach; ftill the more humble fenfe which we are now confidering, the more confined dominion of the ear, has contributed moft efficiently to the every-day happinefs of life. It enables us to hold communication with our fellow-creatures; to improve and exalt our underftandings by the mutual interchange of ideas; and thus to increafe the circle, not only of our phyfical, but of our moral relations. The charms of eloquence, the pleafure refulting from the concord of fweet founds, inexplicable perhaps as it remains, are other fources of intellectual enjoyment, which contribute to place this fenfe among the moft delightful as well as the moft important we poffefs. Whatever, therefore, by explaining its ftructure, or examining its functions, can lead us to improve its natural, or reftore its difordered fenfibility, cannot be a fubject of trivial moment. Our more immediate object is to confider the human ear, obferving only, that the ftructure of the organ, being fuited to one great end, is in all cafes fundamentally the fame; its different forms and varieties depending on the peculiar economy and abode of each individual creature. There are fome parts, effential to the perception of found, which are always prefent, be the fenfe of hearing delicate or imperfect; there are others which are found only in particular claffes of animals. In thofe which approach neareft to the human form, it differs from that of men only in the relative fize of the different parts. The fenfe of hearing is ftill perhaps the fame, the propagation of found is fubject to the fame laws; and we muft look for the variety of effect, not only to the organs, but to the centre to which all our fenfations tend.

It will be found convenient to make some leading divisions of the subject, under which we may arrange our ideas in more distinct order, and from which we may set forth with greater freedom, when about to examine the powers and structure of the ear. The necessity of such arrangement will be obvious to any one who wishes to distinguish between positive truths, and the probable application of them, to the elucidation of different phenomena. With this view, we shall, in the first place, lay before the reader what may be regarded as demonstrable facts, and then endeavour to explain the application of these, as far as it can be made out by reasoning and probable conjecture. Whatever may be thought of such inferences, the series of facts will remain the same. They will ever form a solid base, however light and imperfect the superstructure raised on it by opinion; however rapidly it may vanish before the illuminating glance of some happier genius, or fall at the touch of more patient and inductive reasoning. These facts consist in a knowledge of the structure of the ear in different animals; in the power possessed by them of perceiving sounds; and further, in the degree of that power enjoyed by man. Of the manner in which this faculty of distinguishing sound is produced, we know but little; and in our endeavour to account for it, we must in many instances take our leave of positive truths, and be contented to trust ourselves to the more doubtful guidance of analogical reasoning and rational conjecture. There is a barrier placed in our road, beyond which nothing is clearly seen: if we pass it, the chance is that we stumble, if we do not fall. We have very little knowledge of the impressions which sounds make on other animals. We know that they hear; and in many instances we scarcely know more. If we could determine that there was a difference in the sensibility, and that this diversity was dependant on one particular structure of the organ, as compared with another, we should gain an important point, and be able to draw some probable conclusions as to the part which each portion of the organ bears in transmitting and modifying sound. We know the degree of perfection in the organ as it exists in man; so we know that many animals, who come near him in its structure, possess powers of nearly equal extent. We are convinced, moreover, that animals, with one part of the organ only out of many, are still capable of being affected by sounds. If, in addition to this, we knew the intermediate gradations of the faculty, as enjoyed by successive classes, when more and more parts are superadded to this simple structure; if we could precisely determine the degree of perfection proportional to each alteration, and improvement in the apparatus, the path would be clear, the barrier thrown down: we should deduce known effects from demonstrable causes; we should go from what is known to what is unknown, without the risk of missing our way: we should be enabled to assign the positive importance of each piece of the apparatus, and mark out clearly its relative functions. As these, however, are at present unknown, and, for the causes mentioned, likely to remain so, we must be contented with the endeavour to explain the phenomena, as we observe them in the more complicated structure, as they occur in creatures who can give an account of their sensations: in short, as we notice them in man. And if we consider the difficulty of accounting for the endless variety of the effects of sound on the human ear, where our knowledge is the most complete, we shall be the less disposed to examine it in other animals, where the variety may be equal, but where our inductions have nothing better to rest on than conjectural supposition. We should have to investigate an obscure subject in creatures, who could not convey to us any ideas of their sensations, or, at least, any such precise ideas as would lead us to well-founded inferences. The result of all that we can at last draw from our investigation would be this, that in the different gradations we observe a variety of organs, of which some parts are constant, others found only in particular classes, and differing in their conformation even in these. The obvious inference is, that the part universally found is the essential means by which we perceive sounds; that the additional apparatus is intended to facilitate its transmission, or to modify its action. Having gained this step, we again are stopped, totally unable to explain the mode by which this part so constantly met with is enabled to excite in us the idea of a sound. All that we know is this, that there are some ideas, which have admittance only through one sense, which is peculiarly adapted to receive them; and if the nerves, which convey them from without to the brain, are so disordered as not to perform their functions, there is no other way in which they can be perceived by the understanding. In this paucity of facts, we must make the most of those we possess; and for the better understanding them, shall regard them as they concern the structure of the ear, or as they are connected with its power of distinguishing the properties of sounds. This arrangement leads us to consider the method we have chosen to follow, in analysing the functions of the organ. We first take the ear to pieces, if I may use the expression, and describe the delicate and admirable structure of it in man, beginning from without, and proceeding till we arrive at the immediate seat of sensation; we next give the history of its powers, as ascertained by observable phenomena: and, lastly, we *endeavour* to connect these truths, to trace the progress of sound as affecting the different portions of the ear, and to determine the sum of its action on each; to notice the manner in which the idea of sound is admitted to the brain, and explain the mode in which it becomes modified, during its propagation from without, by the mechanical action of the transmitting parts; and to assign the relative importance of each part, by noticing the effects produced by an alteration or deficiency of them in man, and by considering their conformation in other animals. This comparative view will extend, however, only so far as may be necessary to assist us in explaining phenomena.

Before we can attempt to explain the manner in which the perception of sound is accomplished in man, it will be requisite to give a description of all the parts destined to collect, transmit, and modify the pulses of it, as well as of those on which they are finally impressed. And in thus considering the ear as an organ of sense, we shall include all the parts which are in anywise subservient to its functions, and which, in conjunction with the ear, go to form the whole of the organ of hearing. For the convenience, however, of anatomical purposes, it will be necessary to make a division of the ear into different portions; a division which, though an arbitrary one, will greatly facilitate the description. Of the divisions in common use, we shall adopt, as the most natural, that which makes three portions of the ear: the first including the *external ear*, or *auricle*, and the parts exterior to the membrana tympani; the second, the *cavity* of the *tympanum*, and the parts connected with it; and the last, the parts usually comprehended under the general term of *labyrinth*.

The ears are two in number, and, like all the organs designed to receive the impressions of surrounding agents, are symmetrical, or exactly resembling each other in structure. The description of one, therefore, may with great facility be applied to either; and as the plates represent throughout the formation of the left ear, we shall suppose ourselves to be explaining the structure of the same ear in the following

account. The description of that part of the ear, which is formed in bone, will be found in the history of the temporal bone, under the article CRANIUM; and as a knowledge of it is absolutely necessary in comprehending the following view, we shall, instead of puzzling the reader by continual references, suppose him to be fully acquainted with this previous description. As, in the account of the bony parts of the ear, no reference has been made to the plates designed to illustrate the anatomy of this organ; and as, in the following description, the explanations are scattered, we have thought it best to collect them under one view, that we might the more readily bring ourselves acquainted with the most important parts of its structure. The first plate begins with figures of the external ear, and leads us gradually to the most interior parts; the last plate exhibiting all the parts in their relative positions with regard to each other, and to the rest of the skull.

The formation of the ear, as well as of the eye, is very considerably advanced during the fœtal state; some of the parts possessing, even in the early months, a volume nearly equal to that which they finally attain. After the descriptions of the different portions of the ear in the adult, we shall introduce that of each part, as it existed before birth, as well as of the gradual alterations it undergoes before it arrives at the form it is destined at last to maintain.

The organ of hearing, in its simplest form, consists of the expansion of a nerve, gifted with its peculiar sensitive qualities, over the surface of a delicate membrane. In man and the more perfect animals, there is an additional apparatus connected with this, the design of which is supposed to be that of collecting and modifying those pulses of sound which are finally to be impressed on the nervous pulp. In man this apparatus consists of a piece of cartilage, seated externally to the head, which contracts into a funnel leading to the internal parts. The bottom of this tube is truncated obliquely, and its aperture closed by a firm membrane stretched across it, which separates this external part of the ear from the succeeding, or middle portion of the organ. Beyond, or on the opposite side of this membrane, we meet with a small cavity, hollowed out in bone, which has been termed the barrel of the tympanum. Of the several openings into it, there is one more particularly demanding our attention here. It is the internal aperture of a tube, the other extremity of which opens at the posterior part of the nose, behind and above the palate. By means of this communication, the external air is admitted into this barrel, and equipoises the weight of the atmosphere on the other side of the membrane. Across the cavity there is extended, though by no means in a straight line, a series of little bones, the exterior one of which is attached to the membrane we have just mentioned, the most internal of the set being firmly connected with another membrane, which, in conjunction with it, shuts up the entrance to a still more deepened cavity, called the labyrinth of the ear. This last hollow, excavated as it were in the solid bone, consists of a middle portion of irregular figure, and of different channels, which proceed from it in various directions, and, finally, return, with the exception of one only, to the same chamber. All these passages are lined by a membrane, on which the sentient extremity of the auditory nerve is expanded in different shapes; from these it is collected into one trunk, and goes on to join a particular part of the brain, and thus completes the communication between the external agent and the sensorium.

External Ear.

Under this name we comprehend that part which projects from the head, and which, folded in various directions, is known by the name of the *auricle*, or *pinna*, of the ear; and the passage leading from it to the tympanum.

The pinna, itself insensible to sounds, but adapted for the collection of those which are to be transmitted to the tympanum, is placed at the side of the head immediately behind the articulation of the lower jaw. It is of a size varying much in different individuals, of an irregular, ovate, and flattened form, with its broader part above, tapering below; loose and detached from the head behind, and continuous with the skin of the surrounding parts before. Its external surface, directed more or less forward in different subjects, is marked by several eminences and depressions, to each of which a separate name has been affixed.

Beginning our description from the external edge, we just notice the *helix*, which is the elevated convex fold forming the chief part of the outline of the ear. It rises in the middle of the pinna, out of a hollow, termed the concha, and, passing forwards, immediately above the external meatus, it makes a turn upwards and backwards, sweeping round to form the circumference of the pinna. Below, the fold is effaced, and gradually lost in the smooth and flattened part above the lobule, which completes the figure of the ear in this part. From this curling in of the external edge of the pinna to constitute the helix, a groove, or furrow, is formed, which separates it from the opposite eminence, the antihelix, throughout its whole length. The *antihelix* rises gradually from this depression, forming an elevated semi-circular fold, with its concavity towards the meatus, running lengthwise through the middle of the ear, surrounded nearly on all sides by the helix. Towards the upper end, as it turns forwards, the fold divides into two crura, both of which sink under the inverted edge of the helix, at its upper part: the superior of these forms a less elevated and rounder convexity than the lower, which is pinched up into a narrower ridge. Below, the antihelix becomes gradually narrower, and terminates just above an eminence, called antitragus, from which it is separated by a slight notch. As the antihelix arises in two separate portions above, from under the helix, there is left a shallow depression between them, called *fossa navicularis*.

Anterior to, and below these folds, there are two eminences, called *tragus* and *anti-tragus*. The first of these, continuous with the skin of the face, juts out backwards, in an oblique direction, so as to cover, in a great measure, the opening of the meatus. The projecting edge, the line of which is perpendicular, is nearly straight, and slants off above and below, so as to leave a channel, which separates it from the helix above, and another deeper notch dividing it from the anti-tragus, below and behind. This last eminence, which may be regarded as a continuation of the lower end of the antihelix, is placed opposite to the tragus at the lower part of the ear, forming the inferior wall of the concha.

The *concha* is the large deepened excavation in the middle of the pinna, and is surrounded on all sides by the projecting folds we have been describing. Bounded before by the tragus, below by the anti-tragus, the chief portion of its circumference is made up by the semi-circular sweep of the anti-helix, which suddenly shelves off into this hollow. It is divided across unequally by the commencement of the helix, which thus makes a small part of its anterior boundary above. That part of the concha above the beginning of the helix is continued into the furrow which separates this eminence from the anti-helix: the lower division leads on front into the meatus.

The portion of the ear situated below these parts, is termed the *lobule*: it is flat, and terminates in a soft rounded edge,

edge, varying much in figure in different individuals. It is the part which we see, in most nations, pierced for the admission of ear rings.

The internal surface of the pinna, facing the side of the head, is moulded into eminences and depressions corresponding, in an inverse sense, to those observed on the opposite external surface, but not marked in so striking a manner. The line of its connection with the head is a semi-circular one, with its concavity forwards, formed by the fold of the skin, as it passes between these parts. The convexity of the pinna, behind this line, is caused by the bulging of the cartilage in the part which corresponds to the depression of the concha on the external surface.

The textures, which enter into the composition of the pinna, exclusive of those which we find almost universally distributed, are, common integument, cartilage, muscles, and ligaments. The skin covering the external ear is connected very closely to the parts it surrounds, by a dense cellular tissue, containing scarcely any fat. It is more delicate than in the generality of parts; and is furnished with numerous sebaceous glands, disposed throughout its structure. When the cuticle has been removed by maceration in water, we can distinctly see a vast number of rounded foramina, of different sizes; these are the excretory ducts of glands, from which the greasy substance that covers the ear is secreted: they are particularly large and distinct in the concha. The skin alone, covering a close cellular tissue, filled with a delicate fat, composes the lobule of the ear, which does not appear to suffer any irritation from the continued pressure of a foreign body, as an ear-ring, in its substance. On the internal surface and edge of the tragus, the skin is furnished with a few fine hairs, which project over the entrance of the meatus.

The cartilage on which the figure of the whole pinna, excepting the lobule, depends, has been necessarily described in considering the shape of that part; and we have only to notice any alteration in its form, which may be observed after the removal of the integuments. When this has been effected, we may perceive that the figure is broken in upon before by a deep notch, occupied by a ligament, between the upper edge of the tragus, and the opposite portion of the helix. Behind, the united extremities of the helix and anti-helix, instead of forming a continued rounded outline, terminating smoothly in the lobule, appear as a pointed projecting process, separated from the body of the cartilage by a small interval, which, when covered by skin, appeared only as a groove. Between this process and the anti tragus, a tolerably strong ligament is extended. In the dissected cartilage, we observe, in a more striking manner, the eminences and depressions corresponding, in an inverse sense, to those on the external face, some of which were scarcely perceptible before the removal of the investing parts. We see now, also, the cartilage sending in a process, which goes to form a part of the commencement of the meatus externus, as we shall have occasion to mention hereafter. The texture of the cartilage of the pinna resembles that of the nose and trachea, and has, by an eminent and much to be lamented anatomist, been described under the name of fibro-cartilage, as distinguishable, by its structure and properties, from the cartilages entering into the composition of joints. It is flexible and exceedingly elastic, so as to assure, by constantly preserving the ear open, a ready admission to all sounds, the reflection of which into the meatus is still further favoured by its form.

The cartilage is fixed to the side of the head by three ligaments: an anterior one, arising from the root of the zygomatic process of the temporal bones, and terminating in the base of the tragus, and the neighbouring part of the convexity of the helix: a superior one, arising from the aponeurosis covering the skull, and fixed to the upper part of the convexity of the concha: lastly, a posterior ligament attached by one extremity to the mastoid process of the temporal bone, by the other to the protuberance of the posterior part of the concha. They would appear to be nothing, perhaps, but a dense cellular substance.

The muscles of the external ear may be divided into those which move the whole pinna, and those which act partially only on the divisions observed on its external surface. In the first of these classes, which we shall consider here, though it cannot be regarded as entering into the construction of the pinna, we enumerate some small muscles, which are, however, very manifest in a muscular subject, and which appear to have derived their names from their situation, with regard to the ear. They are, the *attollens auriculam*, the *anterior auriculæ*, and the *retrahentes auriculam*.

The *attollens auriculam*, temporo-auriculaire of Chaussier, is a thin flat muscle, situated on the side of the head, immediately above the external ear. It is the broadest of the muscles of the ear, and of a triangular shape: the upper portions of its thin and scattered fibres arise in a curved line from the external surface of the aponeurosis of the occipito-frontalis, rather below the rounded origin of the temporal muscles; from these points they converge in their approach to the ear, (not in corresponding lines, however, from all parts, the anterior fibres being directed more backwards than the posterior ones are forward,) and terminate in a flat tendon, which is fixed to the eminence on the inner side of the pinna, answering to the fossa, which is observed between the crura of the antihelix. This muscle lies immediately under the skin, and over the temporal fascia, from which it is separated by cellular tissue. It will elevate the pinna, and, perhaps, by stretching the part to which it is attached, tend to open the passage of the external meatus.

Anterior auriculæ, zigomato auriculaire. This very delicate muscle, allied in form to the one we have been describing, but much smaller in its dimensions, is situated on the temple, immediately before the ear. It arises from the same surface of the aponeurosis as the former, in that part of it which lies over the middle of the zygoma. Its origin is not always, however, distinct, nor easily determined. It proceeds from thence backwards, and a little downwards, and becoming tendinous as it reaches the ear, passes on under it to arrive at the inner side of that part of the helix, which has been described as dividing the concha into two unequal portions. It is covered immediately by the skin, and lies over the temporal fascia and artery. Its action will be to draw that part of the helix forwards.

Retrahentes auriculam, mastoido-auriculaires, appear as small narrow muscles, affixed, by tendinous origins, to the external and hinder part of the root of the mastoid process, immediately over the attachment of the sterno-mastoideus. From thence they pass transversely towards the ear, and become fixed to the protuberance corresponding to the hollow of the concha. They are hardly to be reduced to any description which shall answer, in every instance, as they vary in number and origin in different subjects. They are covered by the skin, and separated from the temporal bone by cellular tissue. They will stretch the concha, and draw the pinna backwards.

From its connection with these muscles, the auricle can be moved upwards, backwards, or forwards; and by their combined actions in any of the intermediate directions. It is doubtful if they have much power over the tube of the meatus, though they may exert their influence in opening the hollow of the concha. In removing the skin, to gain a view

view of these muscles, considerable caution is requisite; as they are delicate in some, and not in every case easily distinguished from the surrounding parts. To see them more distinctly, the ear should be drawn in different directions, so as to put them on the stretch; and they should be studied immediately as they are dissected, as they soon become confused and indistinct. The muscles we have mentioned as acting on the different eminences of the pinna, are placed at different points on its surface: they are extremely small, so that some anatomists have denied altogether their existence. The *tragicus* derives its name from the tragus on which it lies: placed on the external face of this eminence, which it almost entirely covers, it may be described as arising at its basis and terminating at its summit by tendinous extremities. It is of a triangular shape, with the base below. Where the anti-tragus forms its greatest projection there is attached to its exterior surface a small muscle called *anti tragicus*: its fibres proceed obliquely upwards and backwards, and terminate at the lower and posterior edge of the anthelix, to which they are fixed in the angle of that slit which we have described as existing in the cartilage between this last eminence and the anti-tragus. It is broader below, and tapers gradually to a tendinous point above. The ligament which we have mentioned as filling up the interval noticed above, lies externally to this muscle, which is covered by skin on its internal surface. The *major helicis*, a narrow strip of muscle, arises from the edge of the projecting helix immediately above the tragus: it mounts a little forward, gradually lessening in size, and is attached to the external edge of this eminence just where it begins to make its turn backwards. The *minor helicis* lies on the helix as it begins to arise from the hollow of the concha, its fibres pass forwards and terminate on the edge of the helix opposite the end of the inferior crus of the anthelix. These muscles lie on the external surface of the pinna: there is still another arising from the inner side, called the *transversus auriculæ*. It is placed between the convexities answering to the hollow of the concha and the groove between the helix and anthelix. Its fibres are short, and can scarcely be distinguished as muscular: they occupy nearly the whole length of the space corresponding to the rising of the anthelix, so that the perpendicular measurement of this muscle is considerable, though its transverse one is short. The more regular and more distinct of these muscles are the tragicus and anti-tragicus. The distinct action of each of them has been described by different anatomists, and may be collected by reflecting on their attachments. The motions they produce, however, are at the best extremely obscure, and in most instances not discernible. Their only actions can be those of approximating, or drawing asunder the different eminences of the ear, and the extent of such movement we believe to be extremely minute. This has been supposed to arise from the opposition made by the elasticity of the cartilage to the actions of these small muscular powers, which, it will be readily seen, do not exert their influence through the medium of moveable articulations, but act immediately on a resisting body, in which there is a constant tendency to preserve one customary form. The integral action of these muscles seems to be principally directed towards altering the form and dimensions of the concha, around which they are partially distributed. We shall have occasion to consider the uses of both the orders of muscles we have been describing, when considering the functions of the external ear in their relation to the sense of hearing. In the mean time it must be allowed, that in man the action of many of these muscles is extremely confined, and, in the majority of instances, scarcely perceptible. Whether this may arise from our habit of compressing them by our mode of dress, or from being seldom called into action in the quiet and regulated intercourse of civilized life, is perhaps a matter of but little moment: our wants require accuracy, more than acuteness of sense. There are, however, numerous recorded instances, as well as living examples of persons in whom this power of moving the external ear has been manifest and decided. We are told also, that among the more savage nations, whose predatory habits are such as to render a watchful caution alive to catch every coming sound necessary both for their preservation and support, there does exist a considerable power of moving the ear in different directions. The rapid movements of it in brutes, and the various directions of its opening in animals of different habits, have been the subject of frequent observation. The minute form and paleness of the proper muscles of the human ear render the dissection of them exceedingly troublesome, more especially if the subject be not strongly muscular: indeed, unless in these favourable circumstances, our labour will be in vain; we shall to no purpose seek to distinguish them from the surrounding substance, to which, by their paleness, they are nearly allied.

The pinna in the fœtus possesses nearly the same external characters as in the adult. Its size does not bear the same proportion to the other parts of the ear as it afterwards reaches; it being of all the organ the part which is the least advanced before birth. In the adult male the auricle is observed to be more rounded and full, as well as somewhat thicker than it is in the female. The national distinctions of the ears are derived chiefly from their size and situation. They are described to be, in Europeans, smaller than in the inhabitants of many other climates; amongst whom we have accounts of their reaching a prodigious size. It is well known, that in savage nations they stand off farther from the side of the head; and in the idols of ancient Egypt they are constantly figured as being placed much higher than we now observe them. That such a representation was not the effect of ignorance, but of design, is deducible from the finished workmanship we observe in the rest of their construction. Allowing then that it is taken from nature, it will be no more remarkable than the variety we notice so frequently in domestic animals, as to the situation of the external ear. The four-footed mammalia are the only animals besides man who are provided with a projecting pinna: it is not constant, however, even among these, being deficient in many of those who live either in the water or under ground. Its varieties of figure and position are familiar to all, and we have only to add, that they are provided with strong muscles adequate to move them in every necessary direction.

Meatus Auditorius Externus.

Having completed our description of the pinna of the external ear, we proceed next to consider the passage leading from it to the tympanum. The external meatus extends from the concha to the membrana tympani, by which it is separated from the next cavity, or that of the middle ear. It takes its course immediately between the mastoid process and the glenoid cavity for the reception of the condyle of the lower jaw. The general direction is at first upwards and forwards, it then makes rather a sudden turn downwards and backwards, and is continued nearly in an horizontal line till it reaches the membrana tympani. Considered in the whole of its course it would appear as forming a convexity pointing upwards, and a corresponding concavity directed downwards and forwards. A section carried at a right angle to its axis presents an oval rather than

than a rounded opening. It gradually diminishes in size as it proceeds from the concha, being narrowed for about the middle third of its course, and enlarging again as it approaches the tympanum. Its usual length is rather less than an inch: and it is always shorter above than below, behind than before, on account of the oblique direction of the membrana tympani. In considering the parts which enter into the construction of the sides of the meatus, our attention will be called to a solid or bony portion, a cartilaginous plate, incomplete in parts, its vacancies being filled up by the interposition of a fibrous structure, and, lastly, the common lining of the whole. The bony portion has been already described with the temporal bone, it occupies about one-half of the length of the meatus. The cartilaginous part of the tube is continuous with the base of the tragus, and the lower and anterior part of the concha as before mentioned. It is formed by a broad plate, proceeding inwards from these points, gradually decreasing in breadth, and curling from below upwards and backwards in such a manner as not to form a complete circle of cartilage, but to leave a vacancy between the circumvoluted edges towards the upper and posterior part, which is filled up and completed by a fibrous expansion. The cartilaginous tube thus constructed terminates in an oblique line, the lower part of which projects inwards in a pointed form, and is fixed either immediately or by the intervention of fibrous tissue to the rough edge observed at the inferior part of the termination of the bony meatus. When the membrane, which completes the tube from above, has been cut through longitudinally, so as to give one the liberty of making the cartilaginous plate flat, it appears of a triangular shape, its base towards the pinna, its apex towards the head, which, when folded up, will form the obliquely truncated tube we have been describing. It will be seen from this that the pinna and the cartilaginous portion of the meatus are formed by a continuous piece of cartilage, which in the pinna lies extended by the side of the head, and gradually contracts into a tubular meatus. Near to the tragus there is a considerable cleft in this cartilaginous plate, filled by a fibrous substance: farther in, we find it again divided transversely by another cleft, which does not however run to the full extent of its breadth. Besides these two, we sometimes meet with a third vacancy; and they are all known by the name of incisures (*incisuræ*). It is on this account, as well as from its being an incomplete tube, that it has been compared to the construction of the trachea. The fibrous substance, which occupies the interspace of the second incisure, has been described by Santorini as being covered by muscular fibres, which have retained his name; the musculus incisuræ majoris Santorini, musculus meatus auditorii of Douglas. Its action would be to contract the length of the tube. The fibrous portion, in conjunction with the skin, forms the upper part of the tube, where they complete the vacancy left between the edges of the cartilage. The fibrous plate is not very apparent, but may generally be distinguished from the skin which lines the whole of the tube within. It is continued to the temporal bone, stretching itself on each side as it advances inwards, and serves to connect the oblique edge of the cartilage to that part. Between this expansion and the skin lining the meatus we meet with numerous blood-vessels enclosed in cellular tissue. The whole of the external meatus is covered by a production of skin, which dips into it after having invested the pinna, and becomes reflected over the membrana tympani at the bottom of the conduit. It varies somewhat in appearance, as well as in structure, in different portions of its passage; and may be described generally as being considerably thinner the nearer it approaches to the tympanum. It is covered, more especially towards the pinna, by a fine down, interspersed by a few longer hairs of an equally delicate appearance.

Towards the commencement of the bony meatus, we observe, on removing the cuticle, the skin to be pierced by numerous small openings lying close to each other, which are the outlets for the ceruminous secretion we shall presently notice. They are more particularly observable at the termination of the cartilaginous portion, where they form a zone of minute foramina. As we arrive at the membrana tympani, we find the skin become extremely delicate; and where it is produced over that membrane, it is diaphanous: whether it is only the cuticle which is thus produced, or whether the true skin also goes to form this external layer, is not perhaps exactly ascertained. It adheres but loosely to the cartilaginous portion; as we proceed inwards, it becomes most closely and intimately united with the membrane covering the bone, so as not to be separated from it. Still farther in, and where it covers the membrana tympani, it is separable without any difficulty, so as to be detached in the form of a bag accurately complete at its bottom, so that if the membrana could be removed from within, this sac would still obstruct the communication between the cavity of the tympanum and the internal meatus in the most perfect manner. It is of great sensibility, which has been ascribed to the thinness of the cuticle in these parts.

In the cellular tissue which intervenes between the skin and membranous parts of the meatus, we find a considerable number of small rounded and oval bodies, which are the ceruminous glands of the meatus: we find them, also, but not so closely studded, between the skin and the cartilaginous portion of the tube: they each open by a peculiar excretory duct into the meatus, and give the porous appearance we before mentioned. They furnish a yellow matter of some consistence, extremely bitter and of an oily nature: it is known by the name of cerumen, or the wax of the ear. It acquires in many persons considerable hardness if suffered to accumulate, and forms a solid body obstructing the meatus. The use of this secretion is supposed to be that of affording some defence to the sensible covering of the meatus, as well as to bar the access and nestling of insects.

In order to obtain a correct knowledge of the figure of the meatus, we must make sections of it in different directions, or we may with ease procure a cast of it in common plaster. The sections should be made transversely in different parts of the tube to gain a view of its shape and area, or longitudinally in the perpendicular and horizontal directions, to ascertain its extent and curvatures. It is by these last sections also, that we are enabled to observe the proportions which the bony and cartilaginous portions bear in the construction of the meatus, its connexion with the concha, the openings from the ceruminous glands, and, lastly, if the section be carried on through the petrous part of the temporal bone, the relative bearing of it to the internal part of the organ. Such sections will be found eminently instructive, are easily executed, and require no particular directions for their performance.

The meatus externus in the fœtus possesses the same proportional length as in the adult. Its area also does not materially differ, excepting that it is comparatively larger towards its internal extremity from the magnitude of the circle for the membrana tympani, to the circumference of which it is affixed. The structure of the tube, however, offers some more remarkable differences. The cartilaginous portion is nearly the same, only the incisures are larger and more

more apparent, and the fibrous part occupies perhaps a greater part of the circle. The bony part, as has been already described, is absolutely wanting; we have then only to examine here what supplies the deficiency. Above, the internal lining alone is observed, as forming the provisional sides of the meatus; below, in addition to this, we can plainly perceive a peculiar membranous sheath formed of strong parallel fibres which arise from the ring of the tympanum, and terminate in the cartilaginous part of the meatus. It is this expansion of thick membrane which makes the division between the meatus and the glenoid cavity, which in the adult is formed in bone; as the formation of the bone proceeds from within, it becomes gradually lost. The animals who have no external ear, and still possess an external meatus, are birds, and cetacea. In the former class the tube is short and chiefly membranous, in the latter it is very long, proportionably small, and inflected in various directions.

The middle Ear, or cavity of the Tympanum.

The middle division of the ear is bounded externally by the membrana tympani, which separates it from the external meatus, and internally, by the parts called the labyrinth: it lies under the union of the squamous with the petrous portion of the temporal bone, over the fossa jugularis, with the mastoid process and its cells behind, part of the glenoid cavity and the Eustachian tube before. The irregularity of its form will admit of no exact description of its figure, the walls of which, it will be sufficient to observe, are made up on both sides by bone. It is only towards the meatus that we observe any considerable deficiency in this bony case, where it is interrupted by a large circular opening, which is, however, shut up by a membrane stretched across it, called, from its situation, the membrana tympani. In this cavity our notice will be claimed by a variety of objects, which we believe to be subservient to the transmission and modification of those sounds which have impinged on the membrane from without. Here, however, it will be necessary again to refer the reader to the description of the bony part of the organ, as, without a correct knowledge of that part of the subject, the study of this will be at last but incomplete and unintelligible. In the present place, we have to notice the membranes closing the different openings, the Eustachian tube, the connections of the ossicula, the muscles employed in moving them, and, lastly, the membrane which lines the whole of the cavity and the parts connected with it.

The *membrana tympani* is distinct from the linings of the external meatus and the cavity of the tympanum, from both of which, it may be separated by maceration in water. It has been already mentioned as closing the internal end of the meatus, where it lies in an oblique direction, stretched across the bony circle in the external side of the tympanum. Its obliquity is such, that it forms a very acute angle with the lower portion, and an equally obtuse angle with the upper side of the bony external meatus, to which latter, indeed, it is at first nearly parallel. The plane of its external surface, however, does not lie exactly opposite to the lower half of the meatus, but it is directed rather forwards, the internal surface looking proportionably backwards. The dimensions of the membrane are rather larger than the circle to which it is fixed, which allows, therefore, of its relaxation, and of its being drawn into a wide cone, the apex of which is directed towards the cavity of the tympanum, thus forming a hollowed surface towards the meatus, and a corresponding projecting surface in the tympanum, which latter is strongly united to the descending handle of the malleus, the motions of which it must in all cases follow. The membrana tympani is closely fixed round its circumference to the bony circle which embraces it. It has, however, been a matter of dispute among anatomists, whether there existed, in a natural state, any deficiency in this union, at any part which would allow of the passage of air or any other fluid from the meatus to the cavity of the drum. The most exact researches of later days have, we believe, ascertained, that no such opening does exist in the natural structure of the parts. There can be no doubt, however, that there is occasionally a communicating foramen which allows of the passage of air, or smoke, through this intercepting membrane. The existence of it is proved beyond contradiction, in those persons who have had the power of expelling, by the external meatus, the smoke of tobacco collected in the mouth, which must have passed by the Eustachian tube into the cavity of the tympanum. We have been informed also, that in some of the northern Americans, this phenomenon has been observed pretty generally. The foramen has been particularly described by Rivinus, whose name it long bore. Whether it exist, however, or not, it would seem that the reflection of the skin over its external, and the membrane of the cavity of the tympanum over its internal surface, would effectually close any deficiency left between the membrana tympani and the bone. The membrane itself is dry, and when these reflections are removed, totally transparent. It appears to possess no vessels carrying red blood in its healthy state in the adult, though in cases of inflammation, and in the fœtus, it is sensibly vascular. It differs in structure from any of the other membranes with which we are acquainted, preserving its peculiar appearance long after the other animal parts of the body are dissolved by putrefaction. Joined to this firmness and transparency, Mr. Home has of late considered it as possessing muscular fibres, which pass in all directions from the bony rim to the handle of the malleus. In the elephant this structure, he says, "is visible to the naked eye, as it is even in the human tympanum, when examined under favourable circumstances. When viewed in a microscope, the muscular fibres are beautifully conspicuous, and appear uniformly the same throughout the whole surface; the muscular fibres appear only to form the internal layer of the membrane, and are most distinctly seen when viewed on that side." Its probable use we shall have to consider hereafter. The membrana tympani thus formed, completely establishes a barrier between the external meatus and the cavity of the tympanum; preventing the entrance of air or other fluids. The membrana tympani of the fœtus is more slanting in its position than that of the adult, and it is covered externally by a thin layer of white sebaceous substance, called by some *pseudo membrana*, by others *membrana* or *lamina mucosa*. This seems to consist merely of the secretion of the ceruminous glands, as the whole meatus is more or less covered by a similar whitish substance. It may be separated from the outer surface of the membrana in a distinct circular piece.

The *Eustachian tube*, or trumpet, is a canal formed partly in bone, and partly in cartilage and membrane, extending from the cavity of the tympanum to the upper part of the pharynx, behind the posterior opening of the nares; its direction, viewing it from the tympanum, is obliquely forwards, inwards, and downwards: about two inches in length, contracted and of a circular form at its commencement in the tympanum; it becomes gradually larger, with its sides flattened into an elliptical canal, as it approaches the pharynx, into which it opens by a transverse mouth with an elevated margin around it. The bony portion of the tube forms the third next the tympanum, the remaining two-thirds being made up of cartilage and membrane. The first of these commences in the anterior and superior part of the tympanum, and passes on in the very substance of the temporal bone, to join the other portion.

portion. In this course it lies under the channel which contains the tensor tympani, and externally and above the canalis carotideus, from both of which it is separated only by a thin bony plate. The other two-thirds, regarded as an whole, resemble a flattened cone, whose apex is continuous with this bony portion, into the irregular edge of which it is firmly implanted. From this origin, the tube passes obliquely forward, attaching itself to the neighbouring bones, and when arrived opposite the internal ala of the pterygoid process, enlarges suddenly just before it terminates in an open mouth. The cartilage, which enters into the composition of this part of the tube, forms its internal side, or that next the mesial plane. It is of a triangular shape, and constitutes at first not only the inner side of the tube, but also the superior part of its external side. The tube has, from this appearance, been described as if made up by two plates of cartilage united longitudinally at their superior edges, of which the external plate is narrow, and the deficiencies supplied by membrane, whilst the internal plate is continued from the fauces to the tympanum, forming throughout the inner half of the wall. This external plate is not always found, and in such case it is the membranous portion which completes the circumference of the tube without. It is constructed chiefly by the membrane lining the tube strengthened by some fibrous expansions arising from the adjacent bones and enveloping it closely. The Eustachian tube is lined internally by a continuation of the mucous membrane of the pharynx, which gradually loses its redness as it approaches the cavity of the tympanum, becoming also more evidently delicate in its texture. This tube establishes a communication between the tympanum and the external air, which thereby gains access to the cells formed in the substance of the mastoid process, and already described as opening into the upper and posterior part of the cavity. This air, however, or any other fluid, cannot penetrate into the internal ear, as the openings between them are closed by membranes in the living subject. The foramen rotundum is shut up by its peculiar membrane, which resembles the membrana tympani in appearance: its plane is not parallel but oblique, in regard to the latter, as may easily be supposed if we consider the direction of this opening. The foramen ovale also is closed by its membrane, to which the base of the stapes is firmly affixed, the latter not filling up the whole of the opening, but leaving a narrow border in which the transparent membrane is apparent.

From the consideration of the barrel of the tympanum, we proceed to that of the parts which it contains. These consist of three small bones, called the *ossicula auditus*, some muscles concerned in moving them, and a nervous cord crossing the cavity transversely.

The figure of the ossicula has been already the subject of a particular description; and we have here to examine the relations which they bear to the tympanum, and to each other, as well as their modes of connection; we then observe the possible degree and extent of their motions, as resulting from these connections. With an accurate understanding of these points, we proceed to examine the muscles or moving powers which can be brought to act on them, and attend more particularly to the spots at which they make their appearance in the tympanum, and the relative situation of these points with regard to the bones; as it is from them alone that we can estimate the line of direction in which they act. Possessing a correct knowledge of these facts, we may calculate the probable effects of their combined or individual action on the bones, and consequently on the parts connected with them, the membrana tympani and the membrana fenestræ ovalis. The handle of the malleus is attached, throughout the whole of its length, to a line in the upper half of the membrana tympani; the lower point of it being fixed to the apex of the cone we have described in the centre of it, from whence the attachment is continued to the circumference. Above, the neck of the malleus is tied to the bony ring of the tympanum; its head lying in a hollow of the superjacent bone, to which it is fixed by a strong ligament descending from above, and passing to its inner surface. Anteriorly the long process is admitted into a fissure of the bone, from which it cannot be removed in the adult. The direction of the long axis of the malleus will be thus nearly perpendicular, and that of its long process horizontal. In this situation, its double articular surface is directed backwards and inwards, the whole of its neck and head being above the frame supporting the membrana tympani; so that when viewed from without that opening, we can see its handle only. The articular surfaces of the incus lie closely embracing the corresponding surfaces of the malleus, to which it is attached by a capsular ligament, allowing some freedom of motion: its short leg is directed backwards and a little downwards, so that its point rests in a small hollow at the commencement of the mastoid cells, in the same horizontal line with the long process of the malleus: it is further fixed in this spot by two distinct and strong ligaments, which effectually prevent its starting. The long leg descends in a line nearly parallel to that of the handle of the malleus, but behind it, and removed farther inwards from the membrana tympani; it does not, however, extend so far down into the cavity of the tympanum. From this position all that we can see of the incus below the circle of the tympanum is the inferior part of its long leg, as it turns inwards to be connected with the head of the stapes, to which it is united by a loose capsular membrane. This last bone, as it lies in the fenestra ovalis, has the long axis of its base nearly at right angles to the descending crus of the incus, and the manubrium of the malleus, and consequently parallel to the long process of that bone: the base has its convex edge uppermost, and is fixed firmly to the membrana fenestræ ovalis: from the narrow strip of membrane left between it and the rim of the fenestra, it can have but a very circumscribed and inconsiderable motion. Such are the relative positions and connections of these bones; and if we examine their possible motions, we shall find them limited to very narrow bounds. It will be found that they have but little action among themselves, their motions being chiefly restricted to changes producible on the membranes of the tympanum. Of their individual action we shall say nothing; as, from their connections, we can hardly suppose one bone to be moved, without influencing the motions of the whole, which we shall therefore consider in combination. The axis of motion of the integrant bones is in a line drawn from the point of the short leg of the incus to the commencement of the long process of the malleus; so that if the parts of the bones lying below this line be drawn inwards, the parts above must be carried outwards, and *vice versâ*. From the connections, however, of the head of the malleus and the base of the stapes, their motions in these directions can describe but very minute portions of a circle. The incus, having no muscles, would appear in this instance to be perfectly passive, rotating on its short leg as the stapes acts with advantage on its long process, or the malleus on its articular base. Besides this motion inwards and outwards, we are disposed to admit of a slight motion of the bones backwards and forwards, in which, however, they do not move in parallel lines, there being two centres of motion, one in the point of the short leg of the incus, the other in the head of

the malleus, the revolving points being the manubrium of this bone and the long leg of the incus. But from the peculiar obliquities of their articular ſurfaces, which may be readily underſtood by examining the bones, if the handle of the malleus is drawn forwards, the long leg of the incus will be carried backwards, and communicate its motion to the head of the ſtapes: if the ſtapes be drawn backwards, it will carry with it the long leg of the incus, conſequently to which the handle of the malleus will be carried forwards and a little outwards. Theſe motions are, however, ſtill more limited than the former, in which the integrant bones are carried on their axes either inward or outward, and even by minute reſearch ſcarcely determinable.

The muſcles which can be brought to act on the officula are four in number; three belonging to the malleus, the tenſor tympani, externus mallei, and laxator tympani; and one attached to the ſtapes, the ſtapideus.

The *tenſor tympani* ariſes from the upper ſide of the cartilaginous portion of the Euſtachian tube, juſt under the opening in the ſphenoidal bone, for the paſſage of the arteria meningea media; from thence it runs backwards towards the tympanum, forming a rounded fleſhy belly, terminating in a tendon: during this part of its courſe, it lies enveloped in a ſtrong membrane, in a canal formed for its reception above the bony portion of the Euſtachian tube: arrived at the extremity of this canal, its rounded tendon emerges into the tympanum, paſſing through a contracted circular opening at the end of the bony channel. On coming through this hole, it turns over its external edge, and goes towards the membrana tympani, in a line directed horizontally and a little backwards, to be inſerted into the ſhort proceſs of the malleus, as it lies turned towards the internal part of the tympanum.

The *externus mallei*, in ſhape like the tenſor tympani, ariſes by a ſmall origin from the exterior edge of the ſpinous proceſs of the ſphenoidal bone, from which it runs backwards and a little outwards towards the fiſſure in the glenoid cavity, along which its tendon proceeds, and becomes fixed to the whole length of the long proceſs of the malleus, as it lies in its particular groove at the anterior part of the cavity of the tympanum.

The *laxator tympani* is the ſmalleſt of the muſcles of the malleus: it riſes from the ſuperior and poſterior margin of the bony ring of the tympanum, from which point it deſcends to be fixed by a tendon into the handle of the malleus, near the root of its ſhort proceſs. The upper extremity of this little muſcle lies in a fold of the membrane of the tympanum, juſt where it begins to be reflected over the membrana tympani, and as it deſcends it paſſes a little forwards.

The *ſtapideus* ariſes in a ſmall cavern in the petrous portion of the temporal bone, near the aqueduct of Fallopius; paſſing through this, its tendon emerges into the tympanum through a ſmall circular hole, over which it turns and paſſes forwards and a little downwards and outwards, to be inſerted into the poſterior part of the neck of the ſtapes.

The action of this laſt muſcle and the tenſor tympani is not in the direction of their fibres, but in a line which forms an obtuſe angle with them, their powers acting by the intervention of a bony pulley. By obſerving the ſituation of this point in its relation to inſertion of the tendon of the tenſor tympani into the malleus, and bearing in mind at the ſame time the connections of the officula, we ſhall find that the effect of its action will be to draw the membrana tympani inward, by which means it becomes proportionably tenſe. At the ſame time, by the joint rotation of the malleus and incus on their axes, the long leg of the latter will be drawn inwards, and ſomewhat forwards; and, from its connection with the ſtapes, muſt depreſs that bone, but more particularly the anterior end of its baſe, in the membrana feneſtræ ovalis. The action of this muſcle is the moſt extended of any of the four, and the moſt eaſily determined by examination. The point at which the tendon of the ſtapideus appears is ſituated rather above a plane, which ſhould be drawn through the baſe of the ſtapes, and more internal than its neck; ſo that it muſt proceed a little downwards, as well as forwards and outwards, to arrive at its inſertion. Its action would appear to us to be that of drawing the neck of the ſtapes towards this pulley; and in effecting this, it will neceſſarily draw with it the long leg of the incus, thereby carrying the handle of the malleus a little forwards and outwards, and relaxing in a ſlight degree the membrana tympani. The other effect of its action will be the depreſſing of the poſterior end of the baſis inwards, and drawing its anterior end proportionally outwards. For reaſons, however, before mentioned, this can produce but little viſible effect on the membrane of the feneſtra ovalis, which will allow but of little motion in the baſe of the ſtapes. The poſſible effects of the action of this muſcle has been a fertile field of conjectures, which we fear are not yet reduced to truths.

The *externus mallei* will draw the handle of the malleus forward and upward, and will conſequently ſtretch that half of the membrane which lies beyond the malleus, and relax that part which lies between the handle and its origin; at the ſame time, it will cauſe the long leg of the incus to rotate backwards, and carry with it the head of the ſtapes. It may poſſibly thus exert ſome power over the membrane of feneſtra ovalis.

The *laxator tympani* is deſcribed as drawing the handle of the malleus upwards and backwards, and thus relaxing that part of the membrane which lies between its inſertion into the malleus and its origin. It will ſtretch the part of the membrane lying on the anterior ſide of the malleus, and become in ſome meaſure the antagoniſt of the former muſcle.

The action of the muſcular fibres of the tympanum, as deſcribed by Mr. Home, would be to bring the broad cone of the membrana tympani into a plane ſurface, and thus antagonize the tenſor tympani, if the handle of the malleus could be affected by their action.

We have thus endeavoured to give the reader ſome account of the motions of the officula, the greater part of which are demonſtrably evident on the recent ear of the adult; the others are ſo ſlight, as to oblige us to calculate rather on their probable, than aſſert their real degree. The general concluſion as to their actions will be, that they are all to be referred to the poſſible changes they can produce on the membranes of the tympanum, which conſiſt in their being rendered tenſe or relaxed. The degree to which this is effected by their intervention does not appear to be within the reach of experiment in the living ſubject; the examination of ſuch points in the dead muſt be neceſſarily liable to error. The effects of different degrees of tenſion or relaxation, in modifying the pulſes of ſounds, will be conſidered hereafter.

An object met with in the cavity of the tympanum yet remains to be noticed, which, though not ſubſervient to any purpoſes perhaps immediately concerned with hearing, muſt not be paſſed over. On looking into the tympanum, we obſerve a ſmall nervous cord croſſing it tranſverſely, called from its ſituation *chorda tympani*. On tracing it from behind, we find the nerve entering the tympanum at the baſe of the ſmall pyramidical eminence, whoſe apex gives paſſage to the tendon of the ſtapideus; from thence it paſſes obliquely acroſs between the long leg of the incus and the

manubrium of the malleus, to which laſt it is ſo cloſely attached, that it cannot move without intereſting the nerve at the ſame time. As it croſſes it, however, near its upper end, and not far from the axis of motion, it cannot be drawn much in the motions of this bone. Having paſſed it a little above the inſertion of the tenſor tympani, it increaſes in ſize, takes an horizontal courſe forwards, and goes out of the cavity in company with the tendon of the externus mallei.

The facial nerve, in its paſſage through the æquæductus Fallopii, gives off two ſmall twigs, which ſupply the tenſor tympani and ſtapideus: during its ſtay in the ſame channel, it ſends off alſo the nerve we have been deſcribing, which, after its exit from the anterior ſide of the tympanum, forms a junction with the lingual branch of the inferior maxillary nerve.

The whole cavity of the tympanum is lined by a mucous membrane, which we have mentioned already as gaining access to the ear through the Euſtachian tube; from the opening of which, it may be ſeen ſpreading in all directions. Internally, it covers the membranes of the feneſtræ; externally, it paſſes over the membrana tympani, forming its inner layer, and it is between theſe the handle of the malleus is confined in its ſituation. Behind, it enters the maſtoid cells, which it lines throughout. Before, paſſing from the Euſtachian tube, it is reflected over the glenoid fiſſure, the opening of which it cloſes towards the tympanum, ſurrounding in this place the long proceſs of the malleus, and the chorda tympani. In the middle of the tympanum it is ſeen paſſing over the officula, forming between them and the walls of the tympanum numerous membranous proceſſes of conſiderable breadth. It thus completely covers the cavity of the middle ear, and the parts connected with it, having but one aperture of communication with the external air by means of the Euſtachian tube. It appears to be a mucous membrane, analogous in ſtructure to the membranes lining the ſinuſes, and like them, defends the parts it covers from the immediate contact of the air. When inflamed, or in the fœtal ſtate, it is of a marked red, and reſembles preciſely the ſurface of other mucous membranes, which it reſembles likewiſe in its offices. It is extremely ſenſible, by which character it may be ſtill further diſtinguiſhed from fibrous perioſteum.

The membrana tympani is ſo delicate in the fœtus, as not to allow us to make any diſtinction into layers. As it becomes firmer after birth, its direction is leſs oblique, and it is removed to a greater diſtance from the internal ſide of the tympanum. The Euſtachian tube increaſes gradually alſo in ſize as well as length, as the dimenſions of the cranium are enlarged. The officula and bony walls of the tympanum undergo but trifling alterations, as the reader will have obſerved in the deſcription of thoſe parts. The mucous membrane pours out leſs of its ſecretion as the age advances: ſo that after the ſecond year, we ſeldom ſee in the healthy ſtate any of that whitiſh mucus which fills the tympanum in the fœtus, at which period the membrane is vaſcular and ſpongy.

The work of demonſtrating on the adult ear the poſitions and ſtructure of the parts we have been deſcribing, is one of conſiderable nicety and labour. The moſt uſeful views, perhaps, are thoſe which ſhew the relative ſituations of the important parts, with regard not only to the tympanum, but to the whole apparatus of the organ; and theſe may be obtained by ſections of the cavity in various directions. We ſhall mention only a few of the moſt uſeful here, as when by means of theſe the inquirer has obtained a correct knowledge of their relations, he will readily execute any further ſection without the aſſiſtance of written directions. We will firſt ſuppoſe him to have removed from the ſkull, by two tranſverſe ſections, the parts more immediately connected with this organ. If then a fine ſaw be carried in a plane, which ſhall extend horizontally from ſome part of the lower half of the external meatus to the lower edge of the internal meatus, he will obtain, in the upper ſection, a view of all the more important parts of the tympanum, without in any way injuring the ſituation of its contents, as he will have paſſed below the point of the handle of the malleus, and conſequently the baſe of the ſtapes. He will be able to obſerve the tendons of ſome of the muſcles, and the points at which they emerge, moſt of the openings of the tympanum, and the direction of its membranes. Having ſtudied this, he will learn what is yet wanting to complete the view of the ſubject, and proceed either on the ſame, or any ſections, to remove ſuch parts as obſtruct his reſearches. The moſt uſeful perpendicular ſection, is one carried in the direction of a plane paſſing perpendicularly through ſome part of the interior half of the meatus, towards the middle of the ſella turcica. In this inſtance the officula will eſcape, and each half of the ſection contain parts of conſiderable intereſt. To obtain a view of the obliquity of the membrana tympani, we remove longitudinally the anterior half of the meatus, down to the bony circle which ſupports it: in the ſame piece we may open into the tympanum from before, and by dividing the Euſtachian tube through the whole of its length, gain a view of its general direction and ſtructure. The officula ſhould be ſtudied in their fœtal ſtate, at the latter period of which time they are perfect in form, and can be removed without danger of breaking. Another method of obtaining a knowledge of the relative ſituations of the bony parts of the ſtructure of the internal, as well as middle ear, is by taking caſts of them in eaſily fuſible metals. The bone is encaſed in a covering of plaſter which ſurrounds every part but the opening of the external meatus: it is then heated red, and the heat continued till ſmoke no longer iſſues from the meatus: at this period ſome fluid metal, conſiſting of equal parts of lead, tin, and biſmuth, is poured into the opening, and the whole thrown into water. The plaſter and ſurrounding bone are, after this calcination, eaſily removeable by any ſharp inſtrument, and the metallic caſt expoſed, repreſenting accurately and completely, if the operation has been ſucceſsful, all the cavities of the ear in their relative ſituations and proportions. On account of the difficulties of the inveſtigation ariſing from the minuteneſs and delicacy of ſtructure, we have thought it neceſſary to give theſe few introductory hints as to the beſt mode of proſecuting the examination of the ear: and although we may fail in our firſt attempts, the ſucceſsful execution of them will be afterwards readily obtained, when directed by the acquired ſkill and corrected knowledge of the inquirer.

In our ſhort comparative notice of the external ear, we found man poſſeſſed of parts which were deficient in ſome other claſſes of animals: in the preſent caſe we ſhall find ſome of them approaching him more nearly in the ſtructure of this organ, inaſmuch as they have a tympanum exterior to the part which receives the auditory nerve, though varying much in conſtruction from that of the human ear. The membrana tympani is found in ſome of the reptiles, and more particularly in thoſe which inhabit chiefly the ſurface of the earth. In birds it is remarkably large: in the cetacea, and other orders of mammalia, it reſembles much that which we have been deſcribing in man. The cavity of the tympanum is wanting in all thoſe creatures who poſſeſs no membrana tympani; conſequently, in the claſſes of inſects, worms, fiſhes, and moſt of the ſerpent tribe. We find it in thoſe

reptiles

reptiles who are furnished with this membrane; in birds, where the cavity is increased by its continuity with the cells of the cranium; in cetacea and the other mammalia, in whom, however, it is not so large as it is in the human subject. The Eustachian tube is found only in those animals who are provided with the cavity and membrane of the tympanum, to which it would appear, therefore, to be subservient. It has no existence in the serpent tribe, who are furnished, however, with an ossiculum. The ossicula are not found in the three lower classes or in some of the aquatic reptiles. In the other creatures belonging to this last tribe, and in the two upper classes, they are always to be seen. In the more perfect animals, as we call them, they are more in number, have articulated junctions, and are provided with muscles which act by their intervention on the membrana tympani. The fenestra ovalis is observable in all the animals in which we can distinguish an organ of hearing, with the exception of the spinous fishes and the genus sepia. In those who have no ossiculum, it is closed by a membranous or cartilaginous operculum, whilst in the contrary case it is more or less shut up by a bone adapted to its opening. The fenestra rotunda is deficient in all those creatures who do not possess that part of the internal ear called cochlea. There is some appearance of it in birds who have the rudiments of the cochlea: in the mammalia it is always conspicuous, but the largest in those animals who are furnished with the proportionably largest cochlea.

The internal Ear or Labyrinth.

We have now carried our researches from without, to the most internal part of the organ of hearing, designed for the reception of the terminations of the auditory nerve. The best mode of prosecuting our inquiries will be, first, to bring ourselves acquainted with the bony labyrinth; then with the membranous parts it contains, or the additional apparatus on which the nerve is spread; and, lastly, to trace the distribution of the nerve to the intimate recesses of these most delicate parts. The bony cavities communicating with each other, into which this nerve is admitted, are known altogether by the name of *labyrinth*, and have been divided into three portions; a middle one, named *vestibulum;* the common centre of the different cavities which compose the labyrinth; an anterior division communicating with it, called the *cochlea;* and a posterior one, consisting of the *three semicircular canals.* The detailed description of these has been already given in that of the temporal bone, to which the reader is referred before he begins the study of the soft contents of the labyrinth. By a careful attention to what is there described, he will readily inform himself of the relative situation of the contained parts, as well as their form and connections, as these delicate parts are all exactly adapted to corresponding surfaces in the surrounding bony case. It has been found that all the cavities we have above-mentioned are lined by a fine membrane differing in its nature from that which forms the lining of the tympanum, and little known to us, until of late years. This ignorance of its form and structure is the more to be wondered at, if we recollect but for an instant the acknowledged genius and industry of those eminent men who have made the ear the subject of so many elaborate researches. Till lately, all that we knew of the contents of the bony labyrinth, consisted in some vague ideas respecting certain *zonæ sonoræ*, as they were termed by Valsalva, connected with the semicircular canals, and a *septumnervum* dividing the vestibulum into two halves. The loose descriptions, however, which were given by different anatomists of these expansions, lead one to suspect that they were far from possessing any thing like a correct knowledge of the membranous labyrinth, as it has been since described by Scarpa. From repeated investigations of the organ of hearing in different classes of animals, he was induced to suspect that there existed in man a membranous labyrinth included in the osseous one. He had ascertained the existence of it in fishes, reptiles, and birds; and was led by analogy to expect a similar apparatus in the human ear. After numerous trials, he fully confirmed his rational conjecture, and was enabled to observe the great similarity which it bore to that he had remarked in the former classes. He discovered also an additional part, consisting of a membranous sacculus placed in the cavity of the vestibulum, the probable use of which we shall have hereafter to consider. In examining the soft contents of the labyrinth, we shall begin with those contained in the bony semicircular canals. Each of these bony channels encloses another membranous tube, which is perfectly distinct from the periosteum, and which should be considered as the proper semicircular canal. These membranous tubes are of less diameter than the bony case in which they lie, from which they are separated by a delicate cellular tissue, forming the medium of connection between them. Each of the canals, at the part from which it commences in the vestibule, dilates into an oval bag, which is known by the name of *ampulla*, corresponding precisely in form to the dilatation we have already described in the beginning of each bony canal. It contracts again into a narrower tube as it proceeds, still accommodating itself to the form of its bony case; and after making its semicircular curve, returns again to the same membranous sac in the vestibule from which it commenced. These little canals are cylindrical, and pellucid as well as their ampullæ, which appear as small oval expansions of the membrane, just before the canal communicates with the sac common to them all. One of these ampullæ lies in the sinus ellipticus of the anterior or superior bony semicircular canal: another is contained in the fovea orbicularis of the inferior bony canal. The third ampulla is enclosed in the sinus infundibuli-formis of the exterior bony canal. The membranous canals proceeding from the two first of these ampullæ, after making their circuit, unite and form one common canal, communicating with the alveus communis in the vestibule. The exterior membranous canal takes a solitary course throughout, and returns as it departed, by its own proper channel. We have now traced these canals from their ampullæ, back again into the vestibule, and have to describe the cavity which forms the common centre of communication between them all. In the fovea semielliptica, which lies nearly opposite the fenestra ovalis, there is placed an oblong transparent membranous bag, which crosses the vestibulum transversely: the largest end of this little sac lies in the fovea we have just mentioned; whilst the other extremity, contracted a little in size, stretches towards the posterior canal. It is from this *alveus communis*, as it is termed by its first discoverer, Scarpa, that the membranous canals proceed, and it is back again into it that they open. The ampullæ of the superior and external canals commence from that part of the sac which lies in the fovea semielliptica; the ampulla of the posterior canal having its origin in the smaller portion of the bag: from these points the membranous canals proceed in the manner we have described, and open again by two apertures into the middle portion of this sac, thus completing the free communication which we observe between each particular tube. These cavities are all filled by a limpid fluid, which encreases so much the natural transparency of the membranous investment, that it may escape the eye of a person who was not prepared to find it.

On making an opening into the vestibule in the recent subject, if the sac is left entire and turgid, it has the appearance of a bubble of air, so perfectly pellucid are the membrane and its contents. Independently of this, we find in the vestibule another membranous sac of a rounded figure, which is placed in the fovea hemisphærica of this cavity. It is also transparent, and forms altogether a sphere, one half of which is buried in the corresponding fovea, the other projecting into the vestibule. The first of these halves adheres so strongly to its containing hollow, as not to be separated from it without laceration: the projecting half is received into a corresponding depression in the membranous alveus communis, without, however, in any manner, communicating with its internal cavity. This spherical sac is closed on every side, and is distinct from all the other membranous receptacles of the labyrinth, being filled with its proper limpid fluid. In the fœtus, during the early months, the investment is so firm as not to collapse, when the fluid has been let out by a lancet.

We here finish our account of the membranous contents of the canals and the vestibules; and to complete the description must examine the soft parts which go to complete the construction of the cochlea. It has already been mentioned, that the lamina spiralis of the cochlea was composed of different substances. One, a bony plate forming the part next the central modiolus, requires no further description; it is the part which completes the lamina spiralis that we have now to examine. It is found to consist of two substances, one of which approaches the nature of cartilage, the other being perfectly membranous. The first of these, which is termed the *zona coriacea*, from the firmness of its texture, is attached to the edge of the bony lamina spiralis which it accompanies in its circumvolutions, and where the osseous plate ceases, this coriaceous part is still continued round the modiolus to the apex of the cochlea. The margin of this coriaceous part, which is fixed to the bony lamina, is pierced by numerous canals, proceeding in a radiated direction throughout its substance, which are continuous with those canals which lie between the plates of the bony lamina, and which have been already described as adapted for the reception of the auditory nerve. The external edge of this part is somewhat transparent, and when subjected to the microscope exhibits a series of reticulated cells, filled with a limpid fluid, in which we can perceive numerous white filaments, which are the ultimate expansions of the nerve. The other portion of the septum is membranous, and appears to be a duplicature of the periosteum lining the scalæ of the cochlea reflected from the sides to complete the deficiency of the lamina spiralis, which it encloses in its fold. In other words, the periosteum, which covers the two plates of the bony lamina spiralis, is continued from its edge over the zona coriacea, and meeting at the termination of this, coheres, and proceeds to be reflected over the internal parietes of the cochlea. And as both the osseous and coriaceous parts decrease in breadth as they approach the apex of the modiolus, it will follow that this membranous portion forms a greater part of the septum in proportion as the lamina spiralis advances to its termination.

We here conclude our description of the labyrinth, but before we proceed to consider the distribution of the auditory nerve, it will be proper to take notice of the fluid contained in the different divisions we have been following, and which, from the constancy of its appearance, would seem to execute no trivial part in conveying sounds to the nerve with which it is in immediate contact. It has been ascertained by numerous and indisputable examinations, that the labyrinth is filled by a fluid, as well as the membranous receptacles which it encloses, from which it will appear, that the membranous labyrinth itself, with its contents, may be said to float in the water of the bony labyrinth; which will be the more readily admitted, if we consider that the same occurs in the ear of some other classes of animals, as fishes, reptiles, and birds. It is also very observable in the human ear, on account of the great difference between the diameters of the membranous semicircular canals and their bony case. In the vestibule it has been often demonstrated occupying the space between the fenestra ovalis and the membranous sacs, long before these sacs were known to exist in their present form. With regard to the scalæ of the cochlea, the fact of their being turgid with fluid was long since admitted, and the lamina spiralis has been described as lying "inter duos aquæ rivulos demersa." The aqueducts, which communicate with the cavities containing this fluid, have been already described; we have here only to add, that they are lined by a continuation of that delicate membrane which invests the internal surface of the labyrinth, of which we deferred the mention till we had considered all the parts which it covered. We find it, if we begin from the vestibule, lining the whole of that cavity, dipping into the semicircular canals, entering into the vestibular scala of the cochlea, and passing through the opening of the infundibulum at its termination, descending through the tympanic scala to the foramen rotundum. It is the same membrane which lines the aqueducts, and terminates in an expanded shape under the dura mater, covering the petrous portion of the temporal bone. Of the peculiar structure of this membrane, as well as of that which forms the membranous receptacles, we know scarcely any thing. It supplies the place of periosteum, and we have throughout mentioned it under that name: it would seem, however, to differ from it materially in one character, namely, that we suppose it to be the secreting surface from which the fluid of the labyrinth is poured out. The membranous canals and their sac appear to be of a similar structure, though perfectly distinct in situation. The only difference observable between the structure of the membranous labyrinth in the fœtus and the adult is, that in the former case it is most evidently vascular, whilst, in the latter, it is too delicately thin to allow of the existence of red blood-vessels. The early developement of the osseous labyrinth in the fœtus, and the perfection which it reaches long before the usual period of birth, have been elsewhere noticed; we introduce the mention of it here, only, as it is in the fœtal ear, that we must seek with the best chance of success to examine the membranous and other soft parts which it contains. Before we attempt this delicate investigation, we must obtain a correct knowledge of the osseous labyrinth, and the relative positions of its different cavities, in order to remove the bony parietes, without injuring the subjacent parts by random, or ill-judged efforts. With such knowledge but few directions are necessary, without it the most minute would be given in vain. To gain a view of the membranous structure, we begin by laying open the vestibule from the foramen ovale so as to bring into sight the sinus of the foramen rotundum and the commencement of the cochlea. This is easily effected in a fœtus of three or four months, where the labyrinth is already evolved, and the removal of the bony parts is neither a work of difficulty nor labour. We have this advantage, also, that at this early period the tunics of the membranous receptacles are much more compact and firm, than we observe them at after times; and in addition to this, we always find them involved in a mucous wrapping, which adds much to their firmness, so that the membranous semicircular canals, when exposed to the air and cut transversely, still preserve their truncated tube open. It is after cautiously

cautiouſly removing the oſſeous covering, that the pipe of an Anel's ſyringe has been introduced into one of the ampullæ, and from thence the membranous canals and their common ſac have been filled by a coloured fluid, proving beyond doubt the manner of their communication. This fac may be preſerved entire even in opening the veſtibule of the adult from the feneſtra ovalis, or we obtain another view of it by cautiouſly cutting away the cochlea, ſo as to gain an inſight into the veſtibule from the part which it occupied. All theſe inveſtigations ſhould be made in the moſt recent ſubjects, as the membranes of their fluid ſoon loſe their tranſparency, and become inextricably confuſed. It is, perhaps, from examining them in this ſtate, that anatomiſts, prior to Scarpa, have given us ſuch vague and unintelligible accounts of their ſtructure. The mode of obtaining a proof of the exiſtence of a fluid in the labyrinth, has been moſt excellently deſcribed by Meckel in his "Diſſertatio de labyrinthi auris contentis," to which we ſhall refer the reader who wiſhes for a minute and particular account of his manner of proceeding. He preferred the making a ſmall opening into the cochlea, from which a fluid immediately burſt, and then by preſſing the baſe of the ſtapes againſt the feneſtra ovalis, he was enabled at will to force out more of its fluid contents; the ſame fact occurs if we make the opening into one of the bony ſemicircular canals. By freezing alſo ſeveral recent ears, he decidedly obſerved an icy cake in the labyrinth formed by the congelation of the water it contained. To obtain a view of the zona mollis of the cochlea, we make ſections of this body in different directions, or carefully remove its ſides, beginning at the feneſtra rotunda, and following the ſcala to its termination in the infundibulum. It need only be added, that from the tenuity of the parts to be examined, the inveſtigator ſhould be provided with magnifying glaſſes of conſiderable power.

Having thus ſtudied the apparatus deſigned for the reception of the auditory nerve in man, we proceed, before we complete our deſcription of the organ, by tracing its extreme diſtributions on theſe ſoft parts, to give a ſuccinct account of them as they have been ſeen in other claſſes of animals. The *cray-fiſh* and the *ſepia* have been found to poſſeſs only a veſtibule; the animals of all the other claſſes have the additional apparatus of ſemi-circular canals. And it may be worth our noticing that in all of theſe, the membranous ſemi-circular canals regularly ſwell into an ampulla, in the part at which the auditory nerve is admitted; that all of them are filled with their peculiar fluid; communicate freely with a common ſac in the veſtibule, and are immerſed in the water of the labyrinth. *Fiſhes*, however, and *reptiles*, have this peculiarity, that their membranous receptacles are found to contain certain ſolid bodies, *lapilli*, or *oſſicula*, as they have been termed, which are ſuſpended by a great number of nervous fibrillæ. Again, the more perfect animals are provided with the elaborately conſtructed cochlea, and the feneſtra rotunda.

We ſhall take up our deſcription of the *auditory nerve* at that part of it where it enters the internal meatus; its connection with the encephalon will be found in the hiſtory of the brain; the foramina, through which it penetrates to gain admiſſion to the ear, are deſcribed under the article CRANIUM. The auditory nerve lies in the internal meatus, in a twiſted form, and rolled up, as it were, in different bundles, which, when unravelled, give the nerve the form of a flattened band of fibres. At the commencement of this twiſted appearance, we obſerve a ganglion-like ſwelling, which gives origin to three branches, differing conſiderably in ſize.

The *largeſt* of theſe, as it arrives at the *maculæ cribroſæ*, divides into numerous threads, which pierce the pyramid of the veſtibule, into which they enter, appearing, to uſe the words of Scarpa, "barbulæ albidiſſimæ quam ſimiles." Theſe divide into two portions, one of which is received into the membranous ſac of the *alveus communis*, over which it firſt expands in a fan-like form, occupying about two-thirds of its length. Soon after this expanſion begins, we loſe ſight of the nervous fibres which penetrate the ſac, and ſeem to terminate in a delicate nervous pulp, ſpread over the inner ſurface of this membranous inveſtment. The other portions of this *barbula* take their courſe towards the ſuperior and exterior canals, the ampullæ of which they embrace with this expanded ſurface: after which, they penetrate the membrane, and appear as a ſoft nervous pulp on the inner ſide. The *leſſer branch* penetrates through a ſingle foramen in the bone from the meatus; which, however, is ſubdivided into numerous ſmall canals, before it opens again at the baſe of the foſſa orbicularis of the poſterior canal: in conſequence of this diſpoſition, we ſee the nerve emerging in numerous fibrillæ, remarkable for their whiteneſs, which are ſpread over the ampulla of this canal, which they ſubſequently penetrate, and terminate, as the other branch, in a nervous pulp on its inner ſide. After minute inveſtigation, Scarpa was unable to trace this pulp beyond the ampulla into the membranous canals. The *middle branch* of theſe three paſſes almoſt immediately after its ſeparation from the others, through a foramen, or *macula foraminuloſa*, correſponding to the bottom of the ſacculus ſphericus, into which it enters, and the internal ſurface of whoſe membrane it covers with a nervous pulp, which is more oſtenſible at the part by which the nerve penetrates. This diſtribution has been compared, and not unaptly, to the expanſion of the optic nerve into the retina.

The auditory nerve having given off theſe branches, goes direct towards the baſe of the *cochlea*, where its fibres become untwiſted a little, and penetrate the *tractus ſpiralis foraminuloſus* on every ſide, in the direction of the axis of the modiolus; a tolerably large cord in the middle of the nerve paſſing into the hole in the baſe, and running through its length, till it arrives at the infundibulum, and the laſt half turn of the cochlea. The nervous fibres, which paſs through the external circle of the tractus ſpiralis, penetrate the firſt turn of the ſcalæ; thoſe which paſs through the next circle of the tractus arrive at the ſecond turn of the ſcalæ. The fibres having penetrated in this way through the ſmall canals, arrive at the external ſuperficies of the modiolus contained in the ſcala tympani, and paſs on till they arrive at the lamina ſpiralis: here they change their direction, which was before parallel to the axis of the modiolus, and follow the plane of the lamina ſpiralis, which they penetrate, and between the laminæ of which they radiate in minute penicillous filaments, extending on through the zona mollis, where they are finally loſt, as before noticed. Thoſe which pervade the ſecond circle of the tractus ſpiralis have to take a longer courſe before they arrive at the ſcala tympani of the ſecond turn, where they are diſtributed in the manner above deſcribed, receding from the modiolus, and terminating in the moſt minute reticulated filaments in the outer edge of the ſubſtance of the zona mollis. This diſtribution of the nerve through the ſpiral lamina of the cochlea is very conſpicuous, when viewed through a microſcope, and ſtill more diſtinct, if the cochlea be macerated for a few hours in a mixture of ſpirit of wine, and nitrous acid, which will be found to increaſe the tranſparency of the oſſeous lamellæ. The nerve which paſſed through the centre of the modiolus, is found to ſupply the laſt half turn in the ſame manner as the other branches did the turn below.

We

We have omitted the mention of the arteries, and other veſſels of the ear, as they poſſeſs no peculiarity of diſpoſition, and will be better deſcribed elſewhere. It is ſufficient to remark, that the whole of the organ is well ſupplied with veſſels and nerves from the moſt contiguous trunks, the veins of the internal ear communicating with the lateral ſinuſes.

We thus complete the firſt great diviſion of the ſubject, having given a detailed hiſtory of the human ear, and a brief account of it as it exiſts in other animals. Before, however, we ſhall attempt to exhibit what is at preſent believed, with regard to the functions of this apparatus, we think it proper to give a ſhort account of the powers of the human ear in diſtinguiſhing the varieties of ſound; after which inquiry, we ſhall be better prepared to take a ſurvey of its phyſiology, as far as it is at preſent underſtood.

Deſcription of the Plates in which the Anatomy of the Ear is repreſented.

PLATE I.

Fig. I.—A well-formed left ear of a male, drawn from life. It has a more rounded ſhape, is thicker, and is marked by ſtronger features than in the female.

a to *e*, the helix, forming the external circumference, or fold of the auricle.—*a*, the upper end, or beginning of this border, ſloping into the concha; *b*, part of the edge which is loſt in the ſkin of the face; *c d*, that part which is prominent from the head; *e*, the lower end of the fold, which terminates in the lobule of the ear.

f to *m*, the antihelix, forming a plait, or fold, in the external ear.—*f g*, the upper end of it dividing into crura, ſinking under the edge of the helix; *h*, the junction of the crura, or proceſſes *f* and *g*; *i k*, the lower end of the antihelix, continued at *i* into the concha, and at *k* into the antitragus.

l, the tragus covering the entrance to the external meatus.

m, the antitragus.

n, the lobe of the ear.

o o, the furrow between the helix and antihelix.

p, the oval, or boat-like depreſſion between the crura of the anthelix.

q, the concha.

r, the beginning of the meatus auditorius.

Fig. II.—A well-formed female ear, drawn from life. In its moſt perfect form it poſſeſſes a more lengthened and delicate ſhape than the male.

Fig. III.—A repreſentation of the muſcles which move the external ear, or auricle. They are exhibited as ſeen from behind, or from that ſurface which is turned towards the ſkull, in order to obtain a more complete view of the whole at one glance: there is leſs objection to this, as the muſcles are not attached immediately to the bone, but to the aponeurotic and cellular ſheath which covers it.

a d e, the cartilage of the ear, as ſeen on that ſide which looks towards the cranium.

f to *p*, the attollens aurem.—*f g h i*, the upper end of this flat and delicate muſcle, the fibres of which converge; *l m*, and terminate in a tendinous expanſion; *o p*, attached to the prominence correſponding to the hollow between the crura of the anthelix.

q to *t*, the anterior auris.—*q r*, the anterior portion attached to the aponeuroſis of the occipito frontalis: it grows narrower at *s*, and is inſerted tendinous into the prominence at the back of the beginning of the helix *t*.

u to *x*, two retrahentes aurem.—*u v w x*, the upper and larger of theſe two; it conſiſts of two or three portions of muſcular fibres, *u*, *v*, *w*, and is inſerted by an evident tendon into the bulging part of the pinna, correſponding to the hollow of the concha; *y z*, the inferior and ſmaller of theſe muſcles, directed obliquely under the other.

Fig. IV.—There was conſiderable difficulty experienced in executing this figure, both from giving the relative ſituation of the parts clearly and correctly, and from the neceſſity of choofing ſuch a point of view as would enable one to gain a ſufficiently perſpicuous view of the moſt important points, without giving any erroneous idea of them by the ſtrong fore-ſhortening of the picture.

The external ear is ſeen fore-ſhortened ſtraight from before.

b to *d*.—*b c*, the meatus externus, as it appears detached from the bone; *b*, *c*, its two curvatures; the firſt, *b*, upwards and forwards; the ſecond, *c*, downwards, and in ſome degree backwards; *d d*, the oblique direction of its internal end, which is ſeen as cloſed by the membrana tympani.

e, the membrana tympani ſtretched on its bony ring, and bulging inwards.

f g h the malleus.—*f*, the handle or proceſs attached to the membrana tympani; *g*, the long proceſs; *h*, the head.

i k, the incus.—*i*, the ſhort leg or proceſs; *k*, the long proceſs.

m, the ſtapes.

V H A *m n p*, the labyrinth.—*n p*, the cochlea; *n*, its beginning, its termination at *p*; *m*, the veſtibulum. V, the bony caſe of the anterior, or ſmaller of the ſemicircular canals; H, the poſterior, or largeſt ſemicircular canal; A, the outer, or ſmalleſt canal.

This figure, exhibiting the moſt important parts of the ear in their ſeveral relations to each other, holds a middle place between the figures of the external ear and the more intricate ones of the internal parts, to which it naturally leads us.

The remaining figures of this plate, together with the two firſt of the following one, repreſent the parts contained in the middle diviſion of the ear, or the cavity of the tympanum: all theſe parts are ſhewn in their natural connections with each other, as well as individually. It appearing, however, ſcarcely poſſible to give the true form of theſe fine and delicate parts, with ſufficient fidelity and clearneſs, of their natural ſize, there are repreſentations of them as magnified to four times their natural diameters. The figures IV, 8, 9, 10, 11, XII, XIII, of this plate, and I, II, of the ſecond, ſhew them of their natural ſize. In figures V, VI, VII, VIII, IX, X, XI, we ſee them magnified to four times their proper dimenſions. The form of theſe parts varies from many cauſes: we have choſen that which appears the moſt general and the moſt perfect.

Fig. V.—The labyrinth and oſſicula auditus, four times their natural dimenſions. Although the labyrinth is not ſhewn ſo completely in this figure as in theſe of the following plate, it was repreſented here in order to ſhew the connection between the different bony portions of the ear, that when we meet with the views of the labyrinth, we may be previouſly acquainted with the relations they bear to the ſurrounding parts. Independently of this object, the figure before us exhibits the mutual connections of the oſſicula, the order in which they are placed, and the general line of their directions. On theſe accounts it ſhould be ſtudied before we proceed to the following figures.

a to *e*, the malleus in full view.—*a*, the long proceſs; *b*, the ſhorter proceſs; *c*, the handle, or proceſs attached to the membrana tympani; *d*, the neck; and *e*, the head of the malleus.

f to

f to *i*, the incus.—*f*, the body of the incus; *g*, the short leg; *h*, the long leg, or process; *i*, the small epiphysis of this leg articulated with the stapes.

k to *n*, the stapes.—*k*, the small head of the stapes; *l*, the anterior crus; *m*, the posterior crus; *n*, the basis, connected with the membrane which closes the fenestra ovalis.

o to M, the labyrinth.—*o* to *r*, the first turn of the cochlea; *s t u v*, the second turn; *w x*, the half turn, or third; *y*, the foramen rotundum, of a somewhat triangular form; *z z*, the vestibulum; A B C D, the anterior, or superior of the semicircular canals.—A, the ampulla, or sinus ellipticus; B C, its curvature; and D, its junction with the inferior or posterior canal; E F G H, the inferior canal.—E, its ampulla, or fovea orbicularis; F G H, its peculiar curve, and the connection of the united canal D, with the exterior semicircular canal; I K L M, the exterior canal.—I, the ampulla, or sinus infundibuliformis; K L, the direction of its curve; M, its termination in the vestibulum.

Fig. VI.—The malleus, drawn in such a situation as to gain a view of the long process *a a*, and the smooth cartilaginous surface *, for articulation with the body of the incus.

Fig. VII.—A longitudinal section of the malleus, being the anterior half of the last figure, reversed so as to shew the greater and smaller medullary cells.

Fig. VIII.—The malleus, in the same position as in *fig.* V., but separated from the incus; *a, b, c, d, e*, mark out the same spots as in that figure; *, the articulating surface.

Fig. IX.—The incus, in the same position as in *fig.* V., its parts being noted by the same letters; *, the articular surface adapted to the head of the malleus.

Fig. X.—The stapes: this side of it is, when in its natural position, directed downwards; *a b*, the head of the stapes; *c*, the neck; *d*, the anterior crus, straighter and thinner than the posterior *e*, which is thicker and more curved; *f*, the basis.

Fig. XI.—The stapes seen from above; *a*, its cartilaginous surface, articulated with the small epiphysis of the incus; *b*, its anterior; *c*, its posterior crus; *d*, the basis, with its sloping sides. The view we have here of the stapes is a perpendicular one, as in the line of its axis it will be found to differ in form from that in *fig.* V., in the proportion that the latter differs from a perpendicular aspect.

Figures 8, 9, 10, 11, shew the bones of their natural size.

Fig. XII.—The temporal bone of an adult, from which so much of the bony meatus has been removed as to enable one to gain a view of the muscle called externus mallei.

a to *d*, the temporal bone.—*a*, the squamous portion; *b*, the zygomatic process; *c*, the glenoid cavity for articulation with the lower jaw; *d*, the mastoid process.

e e, the circumference of the meatus broken off, in order to obtain a plainer view of the cavity of the tympanum *t k i u*.

f, a portion of the petrous portion of the temporal bone.

g h, a portion of the sphenoidal bone.

i, the foramen rotundum, closed by its proper delicate membrane, which separates the cavity of the tympanum from the cochlea.

k, l, m.—*k*, the malleus; *l*, the incus; *m*, the stapes.

n o p, the laxator tympani.—*n*, the upper extremity attached to the rim of the meatus, lying in a fold of the internal lining of the membrana tympani; *o*, its fleshy portion; *p*, the tendon fixed to the handle of the malleus.

q r s, the externus mallei.—*q*, its origin attached to the spinous process of the sphenoidal bone; *r*, its fleshy portion; *s*, its tendon inserted into the long process of the malleus.

t, the tendon of the tensor tympani as it is seen emerging from its canal.

u, the tendon of the stapideus as it passes from out of its bony cavity.

Fig. XIII.—A continuation of the former figure; but in order to shew the tensor tympani and the stapideus, some more of the bony parietes have been removed.

a b c, the Eustachian tube.

d e f, the tensor tympani.—*d*, the tendinous origin attached to the tube; *e*, the fleshy belly; *f*, the tendon affixed to the short process of the malleus.

g h i, the stapideus.—*g*, its tendinous origin; *h*, its thread-like belly, which lies in a bony canal; *i*, its tendinous end, attached to the posterior part of the neck of the stapes.

Plate II.

The figures in this plate, with the exception of the two first, are intended to represent the structure of the internal ear, or labyrinth; and are, as well as all the foregoing ones, taken from the left ear, in order not to increase the intricacy of a delicate subject by the confusion which must arise from the change of side.

Fig. I.—The outline of the temporal bone of a child, with the officula in their natural size and situation.

a to *d*, the temporal bone.—*a*, the squamous portion; *b*, the zygomatic process; *c*, the petrous portion; *d*, the mastoid process.

e e, the bony ring, in a groove of which the membrana tympani is affixed.

The malleus, incus, and stapes need not be marked, as they have been already sufficiently distinguished in the preceding figures in *Plate* I.

Fig. II.—This figure represents the officula, from the opposite side to that in which they were seen in *fig.* I.

a, the squamous part of the temporal bone; *b*, the zygomatic process; *c d*, the bony ring; *e*, the malleus; *f*, the incus; *g*, the stapes seen from its basis.

Fig. III.—The bony case of the labyrinth seen from below, magnified four times.

1 2 3 the cochlea.—1 1 1, the first turn; 2 2 2, the second turn; 3, the incomplete third turn; *a, a, a*, small canals for the nerve of the sacculus sphericus; *b b b*, the tractus spiralis foraminulosus for the passage of nerves and vessels; *c*, the opening of a canal in the middle of the base of the modiolus, through which a nerve passes to the infundibulum; *d*, an opening in the beginning of the cochlea, for the passage of the membranous aqueduct.

e, maculæ cribrosæ for the passage of nerves to the ampullæ of the superior and exterior canals, and the alveus communis.

f, an oval opening for the nerve of the ampulla of the posterior canal.

*, opening of the aquæductus vestibuli.

g to *q*, the bony case of the semicircular canals.—*g h i*, the posterior canal; *k l m*, the superior canal; *o p q*, the exterior canal; *g, k, o*, the parts containing the membranous ampullæ.

Fig. IV.—The bony case of the labyrinth, one half of which has been regularly removed throughout, in order to exhibit the internal characters of the bone.

a to *l*, the upper half of the cochlea.—*a a*, the thickness of its external crust in a fœtus of eight months; *b c d*, the lamina spiralis; *b c*, the scala vestibuli; *e f g h i*, the scala tympani.

tympani. In this figure we see only the bony lamina spiralis. *b*, its commencement; or broadest part; *d*, its termination in the little hook, or *hamulus*; *k*, the opening of the infundibulum, where the two scalæ communicate; *l*, the opening for the aquæductus cochleæ.

m to *q*, the under half of the vestibulum.—*m*, the thickness of its case in the fœtus; *n*, the fovea hemisphærica; *o*, the fovea semielliptica; *p*, the projecting ridge between them, terminating in the pyramis vestibuli; *q*, the opening for the aquæductus vestibuli.

r, G, K, L, the canals divided each into half.—*r*, the thickness of their case in the fœtus; G, the posterior; K, the superior; L, the exterior semicircular canal; 1, the opening of the large end of the posterior canal; 2, the opening of the large end of the superior canal; 3, the opening common to their conjoined tubes; 4, the larger end; 5, the more contracted opening of the external canal.

Fig. V.—The labyrinth laid open in the same way as the last figure, with the soft parts it contained.

a to *e*, the lamina spiralis viewed from above.—We can scarcely distinguish on this side the distribution of the nerve, which is visible on the under surface; *a a a*, the first turn; *b b*, the second turn; *c d e*, the third turn of the lamina; *d e*, its unconnected edge, through which the two scalæ communicate. Comparetti has described the lamina as consisting of four different substances, or zones, as they are termed: 1, the bony zone, or strip; 2, the flexible coriaceous, or leather-like zone; 3, its vesicular zone; 4, the membranous zone attached to the cupola.

f, the sacculus sphericus, lying in the fovea hemispherica of the vestibule.

g, space between this last and the alveus communis.

h, the alveus communis, or membranous sac, communicating with all the canals, with the fan-like expansion of the nerve over it.

1 *k i* 3, the membranous posterior canal—1 *i*, its ampulla; *k*, the radiated expansion of the nerve over it.

2 *l m*, the superior membranous canal.—*l*, the ampulla.

4 *n* 5, the exterior canal communicating at each end with the alveus communis. Soemmerring gives each of these canals the name of cartilagino-membranous canal, "knorpelig haütiges bogenrohr."

Fig. VI.—The soft contents of the labyrinth removed from their bony case, of their natural size, and in their natural situation; *a a*, the spiral plate of the cochlea; *b*, the sacculus sphæricus; *c*, the alveus communis; *g*, the posterior; *k*, the superior; *l*, the exterior semicircular canal.

Fig. VII.—Another view of the labyrinth laid open.

a b c, the cochlea. In order to expose the zona mollis, the exterior bony case has been removed.

d e f, the vestibulum.

g to *q*, the semicircular canals.—*g h i*, the posterior; *k l m*, the superior, *o p q*, the exterior canal.

1 2 3, the lamina spiralis seen on its under surface; 3, the two sacs of the vestibule, which, viewed from this, appear as one common bag.

t u, the membranous posterior canal.

v w x, the superior membranous canal, uniting with the last at *x*.

y z, the exterior membranous canal.

This figure exhibits the distribution of the auditory nerve on the labyrinth; the large branch going to the cochlea, the three lesser branches to the vestibule and canals.

Fig. VIII.—The natural size of the parts containing what we see exhibited in the last figure.

Fig. IX.—The larger half of a recent cochlea of the left ear, divided perpendicularly through the modiolus, and magnified to four times its size.

a, the external shell.

b, the modiolus.—I I, the first turn; II II, the second turn; III III, the third turn ending in the cupola.

c to *i*, the lamina spiralis.—*c d*, the beginning of it; *e*, a portion, which by its direction is seen on its under surface; *f*, the lamina at the commencement of the second turn, where we see its upper surface; *g*, the lamina coming round; *h*, the beginning of the third turn; *i*, its termination in the infundibulum.

1 to 7, the under and smaller scala, or the scala tympani. The arithmetical order of the figures denotes its progress upwards.

d to *h*, the larger scala, or that of the vestibulum. The alphabetical order of the letters points out its gradual rise towards the top of the cochlea.

7, the point where the scalæ meet.

i 6, the infundibulum cut across.

n n, the longest diameter of the cochlea.

Fig. X.—A perpendicular section of the bony cochlea. I, II, III, its turns.

a to *c*.—*a*, the cupola of the cochlea; *b*, the modiolus.

d, the bottom of the meatus auditorius internus.

e f g h i, the bony lamina spiralis; *g h*, the hamulus.

1 2 3 4 5, the scala tympani.

k l m n, the scala vestibuli.

Fig. XI.—The ampulla of the posterior semicircular canal magnified to twenty times its natural size, to shew the radiated expansion of the nerve.

a a, the ampulla; *b b*, the portion joined to the alveus communis; *c c*, the canal into which it contracts; *d*, its opening; *e*, the point where the nerve appears as a white spot, from which it radiates in all directions, *f f f*.

Fig. XII.—The shape of the area of these tubes.

Fig. XIII.—The fan-like expansion of the nerve of the alveus communis, magnified by a power of twenty; *a*, *b*, two arterial twigs.

Plate III.

The relative size and position of the organ of hearing, with regard to the skull in the adult.

a, the right os nasi.

b to *h*, the frontal bone.

d to *i*, the cribriform plate of the ethmoidal bone.

k to *o*, the parietal bone.

p to *u*, the temporal bone.—*s t u*, the squamous portion; *p q u*, the petrous portion; *q r*, the mastoid part.

t v w x z, the sphenoidal bone.

1, the canal for the carotid artery.

2, the passage for the auditory and facial nerves.

3, a fissure for a communicating branch between the second branch of the fifth pair of nerves and the facial nerve.

5, the opening of the aquæductus vestibuli.

On the left side, by the removal of some of the petrous portion of the temporal bone, we are enabled to distinguish plainly the external meatus passing under the membrana tympani, the bony ring supporting this membrane, and the oblique direction of the latter. We see also the ossicula, the cochlea, the vestibulum, and, lastly, the three semicircular canals.

The Powers of the human Ear in distinguishing Sounds.

In prosecuting the second division of our subject, we shall soon be struck with the consideration, that the ear discriminates all the different qualities of sounds, not only by its structure,

ſtructure, but by a judgment corrected by experience, aſſiſting moſt materially in forming our concluſions as to ſome of its qualities. We here then make a diſtinction of powers, and ſhould firſt examine thoſe arising from the mechanical conſtruction of the organ; and afterwards, thoſe depending on the correction of judgment: we ſhould not, however, inveſtigate the latter, until we have examined what proportion the ſubordinate parts of the organ bear in producing theſe effects; ſupporting our theory by the few facts we can draw from the ſource of comparative anatomy. After ſuch inquiry, obſerving the difficulty of adapting phenomena to mechanical ſtructure only, we ſhould be the better able to determine what ſhare judgment bears in production. As the line of diſtinction between theſe powers is not, perhaps, clearly aſcertained, and as the degree of them, taken conjointly, has been more frequently the ſubject of obſervation and experiment, we ſhall give the ſimple hiſtory of the powers as deduced by obſervable phenomena, reſerving all examination of cauſes till we have gone through the received opinions, as to functions of different parts of the organ.

We are not to enter here on the theory of ſound, which will be conſidered at length in another place, but briefly mention the varieties diſtinguiſhable by the organ of hearing. They may be claſſed, ſufficiently for our preſent purpoſe, into thoſe dependent on the greater or leſs frequency of the vibrations; on the quantity, force, or momentum of the vibrating parts; and on the greater or leſs ſimplicity of each ſound: obſerving that, in all theſe caſes, we are to include the variations as to the duration of the ſound, the diſtance at which it commences, and the direction in which it comes.

On the firſt of theſe cauſes depends the *tone* or *pitch* of a ſound, as to its being grave or acute; and the degree of diſcrimination which a good ear poſſeſſes in this reſpect has been the ſubject of frequent obſervation and experiment. On the ſecond cauſe depends the *loudneſs* or *ſoftneſs* of a ſound, which the ear can accurately diſtinguiſh, as far as intenſity is concerned; but the difference between a loud ſound coming from a diſtance, and a ſoft one pulſating from a nearer point, is not perhaps to be determined with an equal degree of correctneſs. As to *ſimplicity of ſound*, the ear is ſo organiſed as to ſeize readily on the differences between one ſimple ſound and another; but it can determine only vaguely the differential proportions between two noiſes. If, at the ſame inſtant, many noiſes arrive at the ear, the loudeſt will drown the weakeſt, and make of it but a ſimple noiſe; but if they ſucceed each other, the ear can diſcriminate as to their intenſity and duration, but not as to tone. Noiſe is a multitude of ſimple ſounds, which the ear cannot ſeparate from each other, and which excite in this confuſed junction the idea of one ſound only. But where ſimple ſounds ſucceed each other, the ear appears to partake of each ſeparate vibration of the ſounding body, and diſcriminates with great accuracy: nay more, if ſimultaneous ſimple ſounds, arising from the vibration of different ſounding bodies, ſtrike the ear, it can perceive them all diſtinctly. It has not, however, this power of diſcernment to any very nice degree, excepting in perſons exerciſed in muſic: for although the ear can make the difference, ſounds are ſo analogous, their gradations ſo imperceptible, that an ear not corrected by judgment would ſtill confound them. To purſue this at preſent would lead us beyond our intention, which is to ſtate the power, without entering into its cauſe. Extremely ſenſible alſo is the faculty of the ear in diſtinguiſhing the quality, as well as the degree of tone. We know from experiment, that a muſical ear can diſtinguiſh nearly eight octaves as to pitch; but it can alſo ſtill perceive any variety of quality in the ſame note, or the difference arising from the law which governs each ſeparate vibration, and which conſtitutes the difference between inſtruments of different kinds, or different inſtruments of the ſame kind, or even the ſame inſtrument differently employed. It will thus diſtinguiſh clearly the character of the ſame note, given out by various inſtruments. The flute and the oboe may be in perfect uniſon, as to the pitch of the note, and as to its ſtrength; ſtill there will be always ſomething between theſe equal ſounds, which will not allow the ear to confound them: there will be a peculiar difference as to clearneſs, ſoftneſs, and other qualities, which a diſcriminating ear will inſtantly ſeize. We can diſtinguiſh very accurately alſo the modulations of voice and articulated ſounds; and ſome nations diſtinguiſh in their pronunciation certain letters, between which an ear unuſed to the ſound can perceive no difference. Every articulate word is a different modification of ſound, by which, when we reflect for an inſtant on the varieties of language, we ſee that the mind may be furniſhed with diſtinct ideas even to an infinite variety. There is another difference in the powers of the ear, which conſiſts in its being moſt delicately ſuſceptible of ſome of the qualities of ſounds, whilſt it is dull in perceiving others. It has, for inſtance, been obſerved, that a perſon capable of perceiving ſounds ſo low as to be totally unperceived by another in his company, has yet been far from having a correct ear in diſcriminating muſical ſounds. And the converſe of this holds equally good: the muſician, who can diſtinguiſh the ſlighteſt variation of tone, has been inſenſible to ſounds clearly perceived by a bye-ſtander. As an inſtance of accuracy of judgment arising from ſenſibility to ſounds, we ſhall mention an anecdote, told by Dr. Darwin, in his Zoonomia. "The late blind juſtice Fielding walked for the firſt time into my room, when he once viſited me, and, after ſpeaking a few words, ſaid, this room is about 22 feet long, 18 wide, and 12 high; all which he gueſſed by the ear with great accuracy."

Having ſtated thus ſhortly the power of the human ear in diſtinguiſhing the qualities of ſounds, we ſhall make a few remarks as to its faculty of determining the *diſtance* and *direction* from which they proceed. Its power of determining the duration of a ſound is obvious; that of diſtinguiſhing diſtance and direction is not ſo clearly defined, although every one is ſenſible of the exiſtence of them. Firſt, as to *diſtance:* it will appear from experiment, that a delicate ear will diſtinguiſh, with conſiderable accuracy, the diſtance from which a particular note begins to vibrate. A ſound, juſt audible at 240 feet, was diſtinguiſhed as being nearer at 40 feet than at 42, and at 38 than at 40; ſuch a power of diſcrimination muſt be allowed to be conſiderable, and to prove ſufficiently that the human ear is a very delicate judge of diſtance, as determinable by loudneſs of ſound. It cannot, however, always be depended on; and perhaps the diſtinction which the ear makes between the roughneſs and ſmoothneſs of a ſound is the beſt criterion by which it judges of proximity or diſtance; ſounds becoming perceptibly ſmoother as they are remote, and proportionably rougher as the ſound commences at ſome nearer point. The manner in which judgment influences this power will be conſidered further on. It has been found alſo by a rough experiment, that the ear can diſtinguiſh the *direction* of two ſimilar ſounds, proceeding from points which ſubtend an angle of about five degrees. Of ſuch ſpaces there are more than a thouſand in an hemiſphere, ſo that the ear can receive an impreſſion of about a thouſand different directions. By other experiments it would appear, that an horizontal difference of direction is not perceptible within the points ſub-

tending an angle of eight degrees, or the perpendicular difference within those subtending ten degrees of elevation. Even this depends in a great measure on the force of a sound; for unless it be of some strength, though we can distinguish the general direction, we can by no means bring it within such nicety of measurement.

The education of the ear to the nice discrimination of these differences, as well as to those of musical sounds, together with the effects of attention in increasing our sensibility of the pulses of sound, come to be considered after we have given the theory of hearing, as it is effected in the peculiar organ allotted for its accomplishment.

Functions of the individual Parts of the Organ of Hearing.

In order to discover what part of the ear is more immediately concerned in the perception of sounds, we shall exhibit a very short comparative review of its structure in those animals in whom an organ of hearing has hitherto been discovered.

In *cray-fish*, and *the sepiæ*, the organ is most simple, consisting of a small cavity or vestibule and a single membranous tube, and in the latter genus the sac includes a small solid body or lapillus: in the interior of this receptacle the auditory nerve is expanded. The *spinous fishes*, in addition to the hollow of the vestibule and membranous bag containing the lapilli, are provided with semicircular canals. The *cartilaginous fishes* have the vestibule, the sacculus for the lapilli, semicircular canals, and a fenestra ovalis, defended by an operculum composed of a membrane and the skin, whilst in the osseous fishes the whole organ is enclosed by bone. To the labyrinth of the *serpent* tribe, which is very similar to the internal ear of the cartilaginous fishes, there is added an osseulum closing the fenestra ovalis. In one of this order, the genus cæcilia, and in almost the whole of the four-footed *reptiles*, a membrana tympani is connected with this osseulum. In the other classes of *birds* and *mammalia*, we find an external passage leading to the membrane, and in the last of these an external cartilaginous auricle is annexed.

The obvious inference drawn from this view will be, that the whole of the apparatus, external to the labyrinth, is not absolutely necessary to the perceiving of sounds, because many creatures we know are susceptible of the impression, who are entirely destitute of these parts of the organ. We suppose, indeed, that the additional apparatus is intended to collect and modify the pulses of sound in their progress towards the labyrinth, to give force to the slightest tremors, and to regulate the intensity of the strongest. Whatever be their office, it is proved beyond a doubt, that for the simple perception of sound a membranous tube, or bag connected with the pulp of a nervous trunk, is fully sufficient; and whatever be the variation in the shape of these, we shall find them in all cases fundamentally the same. We say nothing of the manner in which the sensation of sound is excited in the lesser insects and worms, as we cannot perceive any organ set apart for this purpose, though we know that they are, for the most part, sensible to its impression. Among those creatures which have been subjects of repeated observations, we may remark, that from the osseous fishes up to man, we always find the membranous semicircular canals connected with a common sac in the vestibule. As to the cochlea, it is clear, that from its being found in perfection only in the class of mammalia, it is by no means requisite for simple hearing.

We conclude then, that the *labyrinth*, whatever be its form, is the most important part of the ear, inasmuch as it contains those soft parts immediately connected with the sense of hearing; and by giving an account of the manner in which sound is supposed to be impressed on those parts in man, any one may readily deduce the effects it would have in every other instance.

The pulses of sound, having arrived at the membranes of the fenestræ, are communicated to the aqueous contents of the labyrinth, and from them spread in every direction to the membranous receptacles supporting the auditory nerve; and not only will the fluid external to the membranous sacs and their canals partake of the vibration, but also the whole of their gelatinous fluid contents, and consequently the nervous pulp which is immersed in them. The nerves of the ampullæ, of the alveus communis, and the sacculus sphericus, will all be excited by the tremor, and convey to the brain their peculiar sensations. As to the cochlea, we have described it as consisting of two scalæ, or hollow spiral cones communicating with each other at their apices, the base of one opening into the vestibule, the other being terminated by the membrane of the fenestra rotunda: they are both filled by the aqueous contents of the labyrinth, which will communicate the vibration to the delicate filaments of that portion of the nerve distributed to the zona mollis. And here we cannot but cursorily notice the care which nature appears to have taken, that this nervous pulp should suffer no injury from rude and unexpected shocks, by including it in an elastic membranous receptacle floating in an aqueous fluid, as well as containing one within itself. There has been many an idle dispute concerning the immediate seat of hearing, before the structure of the organ had been the subject of successful as well as minute investigation. It has been placed exclusively in the canals, in the vestibule, and in the spiral lamina of the cochlea; the inferences, however, furnished by a comparative review of this organ, will prove that it can be attributed in preference to no one particular division of the nerve, the whole of which is sensible of the impression. If we might hazard a conjecture, drawn from the same source, it would be, that the nervous pulp of the membranous ampullæ, and the sacs in the vestibule, is the most immediately concerned in the simple perception of sounds; as to this part of the structure there is an analogous formation in all the classes of animals.

It has been ascertained by common observation, that sounds can be impressed on the nerve, not only when propagated through the medium of the air, but that they affect it most powerfully when conveyed by the medium of the solid parts surrounding it. In those animals, whose labyrinth is completely cased in bone, this must necessarily be the only way in which sounds can be communicated; the reason why in man, as well as in other animals who have a membranous opening, acted on by external air, the labyrinth should be hollowed out of most compact bone, is not easily determinable. It has been conjectured, that the sounds rebound from the bony channels to the nerves they surround; also, that we judge of the direction of sounds by means of tremors communicated to the solid parts continuous with the labyrinth. This is rendered the more probable, as we cannot but suppose, that animals who possess this organ in its most simple state, judge with some correctness of the direction of the point from which the sound proceeds. Whatever be the direction of the sound in the open air, when it enters the winding meatus externus, it must necessarily follow the course of that channel, and will in every instance be propagated to the tympanum and labyrinth in the same line of direction. However acute we may suppose the sensibility of the ear to be, we cannot conceive that under such circumstances it could distinguish the angular difference of direction, but that every sound would appear to

to come from the ſame point; which we know not to be the caſe. How far the external ear is concerned in producing this effect, we ſhall briefly notice in the ſequel; and to render ourſelves the better judges, ſhall ſtate then what ſhare the ſolid parts have been ſuppoſed to take. It appears ſufficient here to obſerve, that the nerve can be impreſſed, and can diſtinguiſh direction without the apparatus of the external ear.

Speculations as to the reaſons of the particular form of the *ſemicircular canals*, we conceive, in the preſent ſtate of our knowledge reſpecting this organ, to be but a waſte of labour: their uſe we believe to be perfectly unknown. One fact we ſhall mention, which is, that in the oſſeous fiſhes, whoſe labyrinth is enveloped wholly in bone, we obſerve them to be particularly capacious, and deſcribing portions of large circles. With reſpect to the *cochlea*, the obvious point which would firſt ſtrike us is, that by means of it the expanſion of the auditory nerve is very conſiderably increaſed in the animals who poſſeſs it: we obſerve, alſo, that it is proportionally larger in quadrupeds than it is in man. Its relative importance to the organ cannot be preciſely determined, but it would appear that its exiſtence in the perfect ſtate in which we ſee it in quadrupeds and man, is not neceſſary for any of the nicer perceptions of ſound. Birds, in whom it is found of a ſimple conſtruction, in no wiſe approaching to the elaborate one of the other claſs, have a delicate feeling of all the qualities of ſound. This is proved by their learning to ſing with great correctneſs, and when their vocal organs permit them, by their imitating very accurately the human voice in all its tones and articulations. That the cochlea is not neceſſary for that correctneſs in hearing, which conſtitutes a muſical ear, is thus fully aſcertained. Whether it increaſes the ſphere of the perception, enabling animals who poſſeſs it, to hear thoſe low and gentle tremors, which would not affect an ear without this part, has not been at preſent aſcertained, nor from the difficulty of the inveſtigation do we ſee any probability of effecting it. We omit the different opinions reſpecting the uſe of the decreaſing lamina ſpiralis of the cochlea in modulating ſounds, or its office of perceiving excluſively ſome of their particular qualities, as we can ſee no foundation whatever on which to build them: and ſhall conclude this account of its negative properties by remarking, that although it is rational to ſuppoſe that ſome important purpoſe is anſwered by the conſtruction, we have as yet no data from which to draw a concluſion as to its extent.

The *feneſtra rotunda*, and its membrane, are found only in animals who poſſeſs a cochlea, one of the ſcalæ of which the membrane occludes, forming a ſeparation between it and the cavity of the tympanum. Its uſe is neceſſarily connected with that of the cochlea, and we conclude that it is to tranſmit to the fluid in that part the tremors which have been communicated to it through the air in the tympanum; we ſuppoſe it to be perfectly paſſive, influencing in no degree the quality of the ſound. We noticed, in the deſcription of the nerve of the cochlea, that it was moſt obſervable in the tympanic ſcala, with which the feneſtra ovalis immediately communicates. It is not improbable, therefore, that the impreſſions conveyed to this portion of the nerve paſs through the medium of the membrana feneſtræ rotundæ; the ſuppoſition, though conjectural, carries with it no direct abſurdity.

The *feneſtra ovalis* is another road by which we ſuppoſe ſounds to arrive at the labyrinth, and the importance of the opening and its membrane would appear to be conſiderable, ſince we find them in almoſt all animals, though its immediate office is not ſo clear. In the cartilaginous fiſhes it has been conſidered as performing the part of a membrana tympani, there being no parts exterior to it. In other animals the veſtibular feneſtra is occupied by a bone, between which and the rim of the opening there is apparent, more or leſs of a membrane.

The *cavity of the tympanum*, we have found very generally, when comparing the varieties of ſtructure, and coexiſting with it, certain additional parts, the uſes of which we ſhall now attempt to inveſtigate. In adding this diviſion of the machine, which includes ſeveral ſubordinate parts, it is a matter of no conſequence with which individual piece we begin our examination. They are found exiſting together, and we conclude therefore that they are immediately dependent on each other with regard to their functions, which can ſcarcely be ſuppoſed to be executed unleſs in mutual combination. Again, the configuration of the different pieces is ſo exceedingly different, that we are totally at a loſs to determine the value of any particular form of parts. Conſidered in its integral form, it appears as the medium through which ſounds are communicated to the labyrinth; and our object here is to aſcertain what changes it effects on them during their tranſmiſſion.

The officula and the membranes are ſo immediately connected with each other, that it imports but little with which we next proceed: as, however, an officulum is found in many animals, where the membrana tympani, (if indeed it deſerve the appellation,) appears immoveable from its ſtructure, we ſhall firſt examine the probable office of theſe ſmall bones, and afterwards that of the membranes to which they are attached, and the muſcles which, by their action, have an evident effect in altering their exiſting ſtates.

There is ſo ſtriking a variety in the form of the cavity, not only in different claſſes of animals, but in the different genera of the ſame claſs, that we can draw no probable concluſion as to the utility of the particular ſhape of it in man. Its depth from without inwards is ſuited to the length of the connected chain of the officula, all of which are ſituated in its upper half in the human ſubject, ſo that a plane drawn parallel to the baſe of the ſtapes is deſcribed as dividing the cavity into equal halves. The feneſtra ovalis is thus placed in the middle of the interior wall, oppoſite to the centre of the membrana tympani, and immediately in the courſe of coming ſounds. The feneſtra rotunda is directed more downwards, ſo that the plane of its membrane forms an obtuſe angle with that of the feneſtra ovalis. From this poſition it has been ſuppoſed to be more particularly deſigned to tranſmit thoſe vibrations which have been reflected from the oppoſite bony hollow: and, as it is acted on immediately by the tremors of the air, it has been conſidered by Scarpa as a ſecond membrana tympani. As the feneſtræ differ in their proportional ſize in different animals, we cannot ſuppoſe any thing very material as depending on that circumſtance.

The cavity of the tympanum has communicating with it ſeveral *cells* hollowed out in the bony parietes of the ſkull: in man we have deſcribed theſe as exiſting chiefly in the maſtoid proceſs of the temporal bone. In other mammiferous animals they are irregularly diſpoſed; in the elephant, whoſe acuteneſs of hearing is very great, they exiſt in great numbers, the cells of one ſide communicating with thoſe of the other. In birds, but more particularly in the nocturnal birds of prey, theſe cells are extenſive, and particularly large; for inſtance, in the common white owl. The inference drawn from combining theſe facts will be, that theſe cells are in ſome manner aſſiſtant in the tranſmiſſion of ſound, and probably increaſe its force, as we obſerve them more particularly enlarged in thoſe creatures who are gifted with the

the power of perceiving the loweſt and moſt effete pulſes of ſound.

In every inſtance where we meet with a cavity of the tympanum we find a *tube* of different diameter and length, communicating with ſome other cavity in which the external air is conſtantly paſſing, ſo that the tube being pervious, the air penetrates to the part in which it opens. The air thus admitted fills all the cavities we have juſt now mentioned, as well as that of the tympanum, where its preſence would ſeem to be neceſſary for the ready tranſmiſſion of ſound. Its importance is beſt proved by obſerving what occurs in caſes where its tube is by ſome means cloſed, and in which the air can no longer gain an acceſs to the tympanum. Deafneſs always ſucceeds to a greater or leſs degree, and the cauſe of it is aſcertained by ſome marks which we need not dwell on here: it is enough for our preſent purpoſe to obſerve, that where an opening has been again made for the admiſſion of air, the ſenſe of hearing is at firſt painfully acute. The ear, having loſt its habit of perceiving, is ſo ſenſible to the ſudden return of the ſenſation as to feel much diſtreſs. The ſenſibility diminiſhes by degrees, and the ear again accommodates itſelf to its former mode of action. The opening a new paſſage for the air, by making a perforation through the membrana tympani, is not, however, conſtantly ſucceſsful in reſtoring the functions of the organ for any continuance; the cauſe of failure is not to be examined here, our object being to prove the neceſſity for air being admitted into the cavity, and not to eſtimate the manner in which it ſhould be effected: the organ is not neceſſarily perfect, becauſe air is found in the tympanum, but it is always imperfect if the acceſs for it is barred. Another uſe of the Euſtachian tube has been ſuppoſed to be that of giving admiſſion to ſounds when the hearer is anxiouſly endeavouring to collect them. It had been obſerved, that a man, attentively liſtening to any ſound, generally keeps his mouth half open, and it was ſuppoſed that this was to afford an additional channel for the arrival of ſounds to the internal ear. In oppoſition to this theory it is ſaid, that although we generally open the mouth when in the act of liſtening with attention, it is not for the purpoſe above ſtated, but that in depreſſing the lower jaw, we neceſſarily widen the aperture of the external meatus which is cloſely connected with it, and conſequently, that by this action, we facilitate the tranſmiſſion of ſound to the tympanum. Conſidering the latter uſe of the Euſtachian tube as rather problematical, we ſhall be contented with aſſigning to it its more obvious and important office, or that of conveying air to the cavity of the tympanum.

The *officula* which croſs the tympanum have been ſuppoſed to act either as ſolid bodies, tranſmitting ſonorous vibrations, or merely as ſubordinate pieces concerned in giving different degrees of tenſion to the membranes with which they are connected. That they may execute in ſome extent both theſe functions is not improbable; becauſe in ſome animals they are not furniſhed with muſcles, and conſequently can have no power over the membrane with which they are connected, in which inſtance we can only ſuppoſe them to continue vibrations they have received. In other inſtances, however, where we obſerve a delicate membrana tympani, capable, from its conſtruction, of undergoing tenſion and relaxation, we always find the bones furniſhed with muſcles, which, acting through their intervention, can produce conſiderable alterations in the ſtate of the membranes. We know nothing as to the difference of perception ariſing from this different ſtate of the officula, but from obſerving them to be provided with muſcles only in caſes where they can act with effect, we believe, that, in the latter caſe, their principal uſe is not that of tranſmitting ſounds, but of altering the tenſion of the membranes with which they are connected. In caſes of diſeaſe of the ear, theſe bones have been known to fall out, without very materially injuring the delicacy of the organ, provided they did not involve in their ſeparation the deſtruction of the membrane of the feneſtra ovalis. As we ſuppoſe their principal office to be allied to that of the membrana tympani, we ſhall conſider the latter more particularly before we can draw any inference as to their combined functions.

The officula are provided with *muſcles* which can move them in different directions: the moſt powerful of theſe would appear to produce the effect of rendering more tenſe the membrane of the drum, and by the tranſmitted motion of the bones increaſing the tenſion alſo of the membrane of the veſtibular, or oval feneſtra. By their action they can produce no immediate effect on the membrane of the feneſtra rotunda, which they can only influence by the preſſure given to the fluid contents of the labyrinth. The importance of their acting thus on membranes occluding the openings to the labyrinth, does not appear to be very great, as in birds, whoſe delicacy in the perception of ſound has been already noticed, the plate of bone connected with the veſtibular feneſtra, cannot produce any effect of this kind: it is fitted ſo exactly to the opening, as to be incapable of being in any degree moved in its ſituation. In theſe creatures, the muſcle acting on their officulum, can only affect, by its means, the membrana tympani, to which we refer alſo the chief uſe of the muſcles of the officula in man. That they will alſo produce an alteration in the membranes of the feneſtra is highly probable; but the effects will be comparatively ſlight, when ſet by the ſide of thoſe alterations they will cauſe in the membrana tympani. The importance of their action on the labyrinth is rendered ſtill further of a doubtful nature, when we conſider the perfection of the organ, in caſes where the bones on which they act have been deſtroyed. We have obſerved, that the moſt powerful of theſe little muſcles will, by their action, increaſe the conical form of the *membrana tympani*, and render it more tenſe. It would appear to return, by its elaſticity, in ſome degree, to its former ſtate, as the relaxing power can be brought to act on it but feebly. We conjecture, from this circumſtance, that the membrane is always in a ſtate to tranſmit the pulſes of ſound; and that it is only when our attention is particularly directed to a low ſound, that the membrane is rendered tenſe: this ſuppoſition is, in ſome meaſure, ſtrengthened, by obſerving, that in birds, the muſcle which acts on their officulum can produce the effect of tenſion only. It is, again, ſuppoſed, that in caſes of loud and impetuous ſounds, the membrana tympani in man, at leaſt, and animals ſimilar to him in ſtructure, can be in ſome meaſure relaxed. Granting that ſuch is the caſe, we would obſerve, that the membrana tympani and its muſcles are ſomewhat analagous in function to what we know of the iris: they are to be regarded as the regulators of the intenſity of ſounds; damping the force of the powerful, and facilitating the tranſmiſſion of the ſlight. This leads us to notice ſome further properties of theſe muſcles, as well as to make ſome obſervations on the uſe of the radiated muſcle of the tympanum, as deſcribed by Mr. Home. Are the muſcles of the tympanum to be conſidered as involuntary in their actions, or are they dependent in any degree on the will? We believe them to act independently of the will, and to be ſtimulated by the impulſe of ſound, in the ſame manner as the iris acts from the ſtimulus of light. It has been objected, that in ſuch caſe, their action would be too late; that the ſound would have paſſed the membrana tympani before it could be accommodated to its proper tranſ-

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miſſion. The ſame objection would hold good with regard to the iris, where it may be ſaid that the retina would be impreſſed before the iris had time to alter the diameter of its aperture. How far the membrane is affected, in the inſtance of voluntary increaſed attention, cannot be aſcertained: that the external ear is directed more immediately towards the point from which the ſound proceeds, is, in all caſes, evident. With reſpect to the action of the radiated muſcle of the tympanum we can ſay but little: it can be but trifling, if we conſider the nature of the membrane, and the acknowledged delicacy of the muſcle, which, in man, has hitherto eſcaped our eye. Mr. Home remarks, "that the membrana tympani is ſtretched, in order to bring the radiated muſcle of the membrane itſelf into a ſtate capable of acting, and of giving thoſe different degrees of tenſion to the membrane which empower it to correſpond with the varieties of external tremors: when the membrane is relaxed, the radiated muſcle cannot act with any effect, and external tremors make leſs accurate impreſſions. If the tenſion given by the muſcle of the malleus be perfect, all the variation produced by the action of the radiated muſcle will be equally correct, and the ear truly muſical: if the firſt adjuſtment be imperfect. none of the effects of the action of the radiated muſcle will be correct." Such is the theory as to the uſe of the membrana tympani and its various muſcles, the oſſicula being conſidered as ſecondary agents only, and their articulations not deſigned to regulate the intenſity of violent impulſes, as communicated through themſelves to the feneſtra ovalis, but only to act with more correctneſs and accuracy on the membranes to which they are connected. We believe the tranſmiſſion of ſounds to be performed through the medium of the air in the tympanum, not wholly certainly, but in a conſiderable degree.

In ſuch a complicated machine as the organ of hearing in man, it is difficult and hazardous to affix the preciſe power of every individual piece, when we conſider, that in no caſe does it act ſingly, or uncombined with ſeveral others. The relative importance of each is more eaſily eſtimated; and we ſhall conclude the examination of this part of the apparatus, by obſerving the effects which enſue on their loſs. It is, we conceive, proved, by numerous obſervations, that the integrity of the membrana tympani is not neceſſary for the perfection of the mechaniſm of this organ. Many perſons, who have been able to drive ſmoke from the mouth in large volumes through the external meatus, have, nevertheleſs, retained great accuracy of ear: and it would appear, from ſome later obſervations, that the total deſtruction of the membrane does not neceſſarily produce deafneſs, or even any very perceivable defect in the organ. In an inſtance recorded by Mr. Aſtley Cooper, in which the membrana tympani of one ear was totally deſtroyed, and that of the other nearly ſo, by diſeaſe, it appeared that the deafneſs was inconſiderable, and that ſound was moſt readily perceived by the ear in which no trace of the membrane could be diſcovered. This proves that the membrana tympani may be deſtroyed without any great prejudice as to the power of catching low ſounds. Another circumſtance is, that, in the ſame caſe, the ear was nicely ſuſceptible of muſical tones, the individual playing well on the flute, and ſinging perfectly in tune. The power of accommodating the ear to differing intenſity of ſound was loſt for ſome time after the deſtruction of the membrane: it, however, gradually returned; and at the period of examination there was no diſtreſs ariſing from that deficiency. The inference drawn from theſe obſervations would be, that the membrana tympani is not materially concerned in giving either delicacy, or correctneſs of ear, that it may be deſtroyed without injuring eſſentially its functions, its principal uſe being to regulate "the impreſſions of ſound, and to proportion them to the expectation and power of the organ." In caſes where deafneſs follows the deſtruction of this membrane, it depends, moſt probably, from the diſeaſe having injured, at the ſame time, the membranes of the feneſtra, in which caſe, the fluid of the labyrinth would eſcape, and the auditory nerve inevitably loſe its power of perception.

The obvious uſe of the *external meatus* is to convey the vibrations of ſound, propagated through air, to the membrana tympani; and we find it, accordingly, only in thoſe animals who have a proper elaſtic moveable membrane, as in birds and mammalia. From the inflections and variations in dimenſion, in different parts of its courſe, it is evident that, from whatever point the ſound proceeds, it muſt ultimately ſtrike on the membrane in the direction of this paſſage, and be continued in the ſame line to the auditory nerve. The conſequence of ſuch formation would be, that the ear would in no caſe be enabled to determine the direction from which the ſound proceeded. The ſenſibility of its ſurface, as it approaches the tympanum, is very conſiderably augmented; and it has been conjectured that, by the wave of ſound acting on this part during its paſſage, notice is communicated to the muſcles of the membrana tympani, which are immediately ſtimulated to action. The different directions of the meatus in animals, as well as the differences in the form and obliquity of the membrana tympani at the bottom of it, are ſo numerous, and, apparently, irregular, as not to allow us to form any reaſonable conjecture as to the utility of their particular figure in the human ſubject.

The *pinna*, or that part of the external ear which lies without the head, would appear to be in no wiſe neceſſary for the perfection of the organ, as far as the perception of ſound is concerned, and it can be regarded as an acceſſary part only, ſuperadded to the meatus in quadrupeds and man. In the generality of quadrupeds the auricle is of a conical form, the apex of the cone terminating in the meatus, appearing thus calculated to collect ſonorous vibrations, and tranſmit them with increaſed energy to the internal parts. In man we cannot obſerve ſo much of this conical form in the concha, nor do we exactly perceive the utility of the different eminences and the intervening hollows. The probable ſuppoſition is, that they are concerned in directing towards the meatus, as towards a focus, all the waves of ſound impinging on their different ſurfaces. In order to favour the collecting of ſounds, we have found the auricle to be furniſhed with *muſcles* capable of moving it in different directions. In animals, who have it of a larger form, theſe muſcles are conſiderable both in number and ſtrength, and empower them to direct it with ready execution towards the point from which the pulſes proceed. Man, at leaſt in his civilized ſtate, would appear to have much leſs power in this reſpect. In the inſtance mentioned above, where the membranes of the drum were ſo materially injured, the muſcles of the external ear had acquired a diſtinct power of moving it upwards and backwards, which power was more particularly exerted when the attention was directed to catch an indiſtinct ſound. When the external ear moves, it is moſt commonly to accommodate its poſition to the direction of the ſonorous rays, to fix itſelf ſteadily in order to reflect them, and to ſtraighten the curved direction of the cartilaginous meatus. It is for the latter reaſon, perhaps, that in man we find no muſcle capable of depreſſing the pinna, as ſuch a movement would neceſſarily increaſe its curve, whilſt the motion, either upwards or backwards, would tend to make the paſſage more direct. The pinna has been removed in many inſtances where no material injury to the power of the organ has

has been afterwards obſervable: for a few days after there has been a ſlight deafneſs but the ear has, in every caſe, ſoon recovered all its fineneſs of perception. Where the canal of the meatus has been covered by a continuation of the ſkin over it, there being no auricle connected with it, obſervation has proved alſo that the functions of the organ were perfect.

Such is the apparatus deſtined to convey to the ſenſorium the impreſſions of ſound. We have endeavoured to aſcertain the relative importance and functions of the individual parts, and ſhall now give the ſum of their united powers in man, tracing the progreſs of ſound from without. The pulſes of ſound, which come in contact with the external ſurface of the pinna, are reflected by its eminences and depreſſions, but more poſitively by the ſides of the hollow of the concha, and directed into the external meatus, where their energy is probably augmented. Arrived at the bottom of this tube, they ſtrike againſt the membrana tympani, which we ſuppoſe to alter its degree of tenſion in conformity to their force. The vibration excited by the ſonorous waves is continued with them acroſs the tympanum, by means of the air and the chain of officula to the feneſtræ of the labyrinth, and the fluid it contains. The agitations of this fluid are communicated to the nervous ramifications immerſed in it, and the nerve conveys to the ſenſorium the peculiar impreſſion of the ſound. Further, that there are paſſages communicating with the labyrinth, and ending in widened faces on the interior of the ſkull, by means of which the motion of the fluid is regulated, and its accumulation to too great a degree prevented. We have obſerved alſo, that there remains ſtill another medium by which ſounds could be conveyed with ſome accuracy and force to the nerve, provided the communication was kept up by the vibrations of ſolid bodies: this we ſtated to reſide in the ſolid parts of the head. The concluſion, drawn from this review, will be, that the internal ear is alone ſufficient to perceive the qualities of ſounds, and that the parts exterior to it can only collect, tranſmit, and regulate the intenſity of them.

Having examined the powers of the ear as reſulting from ſtructure, we muſt ſtill look further for the explanation of ſome other faculties which the perfect organ poſſeſſes. We are not to enter here on the advantages which one ſenſe derives from the aſſiſtance of others, in correcting its imperfections, or enlarging its powers: we ſhall ſuppoſe ſuch to be proved with reſpect to the ear, and ſhall therefore only ſtate the inſtances in which they may be obſerved. One of theſe is ſeen in the faculty we poſſeſs of determining the diſtance of the ſounding body. We mentioned before, that when ſounds proceeded with equal forces from the ſame body, the ear was capable of diſtinguiſhing the alteration of diſtance by the difference of the ſtrength or weakneſs of the wave. This power we conceive to be acquired by experience, and that it is ſo, may be rendered further probable by obſerving that loud ſounds coming from a diſtance, and fainter ones pulſating from a nearer point, provided the tone is the ſame, cannot be diſtinguiſhed unleſs by a judgment derived from other ſources. The ſame may be ſaid of the power of aſcertaining direction, which is a ſecondary faculty depending for its perfection on the aſſiſtance of the other ſenſes. It has been ſuppoſed by Mr. Gough, and the theory has been ſupported by ſome ingenious and concluſive experiments, that the ſolid parts of the head are the means by which we judge of the point from which the ſound proceeds. Having proved, by experiment, that the head is a ſenſitive ſolid, and capable of perceiving impulſes made on it by ſounds much more exquiſitely than men generally imagine, he makes ſome obſervations on the relative degree of its ſenſibility in different parts, and adds, "the ſenſation in queſtion being but of little uſe, independently of its connection with hearing, we, for the moſt part, miſtake its true ſituation, and refer it to the organs of this ſenſe. Seeing, however, that we are convinced, by a delicate ſort of touch, what part of the head is affected by the ſtrokes of the ſonorous object, and at the ſame time well acquainted with the form of this member of the human body, we judge accurately what is the ſituation of the excited portion of it, relative to the centre of the axis of hearing:" which he has ſuppoſed to be in an imaginary ſtraight line joining the two ears. We are taught alſo, by experience, to judge of the lateral direction of ſounding bodies according as they ſtrike both the ears with equal or different degrees of force: the perception which determines the poſition to be before or behind the hearer, is determined in the manner above explained. The diſcernment of the ear, then, has its bounds, becauſe the ſounding bodies are not ſubject to the touch, and we can determine diſtance, as well as direction, by judgment only. In the ſame way we know alſo the poſition of a body; and this can only be acquired by exerciſe. If a deaf man was ſuddenly to hear, he would be able to judge with correctneſs of neither: he would be miſtaken, if he has not beforehand ſtudied the nature of the ſounding object, and the varieties of impreſſion reſulting from its different ſituations.

Although the organ of hearing is double, it does not follow that we muſt hear a ſimple ſound twice; the two impreſſions which the ſame tone makes on them both are received by correſponding parts, and tranſmitted at the ſame inſtant to the ſenſorium: the two impreſſions are thus regarded as one, and excite, conſequently, but a ſimple ſenſation: it is exactly the ſame as in the caſe where the object is painted at the ſame inſtant on both the organs of viſion. The differences of power in the ears of different individuals, would appear to depend on ſtructure as well as exerciſe. The correct muſical ear ariſes, in a great degree, from original formation, but its exquiſite accuracy, as we obſerve it in perſons exerciſed continually in the ſcience of muſic, is derived, beyond doubt, from education. The high finiſh which the organ attains by this conſtant attention to muſical ſounds, appears in a moſt ſtriking light, when compared with the undiſtinguiſhing perceptions of the untutored ear. An equality of power in the two ears does not appear to be neceſſary in order to complete the organ as affected by muſical ſounds. Inſtances are every day met with of perſons with ſlight deafneſs of one ear, who are nicely correct in perceiving every variation of tone. To complete the perfection of the ſenſe in every inſtance, it ſeems neceſſary that the organ ſhould diſpoſe and accommodate its action to the impulſe, that it ſhould be on the alert to catch the low tremor of a faint and indiſtinct ſound. It is in ſuch caſes that we obſerve the increaſed energy of the ear when the attention is particularly called forth. Such are the circumſtances and conditions which influence, in a manner, more or leſs direct, the perfection of the organ of hearing; and we ſhall conclude by ſaying a few words on its peculiar pleaſures.

The pleaſures of the ear conſiſt, independently of thoſe of articulated language, in the ſucceſſion of ſounds according to the laws of harmony. We are not ſo well pleaſed with one ſound, as with an entire air, which cauſes joy or ſorrow, pleaſure or pain, by ſome unknown change which it is ſuppoſed to produce on the organ. Muſic pleaſes more as the ear is leſs exerciſed to it: tunes ſimple and unpoliſhed pleaſe at firſt: if we accuſtom the ear to their effects, we ſoon ſeek for more finiſhed and compounded airs, which, at firſt, were far from pleaſing. Muſic thus becomes a

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fource of new pleafures, ever varying her combinations to fuit the educated organ. This can only occur to any high degree in well organized ears; there are fome to whom mufic is ever but a noife. The caufes of the pleafure refulting from harmony and melody are very far from being fatisfactorily explained, notwithftanding the fagacious conjectures and repeated attempts of the moft able metaphyficians, as well as phyfiologifts: we know no more of them than we do of the caufes of the pleafures and pains of all the other fenfes.

The ear, then, is an organ of fenfe, fubjected but incompletely to the will, and unable to withdraw itfelf from the impreffion of every impulfe of found: it is on this account, provided with a certain regulating apparatus, which modifies the action of the external agent, and is further affifted by judgment, as acquired from the other fenfes. Gifted with thefe powers, and alive to all thefe pleafures, we once more fee this beautiful organ perfect in all its parts, capable of exciting in us, with immeafurable rapidity, that infinite number of ideas which refults from the fenfe of hearing.

In the defcription of the ear, as far as it is contained under the article CRANIUM, we mentioned the comparative merits of the different authors who had written on that fubject. The reader will find fome further information as to its functions, in fome papers by Mr. Home and Mr. A. Cooper, in the Philofophical Tranfactions for 1800. 1801, and 1805; in an effay by Mr. Gough, in Mancheft. Mem. vol. v.; and in Haller Element. Phyfiol. vol. v. He will find alfo a complete catalogue of authors on this fubject in the fecond vol. of Dr. Young's Natural Philofophy. See alfo the article ACOUSTICS for further references to fubjects connected with this organ.

Several naturalifts and phyficians have held, that cutting off the ear rendered perfons barren and unprolific; and this idle notion was what firft occafioned the legiflators to order the ears of thieves, &c. to be cut off, left they fhould produce their like.

The ear has its beauties, which a good painter ought by no means to difregard; where it is well formed, it would be an injury to the head to be hidden. Suetonius infifts, particularly on the beauties of Auguftus's ears; and Ælian, defcribing the beauties of Afpafia, obferves fhe had fhort ears.

Martial alfo ranks large ears among the number of deformities. Felibien.

Among the Athenians, it was a mark of nobility to have the ears bored, or perforated. And among the Hebrews and Romans, this was a mark of fervitude.

Lofs of one ear is a punifhment enacted by 5 and 6 Ed. VI. cap. 4. for fighting in a church-yard; and by 2 and 3 Ed. VI. cap. 15. for combinations to raife the price of provifions, labour, &c. if it be the third offence, befide pillory, and perpetual infamy, or a fine of 40*l.*

By a ftatute of Henry VIII. maliciouffy cutting off the ear of a perfon is made a trefpafs, for which treble damages fhall be recovered; and the offender is to pay a fine of ten pounds to the king. 37 Hen. VIII. cap. 6. § 4. In the index to the Statutes at large, it is faid, that this offence may be punifhed as felony, by 22 and 23 Car. II. cap. 1. § 7. commonly called Coventry's act; but ear is not mentioned in that ftatute.

EAR, in *Botany*, is alfo applied to a long clufter of flowers, or feeds, produced by certain plants: and ufually called, by botanifts, *fpica*. The flowers and feeds of wheat, rye, barley, &c. grow in ears. The fame holds of the flowers of lavender, &c.

We fay, the ftem of the ear, *i. e.* its tube, or ftraw; the knot of the ear; the lobes, or cells, wherein the grains are enclofed; the beard of the ear, &c. great numbers of ears of wheat have been known to arife from the fame root.

EAR, in *Conchology*. See AURIS DIANÆ, &c.

EAR, in *Gardening*, a name given to the feminal leaves of plants, or thofe two green and fucculent leaves which firft appear from the feed, and are very different, in all refpects, from thofe which follow. Thus in the melon plants, the two firft leaves are called ears; and the leaves, with their ftalks, which fhoot out afterwards, are called knots, and denominated the firft, fecond, and third knot, according to their place, and time of growing. The cutting off every third knot in this plant, is the great means of procuring the fineft and largeft fruit. Phil. Tranf. N° 45.

EAR, in *Mufic*, denotes a kind of internal fenfe, whereby we judge of mufical founds and harmony; they who pofffefs this fenfe are faid to have a good ear. And the like diftinction we fhould, probably, acknowledge in other affairs, had we got diftinct names to denote thofe powers of perception by.

Thus, a greater capacity of perceiving the beauties of painting, architecture, &c. is called a *fine tafte*. See TASTE.

EAR *of Birds*. See *Anatomy of* BIRDS.

EAR *of Fifhes*. See FISH.

EAR-*ach*, in *Surgery*. See OTALGIA.

EAR, *running of the*, in infants. See INFANT.

EAR, *tingling of the*. See TINNITUS.

EAR, *Jews*, in *Natural Hiftory*. See AURICULA *Judæ*.

EAR *of Corn*, and *Ermine, order of*, in *Heraldry*, fo called from the collar, an order of knighthood, inftituted by Francis I. duke of Britany, for 25 knights of noble defcent. The badge of the order was an ermine on a mount enamelled proper; round the mount the following motto, AMAVIE. The collar was compofed of ears of corn interlaced.

EAR-*picks*, are inftruments of ivory, filver, and other metal, fomewhat in form of a probe, for cleaning the ear. The Chinefe are particularly fond of entertaining themfelves with picking and tickling their ears; this they do either for themfelves, or interchangeably for one another, and have a great number of inftruments of peculiar fhapes and ftructure, invented for this purpofe. But fir Hans Sloane very judiciouffy obferves, that the ufe of them feems very prejudicial; for that, among many people in England who had applied to him on account of deafnefs, the far greater part were thrown into their complaints by too often picking their ears, and thereby bringing humours, or ulcerous difpofitions, on them. Phil. Tranf. N° 246. p. 406.

EAR-*ring*. See PENDANT.

EAR-*fhell*. See AURIS *Marina*.

EAR-*wax*. See WAX.

EAR *wig*. See FORFICULA.

EARCH, in *Geography*, a river of North Wales, which runs into the fea near Pwllhely, in Caernarvonfhire.

EARED OWL, in *Ornithology*. See STRIX.

EARINÆ VESTES, from ἔαρ, *fpring*, among the ancient Greeks, a habit worn in the fpring, which was made of wool, and dyed green. The cuftom of wearing green veftments in this feafon has not been unknown in modern times.

Dempfter fays, it was cuftomary, in his time, for the king, and nobility of England, to go a hunting in the fpring, dreffed in green, that they might be of a fimilar colour with the feafon.

EARING, in a fhip, that part of the bolt-rope, which, at the four corners of the fail, is left open, in the fhape of a ring. The two uppermoft parts are put over the ends of the

the yard-arms, and so the sail is made fast to the yard; and into the lowermost earings the sheet and tackles are seized, or bent at the elew.

EARING, *Third*, in *Husbandry*. See THIRD.

EARL, an English title of honour, or degree of nobility, next below a marquis, and above a viscount.

Earls were anciently attendants, or associates of the king in his councils, and martial expeditions; much as comites, counts, were of the magistrates of Rome, in quality of deputies, to execute their offices for them.

Hence, also, earls are called, in Latin, *comites;* in French, *comtes*, counts, &c. The Germans call them *graves*, as landgrave, marcgrave, palsgrave, &c. The Saxons, *ealdormen;* the Danes, *eorlas;* and the English *earls*.

Earl was a considerable title among the Saxons: it is observed to be the most ancient of any of the peerage; and that there is no other title of honour in use among the present nobility, which was likewise used among the Saxons, beside it. The original titles of honour among the Saxons were, *edeling*, *ealderman*, and *degen*, or *degn*. The first appropriated to those of the royal family; the other two to the rest of the nobility; only the thani were afterwards distinguished into majores and minores. *Comes* in Latin, *alderman* in Saxon, and *earl* in Danc-Saxon, were synonymous. See ALDERMAN.

Originally the title earl always died with the man. William the Conqueror first made it hereditary; giving it in fee to his nobles, and annexing it to shires and counties; for the support of the state thereof, he allotted the third penny out of the sheriff's court, issuing out of all pleas of the shire from which the earl took his title. Accordingly, it became usual in creating an earl, to erect a certain territory into a county or earldom, and to bestow it upon the person and his family; and also to give him a fixed salary, commonly about 20*l*. a year, in lieu of his third of the fines. The diminution of his power kept pace with the retrenchment of his profit; and the dignity of earl, instead of being territorial and official, dwindled into personal and titular. But earls are now created by patent, without any authority over, or particular relation to, their counties; and without any profit arising thence, except some annual stipend out of the exchequer, for honour sake. The number of earls being of late much encreased, and no more counties being left for them, several of them have made choice of some eminent part of a county, as Lindsey, Holland, Craven, &c. Others of some town, as Marlborough, Exeter, Bristol, &c. And others, of some village, or their own seat, park, &c. as Godolphin, Bolton, Danby, &c.

Some earls we have, who are not local, *i. e.* not dignified from any places, but from noble families, *viz.* earl Rivers, and earl Paulet. A third is denominated from his office, *viz.* earl Marshal.

Earls are created by cincture of sword, mantle, a cap, and a coronet put on his head, and a charter in his hand. Their title is, *most potent and noble lord*. Their coronet has the pearls raised on points, with leaves between.

Their place is next to a marquis, and before a viscount; and as in very ancient times, those who were created counts, or earls, were of the blood royal; our British monarchs to this day call them in all public writings "trusty and well beloved cousin;" an appellation as ancient as the reign of Henry IV., who, being either by his wife, his mother, or his sisters, actually related or allied to every earl then in the kingdom, artfully and constantly acknowledged that connexion in all his letters and other public acts; from whence the usage has descended to his successors, though the reason has long ago failed. They also originally did, and still may, use the style of *nos*.

EARL-*marshal* is one of the great officers of the crown; who takes cognizance of all matters relating to honour and arms, determines contracts that respects deeds of arms out of the realm upon land, and matters concerning war within the realm, which cannot be determined by common law, in which he usually proceeds according to the civil law. He had, anciently, several courts under his jurisdiction, as the court of chivalry, now almost forgotten; and the court of honour. See COURT *of Chivalry*.

He has also some pre-eminence in the court of marshalsea, where he may sit in judgment against criminals offending within the verge of the court; whence the chief officer under him is called *knight marshal*. Under him is also the herald's office, or college of arms. See COLLEGE and COURT.

Mr. Camden, in his discourse concerning the etymology, antiquity, and office of earl-marshal of England, attributes the first use of the word "marescalius" in England to Petrus Blesensis, secretary to king Henry II.; and he says, that the first mention he could find of a marshal on record is in the red book of the exchequer, written, as he erroneously supposes, in the time of that king, not having reference to the reign of Henry I., and that the second mention of marshal is in the first year of king John, and adds, that the marshal had not any precedency in respect of his place, until king Henry VIII. in the 31st year of his reign, by act of parliament, assigned him place next to the lord constable and before the lord admiral; and that king Richard II. created the earl of Nottingham (Thomas Mowbray) "earl marshal of England," whereas in former times they were styled only "marshals of England." Camden, however, in a subsequent discourse, concerning the original and succession of the earl marshal of England, and also in his Britannia, receded in part from his former opinion, and allowed the institution of a marshal in England to have been coeval with the reign of William the Conqueror; and this is the generally received opinion. That the term marshal was used as a surname in the time of the conqueror is evident from "domesday," where divers persons under the denomination of marshal are found to hold lands: and, upon the whole, there are so many concurring testimonies of the office of marshal being known in this kingdom almost immediately after the Norman invasion, that there cannot remain the least doubt of its having been brought hither by William I. The earl marshal appears to have been from the first establishment of his office in this kingdom, an officer of great authority and dignity both in war and peace. The office of grand serjeanty, and the institution of the high officer who enjoys it, must be alone the king's, who creates him by letters patent under his great seal, and at the same time, for his better distinction and greater state, delivers to him a rod, which he is thenceforth constantly to bear in his hand. This rod was originally made of wood, and like the tipstaff which is carried by the modern marshalmen: but when king Richard II., in the 20th year of his reign, regranted the office to Thomas, earl of Nottingham, and the heirs of his body, that monarch, in order to enhance the grandeur and honour of this new marshal, by the patent of his creation, directed that he and the heirs of his body "earl marshals," should, in the royal presence, and at all other times, bear and carry a rod of gold, tipped at each end with black enamel, and having the royal arms at the upper end, and the arms of the said earl on the lower; ever since which time the earls marshal have borne the like official badge. It is difficult to ascertain the respective periods in which this officer

officer acquired the ſeveral ſtyles of "marſhal of England" and "earl marſhal of England." The earlieſt patent by which the appellation of "earl" was added to marſhal of England, is that of the 12th of January, in the 9th year of king Richard II., granted to Thomas Mowbray, earl of Nottingham, and conſtituting him earl marſhal of England, to hold to him and his heirs male of his body; and yet the ſtyle of "comes mareſcallus" was far more ancient, and probably aroſe from the perſons on whom the office of marſhal was uſually conferred, being *earls* or *comites*, at or before the time of their inveſtiture: the word "comes" being uſed in theſe early ages as a ſtyle of office and judicature, and not as a title of dignity. This office though frequently hereditary, hath not been always ſo; on the contrary, the limitations in the grants that have been made of it vary from time to time. However the limitations in king Edward III's re-grant of the office to Roger Bigod, earl of Norfolk, were more general, *viz.* "to him and the heirs of his body."

Henry Howard, baron Howard of Caſtle-Riſing, and earl of Norwich, was, by letters patent, dated 19th October 1672, conſtituted "hereditary earl marſhal of England," with limitation, in default of iſſue male, to the heirs male of his grandfather, Thomas earl of Arundel, &c. with remainder to the late earl of Suffolk and his heirs male, remainder to Charles Howard, earl of Nottingham, and his heirs male. On the death of his elder brother, Thomas, duke of Norfolk, earl of Arundel, Surry, &c. which happened in 1677, he ſucceeded to the dukedom, and all other his honours and eſtates.

The office of earl-marſhal is hereditary in the family of Howard, and enjoyed by the duke of Norfolk, the principal branch thereof; though, till of late, on account of the religion of the duke of Norfolk, which rendered him incapable of adminiſtering it in perſon, it was diſcharged by deputation; but yet it is to be obſerved, that it was not given out of the name and family of Howard.

EARN, in *Geography*, a river of Scotland, which riſes in Loch Earn, and joins the Tay a little below Perth.

EARNEST, called by the civil law *Arrha*, and interpreted to be *emptionis venditionis contractæ argumentum*, money advanced, or any portion of goods delivered, to complete or aſſure a verbal bargain, and bind the parties to the performance thereof.

By the civil law, he who recedes from his bargain, loſes his earneſt; or, if the perſon who received the earneſt give back, he is to return the earneſt double. But, with us, the effect of earneſt is more: the perſon who gave it is, in ſtrictneſs, obliged thereby to abide by his bargain; and, in caſe he decline it, is not diſcharged upon forfeiting his earneſt; but may be ſued for the whole money ſtipulated. The property of the goods is abſolutely bound by it; and the vendee may recover the goods by action, as well as the vendor may the price of them. And by 29 Car. II. cap. 3. no contract for the ſale of goods, to the value of 10*l.* or more, ſhall be valid, unleſs the buyer receives part of the goods ſold by way of earneſt on his part, or unleſs he gives part of the price to the vendor by way of earneſt, to bind the bargain, or in part of payment; or unleſs ſome note in writing be made and ſigned by the party, or his agent, who is to be charged with the contract. With regard to goods under the value of 10*l.* no contract or agreement for the ſale of them ſhall be valid, unleſs the goods are to be delivered within one year, or unleſs the contract be made in writing, and ſigned by the party, or his agent, who is to be charged therewith. Anciently, among all the northern nations, ſhaking of hands was held neceſſary to bind the bargain; a cuſtom which we ſtil retain in many verbal contracts. A ſale thus made was called "*handſale*," "venditio per mutuam manuum complexionem." Hence in proceſs of time the ſame word was uſed to ſignify the price or earneſt, which was given immediately after the ſhaking of hands, or inſtead of it. See CONTRACT and SALE.

EARNING, or YEARNING, a name uſed in ſeveral parts of the kingdom for rennet. See RUNNET.

EARSH. See EDDISH.

EARTH, in *Aſtronomy*, is a primary planet, belonging to the ſolar ſyſtem. We ſhall firſt treat of its various motions, and afterwards of its figure and magnitude.

There are three principal motions of the earth: a motion of rotation on its own axis; a motion in an orbit round the ſun; and a motion of its axis round the poles of the ecliptic. Theſe three motions are all mathematically derived from one ſingle impulſion, ſuppoſed to be given to the earth at its origin, and combined with the continued action of the ſun.

The rotation of the earth on its axis, called its diurnal motion, is the moſt uniform we are acquainted with. It is performed in 23h 56′ 4″.1 of mean ſolar time, or one ſidereal day.

The earth, or, more ſtrictly ſpeaking, the common centre of gravity of the earth and moon, deſcribe an orbit round the ſun, which orbit is of an elliptic form of ſmall eccentricity; the ſun being placed in one of its foci. If we ſuppoſe the plane of this orbit extended to the fixed ſtars, it will trace in the heavens a circle called the ecliptic. The plane of the earth's equator, which remains very nearly parallel to itſelf during the whole of this revolution, is inclined to the ecliptic in an angle of 23° 28′. The points in the earth's orbit, which are interſected by this plane, are called the equinoctial points. See ECLIPTIC.

The motion of the earth in its orbit is very far from uniform; but it is ſo far regular, that, with the exception of ſome ſmall inequalities cauſed by the action of the moon and planets, the radius vector, or line joining the centres of the earth and ſun, deſcribes equal areas or ſectors of the ellipſe in equal times. See ELLIPTIC *Motion*.

The third motion of the earth, we have to notice, is that which produces the preceſſion of the equinoxes. The motion of rotation having produced a protuberant form in the equatorial regions of the earth, the continued action of the ſun and moon on this ſurrounding maſs or annulus produces a rotatory motion in the axis of the earth round the axis of the ecliptic; the inclination of theſe axes remaining the ſame. This revolution is accompliſhed in 27,000 years. The reader will find a farther inveſtigation of this motion under *Preceſſion of the* EQUINOXES.

Of the Phenomena cauſed by the diurnal Motion of the Earth.

The diurnal motion of the earth from weſt to eaſt cauſes an apparent motion of the heavens from eaſt to weſt. A very correct idea of this general motion of the ſphere may be formed by inſpecting a celeſtial globe, previouſly rectified for the latitude of the place; recollecting, however, that the convexity of the one repreſenting the concavity of the other, the conſtellations are neceſſarily reverſed, thoſe appearing to the right on the globe which are to the left in the heavens.

If the axis of the earth be prolonged each way till it intercepts the heavens, it will there form the two points called the poles, round which ſtationary points the heavens will appear to revolve. With us the north pole is the elevated pole; and the ſtars near it will deſcribe ſmall circles, increaſing with their diſtance from the pole, till they arrive at a

certain diſtance, when a portion of the circle will be intercepted by the horizon. As the polar diſtance of the ſtars ſtill increaſes, they will continue for a longer time above the horizon; ſtill, however, riſing and ſetting north of the eaſt and weſt points of the horizon, till they reach the equator. At this diſtance from the pole, they riſe exactly in the eaſt, and ſet exactly in the weſt; and at their greateſt altitude, their diſtance from the zenith is obſerved to equal the elevation of the pole above the horizon. As the ſtars recede from the equator towards the ſouth, they deſcribe ſtill ſmaller arcs, continue for a leſs time above the horizon, and riſe and ſet nearer the ſouth point. When they approach this limit, they continue viſible only for a few minutes, and no ſooner appear on the meridian than they are again carried down by the general motion of the heavens below the boundary of our view. The ſun, moon, and planets, appear to partake in great meaſure of the diurnal motion of the heavens; they deſcribe nearly the ſame courſe as a fixed ſtar would do in the ſame ſituation. The diurnal motion of the moon, from its vicinity to the earth, differs a little from that of a ſtar, independently of its own proper motion in its monthly orbit. This ſmall difference is called its parallax. See PARALLAX.

The change from day to night is cauſed by the diurnal motion of the earth on its axis; and the viciſſitudes of the ſeaſons, by the combination of this motion with its annual revolution round the ſun.

Of the Phenomena which ariſe from the annual Motion of the Earth in its Orbit.

The annual motion of the earth round the ſun is performed in an orbit, the plane of which is inclined to the equator at an angle of about 23° 28′. This orbit, being extended to the heavens, traces there the great circle of the ſphere, called the *ecliptic* (which ſee). The effect of the earth's motion in its orbit is to cauſe the apparent annual motion of the ſun. When the earth is in any one point of its orbit, the apparent place of the ſun will be in the direction of the oppoſite point; and the apparent path of the ſun will be ſimilar to that actually traced by the earth; and theſe two bodies will always be in oppoſite poſitions to each other. It was not till aſtronomy had arrived at a ſtate of great perfection, that ſufficient proofs could be collected to aſcertain with certainty which of theſe bodies was really in motion. It appears by arguments which are incontrovertible, and which we ſhall hereafter enumerate, that there no longer remains any reaſonable doubt upon this ſubject.

The earth's motion in its orbit is not uniform. This is inferred from the correſponding irregularity that takes place in the apparent motion of the ſun. This irregularity, which was firſt diſcovered by Hipparchus about 140 years before the Chriſtian era, perplexed aſtronomers for many ſucceeding ages. The immediate effect of this inequality in the ſun's apparent motion is to cauſe an unequal diviſion of the ſeaſons. Various cycles and epicycles were invented to explain theſe inequalities; but their true cauſe was not underſtood, till the great diſcovery of Kepler explained it, by aſſigning to the apparent ſolar orbit its true elliptic figure; and, moreover, eſtabliſhing the curious law, obſerved to prevail likewiſe in the other planetary orbits, namely, that the revolving body alway deſcribes equal areas in equal times. See ELLIPTIC *Motion*.

The difference of ſeaſons, of climates, and the inequality in the length of the days and nights, all ariſe from this circumſtance, that the plane of the earth's orbit is inclined to that of the equator, which is the plane of its diurnal motion.

If a ſtraight line be ſuppoſed always to connect the centres of the earth and ſun, this ſtraight line or radius vector will always trace the ecliptic in the heavens; and the point where it intercepts the ſurface of the earth, (ſuppoſing it a perfect ſphere,) will be that over which the ſun is vertical. Now it is evident, that, in the upper or north part of the earth's orbit, this line will intercept ſome point to the ſouth of the equator; and, on the contrary, when the earth is in the lower or ſouthern part of its orbit, this line will intercept ſome point to the north of the equator: the circle bounding light and darkneſs being always perpendicular to this line, the circles parallel to the equator will be unequally divided at different parts of the orbit, in the ſame manner as we obſerved them to be by the horizon, when we conſidered the phenomena of the diurnal revolution of the earth.

Fig. 68, *Plate* IX. *Aſtronomy*, is intended to illuſtrate this. C S C is the earth's orbit projected into a ſtraight line, the eye being ſuppoſed in the ſame plane; the earth being in the upper or moſt northern part of its orbit, the line S C, joining the centres of the ſun and earth, evidently paſſes through a point, *p*, whoſe angular diſtance from E, the equator, is equal to the inclination of the equator to the ecliptic, or angle E C S. On the contrary, when the earth is at its loweſt part of the orbit, the point, *p*, falls to the north of Q, by the ſame quantity.

The inequality in the diſtribution of the ſeaſons, (by which at preſent the inhabitants of the northern hemiſphere of the globe enjoy a greater portion of the ſun, by about eight days in the year, than thoſe of the ſouthern hemiſphere,) ariſes from a very different cauſe, which we ſhall endeavour to explain.

The great circle in the heavens, called the ecliptic, is in fact the perſpective repreſentation of the ellipſe in which the earth performs its orbit: all the irregularities, therefore, of the original will be transferred to the circle which repreſents it; and the four portions intercepted by the equinoctial and ſolſticial points, though repreſented each by an arc of 90°, will not be deſcribed in equal times, becauſe they do not repreſent ſuch portions of the ellipſe as are originally ſo deſcribed. The point of the ecliptic, repreſenting that point of the ellipſe in which the ſun and earth are neareſt to each other, is called the perigee; and the ſummer and winter months never can be equal, but in the ſingular inſtance of the coincidence of the perigee with one or other of the equinoctial points. The ſolar perigee does not remain fixed, but has a progreſſive motion in the ecliptic, which it paſſes over in about 20,000 years. It is a remarkable circumſtance, that this curious coincidence of the perigee with the autumnal equinox took place about the time when chronologiſts ſuppoſe the world to have been created, or about the year 4000 A. C. At that time each hemiſphere enjoyed an equal portion of the ſun's light and heat; ſince that time, the northern hemiſphere has had gradually the advantage, and the maximum of inequality took place in the year 1250: ſince that time the advantage has gradually diminiſhed, though it is ſtill very conſiderable. It will diminiſh till the year 6472, when the perigee, coinciding with the vernal equinox, will again equally divide the ſummer and winter periods between the two hemiſpheres: after which, the ſouthern inhabitants of the globe will enjoy the advantage of having the greateſt ſhare of the ſun for above 10,000 years.

The Egyptian aſtronomers are ſaid by ſome writers to have been the firſt that maintained the motion of the earth: it was from them, at leaſt, that the Greeks received the idea. Among theſe latter people, Philolaus of Crotona, a diſciple of Pythagoras, was celebrated as being the firſt philoſopher who eſtabliſhed the theory of the motion of the earth

earth in a manner more diſtinct than had been done by any other Pythagorean. He lived 450 years before Chriſt. (Plutarch, de Placit. Philoſ.) Ariſtarchus the Samian, about 100 years after Philolaus, propoſed the motion of the earth in clearer and ſtronger terms, as we are aſſured by Archimedes, in his Arenarium.

Philolaus was alſo followed by Nicetas of Syracuſe, who maintained likewiſe the diurnal motion of the earth, and has been by ſome regarded as the firſt author of this part of the Copernican ſyſtem. Cicero, in his Tuſcul. Quæſt., thus ſpeaks of him: "Nicetas, according to Theophraſtus, believed that neither the ſun, the moon, nor the ſtars revolved about the earth; but that the earth, by a rapid motion round its axis, produced the ſame apparent effect as if it was immoveable, and the motion exiſting in the heavens."

Thus the diurnal motion of the earth ſeems to have been admitted into the philoſophy of the Greeks about 500 years before the Chriſtian era, which was probably ſome centuries after the ſame hypotheſis had been adopted by the eaſtern nations.

The annual motion of the earth is ſaid to have been underſtood and taught by Pythagoras, who obtained his knowledge from the aſtronomers of India and Egypt. This ſuppoſition, which places the ſun in the centre of the ſolar ſyſtem, has been occaſionally ſuggeſted by ancient philoſophers, but never univerſally received till after the revival of ſcience in modern times.

Notwithſtanding Apollonius, a celebrated geometrician of Alexandria in Egypt, maintained this hypotheſis, yet we find it afterwards abandoned even by the moſt eminent aſtronomers; a circumſtance that ſhould the leſs ſurpriſe us, when we reflect how incapable they were of acquiring any juſt knowledge of the diſtances and magnitudes of the heavenly bodies. Beſides, the religious opinions of the heathens prevented the general reception of this doctrine of the earth's motion. For Ariſtarchus, being accuſed by Cleanthes of ſacrilege, for moving Veſta and the tutelary deities of the univerſe out of their places, the philoſophers began to lay aſide ſo perilous a poſition. Many ages afterward Vic. Caſanus revived the ancient ſyſtem in his Doctr. de Pignorant.; but the doctrine gained little ground till the time of Copernicus.

It was in the beginning of the ſixteenth century that this eminent aſtronomer revived this doctrine, and gave permanence to a ſyſtem, which before his time had only been tranſitory and fluctuating. The opinions of Copernicus, however, (ſee COPERNICUS and COPERNICAN *Syſtem*,) were not received without great oppoſition; but the arguments by which they were oppoſed have gradually yielded to the force of reaſon and experience; and, at preſent, we hardly conſider the plaineſt propoſition of Euclid more ſatisfactorily demonſtrated than the diurnal and annual motion of the earth. Yet it is not unintereſting to retrace theſe erroneous opinions. There is reaſon to think, that many of the opponents of the motions of the earth would have changed their ſentiments, had they been acquainted with the diſcoveries that have been made in the laſt century. Tycho, who was the great oppoſer of this doctrine, ſeems to have been influenced by religious motives alone, which at that time deterred many devout individuals from embracing a ſyſtem, which they thought ſo diametrically oppoſed to the very words of ſcripture. Lactantius, the preceptor to the ſon of Conſtantine, diſcuſſes the queſtion at great length, in order to prove that there are no antipodes; and laments the folly and impiety of thoſe who aſſert the ſphericity of the earth, and maintains that the contrary opinion is eſtabliſhed both by philoſophers and the ſacred writers.

Kepler, the contemporary of Copernicus, obſerves at an early period after the revival of this ſyſtem, "Hodierno tempore præſtantiſſimi quique philoſophorum et aſtronomorum Copernico adſtipulantur: ſecta eſt hæc glacies: vincimus ſuffragiis melioribus: cœteris pene ſola obſtat ſuperſtitio, aut metus a Cleanthibus."

Tycho and alſo Riccioli bring forward a great many texts of ſcripture, to prove the ſtability of the earth; and the miracle of Joſhua, which cauſed the ſun to ſtand ſtill, has been thought by many to be deciſive. But the moſt approved divines of the preſent day admit a figurative conſtruction, or popular and accommodating uſe, of theſe paſſages of ſcripture, which, otherwiſe, it would be extremely difficult to reconcile to the diſcoveries of the preſent day. Aſtronomers themſelves always ſpeak the language of ſociety, ſo far as to ſay, the ſun riſes, the ſun ſets, the ſun moves in the ecliptic, &c.; nor ſhould we expect that prophets and inſpired writers, if they were again to come among us, would uſe any other language.

Accordingly we may obſerve in this place, that the Jeſuit Riccioli, though he, at the pope's command, oppoſed the motion of the earth with all his might, as ſomething contrary to holy ſcripture; yet, to frame aſtronomical tables, which ſhould tolerably agree with obſervation, he was forced to have recourſe to the motion of the earth as his only refuge.

This, De Chales, another of the ſame fraternity, frankly confeſſes: "P. Riccioluſ—'nullas tabulas aptare potuit, quæ vel mediocriter obſervationibus reſponderent; niſi ſecundum ſyſtema terræ motæ;' notwithſtanding that he called in all the foreign and forced aſſiſtances of moveable epicycles, ſo that in his Aſtronomia Reformata, where he undertakes to give accurate tables of the celeſtial motions, he gives into the hypotheſis of the motion of the earth." De Chales Aſtron. Reformat. lib. x. cap. i. See COPERNICAN.

As for thoſe who oppoſe the motion of the earth, as being contrary to ſcripture, and who allege thoſe paſſages which mention the ſun's riſing and ſetting, his ſtanding ſtill in the time of Joſhua, and his going back in that of Hezekiah, we need only refer them to allowed laws of interpretation, applicable to the ſacred writings as well as to others, and to the cuſtomary uſe of vulgar language in the deſcription of ſenſible phenomena. By the ſun's riſing, therefore, is meant no more than his re-appearance in the horizon, after he had been hid below it; and, by his ſetting, an occultation of the ſun, which was before viſible in the horizon. When the preacher therefore ſays, Eccleſ. i. 5. "The ſun alſo riſeth, and the ſun goeth down, and haſteth to his place where he aroſe," he means, doubtleſs, no more than that the ſun, which before was hid, is now ſeen in the horizon; and after being there conſpicuous, is hid again, and at length re-appears in the eaſt. For thus much only appears to a perſon who views the ſun; and therefore thus much, and no more, is expreſſed by the ſacred writers.

In like manner, when in Joſh. x. 12, 13. the ſun and moon are ſaid to have ſtood ſtill; all meant by ſtation is, that they did not change their place with reſpect to the earth. For that general, by "Sun, ſtand thou ſtill upon Gibeon, and thou moon in the valley of Ajalon," required no more, than that the ſun which then appeared over that city, ſhould not change its ſituation. And from his bidding the ſun to keep its ſituation, it would be unjuſt to infer, that it moves round the earth at reſt. Of the meaning of this paſſage the interpreters of ſcripture have given different accounts. Some, without ſufficient authority, have thought it to be an interpolation from the book of Jaſher, long ſince loſt.

lull. Others have considered it as a real miraculous event, without presuming to account for the manner in which it was performed; and Dr. Watson, bishop of Llandaff, in his "Apology for the Bible," thinks the relation in some measure confirmed by a passage, which he cites from Herodotus. Others again, both in ancient and modern times, have supposed that the passage is capable of a rational explication, without recurring to a miracle. The book of Jasher, here referred to, they have considered as a collection of poetic songs, in celebration of the extraordinary atchievements of the armies of Israel: and that the passage is a sublime exaggeration of an enthusiastic poet, indulging those fervours of rapturous invention conceded to his art. (See Wakefield's Reply to the Age of Reason.) Similar expressions of a bold figurative kind occur in Homer. The learned Bryant, in his "Observations on some Passages of Scripture, &c." suggests that the invocation of the Israelitish chief did not relate to the luminaries in the heavens, but to two idolatrous and probably oracular temples of the sun and moon, for which the two places mentioned were celebrated. Accordingly he renders the passage in the following manner: "May the sun, whose oracular temple is on mount Gibeon, be dumb; and the moon, whose shrine is in the valley of Ajalon, be equally silent." May their oracles cease for ever: their worshippers have been miraculously defeated; and those who joined the standard of Israel have been as wonderfully preserved. This interpretation of the two Hebrew terms, he says, is countenanced by the version of Aquila and Symmachus, and by Arias Montanus, who exhibits the whole passage in the following manner: "Et dixit in oculis Israel, sol in Gibeon sile, et luna in valle Ajalon."

After all, these and similar expressions, are true and proper descriptions of the phenomena, as they appear to us; but as the scriptures were never intended to instruct us in philosophy and astronomy, they do not at all determine by what motions these phenomena are occasioned. And it has been justly observed, that part of the account recorded in the book of Joshua is merely a description of the appearance; Gibeon and Ajalon, and the whole land of Canaan lying in too northern a latitude for the sun or moon ever to be vertical to any part of it; and yet this was a just description of the phenomena as it appeared to Joshua in the place where he then was; and if one part of the account merely describe the phenomena, the other must likewise be understood in the same manner.

Gassendus, very pertinently to the same purpose, distinguishes, "two sacred volumes, the one written, called the *Bible*; the other, *Nature*, or the *World*: God having manifested himself by two lights, the one of revelation, and the other of demonstration; accordingly the interpreters of the former are divines; of the latter mathematicians. As to matters of natural knowledge, the mathematicians are to be consulted; and as to the objects of faith, the prophets; the former being no less interpreters, or apostles, from God to men, than the latter. And as the mathematician would be judged to wander out of his province, if he should pretend to controvert, or set aside any article of faith from principles of geometry; so it must be granted, the divines are no less out of their limits, when they venture to pronounce on a point of natural knowledge, beyond the reach of any not versed in geometry and optics, merely from holy scripture, which does not pretend to teach any thing of the matter.

"For instances, we may quote Lactantius and Augustine; the first of whom rendered himself ridiculous by disputing from scripture against the roundness of the earth; and the latter, against the antipodes." See ANTIPODES.

But to return from this digression; it is now so long since the motion of the earth has ceased to be a disputed question, that the arguments on each side are nearly forgotten, and those who do not scruple to adopt the hypothesis of the earth's motion, are often less acquainted with the arguments on which it is supported, than they would have been in former times, when their opinions would have often been disputed. Of all authors who have written on this subject, La Place seems to have collected these arguments together in the most popular and perspicuous form. We shall present the substance of them to the reader in as concise a manner as possible, introducing at the same time some additional observations, for the further elucidation of this interesting subject.

When we reflect on the diurnal motion to which all the heavenly bodies are subject, we cannot but recognize the existence of one general cause which moves them, or which seems to move them, round the axis of the earth. If we consider that these bodies are insulated, with respect to each other, and placed at very different distances from the earth; that the sun and the stars are at a much greater distance from it than the moon; and that the variations in the apparent diameters of the planets indicate great alterations in their distances; and, moreover, that the comets traverse the heavens freely, in all directions, it will be difficult to conceive that it is the same cause which impresses on all these bodies a common motion of rotation. But since the heavenly bodies present the same appearances to us, whether the firmament carries them round the earth, considered as immoveable, or whether the earth itself revolves in a contrary direction, it seems much more natural to admit this latter motion, and to regard that of the heavens as only apparent.

The earth is a globe, whose radius is only about four thousand English miles; the sun, as we have seen, is incomparably larger; if its centre coincided with that of the earth, its volume would embrace the orbit of the moon, and extend as far again, from which we may judge of its immense magnitude; besides, its distance from us is 23,000 times the semidiameter of the earth. Is it not infinitely more simple to attribute to the globe we inhabit a motion of rotation on its own axis, than to suppose in a mass so considerable, and so remote as the sun, such an extreme rapid motion as would be requisite to revolve in one day round the earth? What immense power would it not require to contain it, and counter-balance its centrifugal force? Every one of the stars presents similar difficulties, which are all removed by the rotation of the earth.

We have seen, that the pole of the equator seems to move slowly round that of the ecliptic, from whence results the precession of the equinoxes. If the earth is immoveable, the pole of the equator is equally so, since it always corresponds to the same point of the terrestrial surface; the ecliptic, therefore, moves round these poles; and in this motion carries all the heavenly bodies with it. Thus, the whole system, composed of so many bodies, differing from each other so much in their magnitudes, motions, and distances, would be again subject to a general motion, which disappears, and is reduced to a simple appearance, if we suppose the terrestrial axis to move round the poles of the ecliptic.

Carried on with a velocity which is common to every thing that surrounds us, we are in the case of a spectator placed in a ship that is in motion. He fancies himself at rest, and the shore, the hills, and all the objects placed out of the

the veſſel appear to him to move. But on comparing the extent of the ſhore, the plains, and the height of the mountains, with the ſmalineſs of his veſſel, he recognizes, that the apparent motion of theſe objects ariſes from the real motion of himſelf. The numberleſs ſtars which fill the celeſtial regions are, relatively to the earth, what the ſhores and the hills are to the veſſel; and the ſame reaſons which convince the navigator of the reality of his own motion, prove to us the motion of the earth.

We may here obſerve, that in all the works of nature with which we are acquainted, the Creator appears to act by the ſhorteſt, eaſieſt, and ſimpleſt means. Now, if the earth be at reſt, and the ſtars move, the velocity of theſe latter muſt be immenſe; and yet all the purpoſes thereof might have been anſwered by a moderate motion of the earth alone.

For the moon's diſtance from the earth amounts to 240000 miles. Hence, the circumference of the moon's diurnal circle being 1507968 ſuch miles, the moon's horary motion muſt be 62832 miles, inſtead of 2290 miles, which is really the caſe; conſequently, in each ſecond, a ſpace leſs than that of the pulſe of an artery, the moon, though the ſloweſt of all the heavenly bodies, muſt move more than 17 miles. Again, the ſun's mean diſtance from the earth is 23750 ſemidiameters of the earth, or 95000000 miles; conſequently, the ſun's diurnal path, when in the equator, muſt be 596904000 miles; and, therefore, in the ſpace of one ſecond, *i. e.* in the twinkling of an eye, he muſt move more than 6908 miles.

Again, the diſtance of the ſun from the earth, is to that of Mars, ſuppoſing the earth, and not the ſun, to be the centre of the ſyſtem, nearly as one to one and a half; to that of Jupiter, as one to five and a quarter; and to that of Saturn, as one to nine: wherefore, as the diurnal ſpace, and all other things deſcribed in the ſame time, are in the ſame ratio, Mars, in one twinkling of an eye, muſt fly 10362, Jupiter 36266, and Saturn 62172 miles. Laſtly, the fixed ſtars being yet vaſtly more remote from the earth than Saturn, their motion in or near the equator muſt be vaſtly ſwifter than that of Saturn.

Beſides, if the earth be at reſt, and the ſtars move by any common motion, the ſeveral planets muſt each day deſcribe ſeveral ſpirals running forth to a certain term towards the north, and thence returning to the oppoſite term towards the ſouth, ſometimes narrower, and ſometimes broader.

For the diſtances of the ſeveral planets from the zenith alter every day, increaſing to a certain point towards the north, and thence decreaſing again towards the ſouth; conſequently, the altitude of the pole being always found the ſame, and the planets not returning to the ſame point of the meridian, they do not deſcribe circles, but ſpirals. Add, that as the ſeveral planets do not retain the ſame diſtance from the earth, but are ſometimes nearer, and ſometimes recede farther from it, at a greater diſtance, a greater ſpiral, and at a leſs, a leſs is deſcribed.

Farther, as their motion is ſlower when the planet is farther from the earth, the greater ſpirals are deſcribed in leſſer times than the leſſer; and, as the greateſt and leaſt diſtance of the planets from the earth is not affixed to the ſame point of the heavens, the planets have moved in different tracts every day from the beginning.

Beſides, the force by which the ſtars and planets revolve in their orbits are not directed to the centre of the earth, but to the centres of the ſeveral orbits which they deſcribe, or to innumerable imaginary points in the axis of the earth; and theſe forces, tending to different and continually varying centres, muſt likewiſe increaſe exactly in proportion to the diſtances from the axis; whereas the force of attraction is found to decreaſe.

Theſe arguments are, likewiſe, ſtrengthened by analogy. A rotatory motion has been obſerved in ſeveral planets, and always from weſt to eaſt, ſimilar to that which the diurnal motion of the heavens ſeems to indicate in the earth. Jupiter, greatly exceeding the earth in magnitude, moves round its axis in leſs than twelve hours. An obſerver on its ſurface would ſee the heavens revolve round him in that time; yet, that motion would only be apparent. Is it not, therefore, reaſonable to think that it is the ſame with that which we obſerve on the earth? What confirms, in a very ſtriking manner, this analogy, is, that both the earth and Jupiter are flattened at the poles. We comprehend, in fact, that the centrifugal force which tends to remove every particle of a body from its axis of rotation, ſhould flatten the earth at its poles, and elevate it at the equator. This force ſhould likewiſe diminiſh that of gravity at the equator; and that this diminution does take place, is proved by experiments which have been made on the lengths of pendulums. Every thing, then, leads us to conclude, that the earth has really a motion of rotation, and the diurnal motion of the heavens is merely an illuſion which is produced by it, an illuſion ſimilar to that which repreſents the heavens as a blue vault, to which all the ſtars are fixed, and the earth as a plane on which it reſts.

Thus, aſtronomy has ſurmounted the illuſions of the ſenſes; and it is not till they have been diſſipated by a great number of obſervations and calculations, that man has at laſt recognized the motion of the globe which he inhabits, and its true poſition in the univerſe.

Moreover, bodies let fall from any conſiderable height, are found, by experiment, not to fall upon the ſpot perpendicularly under them, but to the ſouth-eaſt thereof.

The experiment was propoſed to Dr. Hook in the year 1679, by a perſon who ſuggeſted, that, if the earth had any diurnal motion, the body would fall to the eaſt of the perpendicular. Dr. Hook, on that occaſion, read a diſcourſe before the Royal Society, wherein he endeavoured, *à priori*, to aſſign what curve a falling body would deſcribe; aſſerting, particularly, that the fall of the body would not be directly eaſt, but ſouth-eaſt; which was confirmed by divers actual trials. The objection, which ſuppoſes, that *e. g.* a ball fired perpendicularly upward in the air ſhould fall weſtward of the place from which it was projected, on the ſuppoſition of the earth's revolution eaſtward, can have no weight, when it is conſidered that the gun and ball partake of the earth's motion; and, therefore, being carried forward with the air as quick as the earth and air turn, it muſt fall down on the ſame place, deſcribing, in its deſcent, the diagonal of a parallelogram, whoſe two ſides are proportional to the forces acquired from the earth's motion and the gravity of the ball. Thus, a ſtone let fall from the top of a main-maſt, if it meets with no obſtacle, falls on the deck as near the foot of the maſt when the ſhip ſails, as when it does not.

Shall we now ſuppoſe the ſun, accompanied by the planets and ſatellites in motion round the earth, or ſhall we imagine the earth and other planets to revolve round the ſun? The appearances of the heavenly motions are the ſame in the two hypotheſes; but the ſecond ſhould be preferred, for the following conſiderations:

The ſun will equally appear in motion, and the earth as ſtanding ſtill, to a ſpectator on the earth, whether the ſun really move round the earth at reſt, or the earth move round the ſun at reſt.

For, ſuppoſe the earth in T (*Plate* IX. *Aſtronomy, fig.* 69.), and

and the ſun in 1; the ſun will then appear in ♈. And, ſuppoſe the ſun to proceed in an orbit ſurrounding the earth from 1 to 2, he will then appear in ♉; and, if he proceed farther to 3, he will ſeem to be in ♊: and thus will he appear to go on, according to the order of the ſigns in the ecliptic. Suppoſe, again, the earth in 1, and the ſun in T, the ſun will now be ſeen in ♎; let the earth go on from 1 to 2, the ſun will appear to the inhabitants of the earth to have proceeded from ♎ to ♏; and if the earth proceed to 3, the ſun will appear to have advanced farther from ♏ to ♐; and ſo on, according to the ſucceſſion of the ſigns of the ecliptic.

Thus, does the ſun appear alike to move, whether he really move or ſtand ſtill; ſo that the objection from ſenſe is of no force. But again,

If one of the planets be ſuppoſed to have moved a certain ſpace from weſt to eaſt, the ſun, earth, and other planets, together with the fixed ſtars, will all ſeem to an inhabitant of that planet to have moved juſt ſo far round in the contrary way.

For, ſuppoſe a ſtar M (*fig.* 70.) in the zenith of an inhabitant of a planet placed in T; and ſuppoſe the planet to have revolved on its axis from weſt to eaſt; in a certain ſpace of time, the ſun S will have arrived at the zenith of T, then the ſtar I, then N, then the earth L, and, at length, the ſtar M again. To the inhabitants of the planet, therefore, the ſun S, with the earth L, and the ſtars I, N, M, &c. will appear to have moved round the planet a contrary way.

Thus, to the inhabitants of the planets (if any ſuch there be) the mundane ſphere, with the ſun, ſtars, and all the other planets, will, as to us, appear to move round them from eaſt to weſt; and accordingly, the inhabitants of our planet, the earth, are only liable to the ſame deluſive appearance with thoſe of the reſt. Moreover, the orbits of the planets include the ſun as the common centre of them all; but it is only the orbits of the ſuperior planets that include the earth; which, however, is not in the centre of any of them, as will be ſhewn under SUN and PLANET. Again, the earth's orbit being proved to be between thoſe of Venus and Mars, it follows, that the earth muſt turn round the ſun; for, as it lies within the orbits of the ſuperior planets, their motion would appear unequal and irregular; but they would never either be ſtationary, or retrograde, without this ſuppoſition. Beſides, from the orbits and periods of the ſeveral planets about the ſun, and of the moon and ſatellites round the earth, Jupiter and Saturn, it is evident, that the law of gravitation is the ſame towards the earth, Jupiter, and Saturn, as towards the ſun; and the periodical times of the ſeveral bodies moving round each, are in the ſame ratio to their ſeveral diſtances from them.

Now, it is certain, that, on the hypotheſis of the earth's annual motion, her periodical time exactly ſuits this law, bearing ſuch a proportion between thoſe of Mars and Venus as the ſeveral other bodies directed by the ſame law do bear; *i. e.* the ſquares of the periods are, in all, as the cubes of the diſtances from the centre of their orbits. But, ſuppoſing the earth too at reſt, this law is broken moſt exorbitantly.

For, if the earth does not move round the ſun, the ſun muſt move with the moon round the earth: now, the diſtance of the ſun to that of the moon being as 23750 ſemidiameters of the earth to 60, or nearly as 396 to 1; and the moon's period being leſs than 28 days, the ſun's period ſhould be found no leſs than 212775 days, or 583 years; whereas, in fact, it is but one year. Which ſingle conſideration Mr. Whiſton thinks of weight enough to determine the controverſy between the two ſyſtems, and to eſtabliſh the motion of the earth for ever.

Whereas, ſuppoſing our earth to have once revolved about the ſun in a circular orbit, whoſe ſemidiameter were equal to the earth's original diſtance from the ſun ſix degrees paſt its perihelion, the annual period would be found exactly and ſurpriſingly equal to the lunar, or the ancient ſolar year, which were exactly commenſurate, containing 12 ſynodical, or 13 periodical months, *i. e.* 365 days, 4 hours, 19 minutes.

The maſſes of the ſun, and of ſeveral of the planets, are conſiderably greater than that of the earth; it is much more ſimple to make the latter revolve round the ſun, than to put the whole ſolar ſyſtem in motion round the earth. What a complication in the heavenly motions would the immobility of the earth ſuppoſe? What a rapidity of motion muſt be given to Jupiter; to Saturn, which is ten times farther from the ſun than we are, and to Uranus, which is ſtill more remote, to make them every year revolve round us, at the ſame time they are revolving round the ſun.

This complication and this rapidity of motion diſappear, by transferring the motion to the earth; a motion conformable to the general law, by which the ſmall celeſtial bodies revolve round the large ones which are placed in their vicinity.

The following is an actual demonſtration of the earth's motion, drawn from phyſical cauſes, for which we are indebted to the diſcoveries of ſir Iſaac Newton, and which Dr. Keil takes for concluſive and unanſwerable.

All planets, it is demonſtrated, gravitate towards the ſun; and obſervations teſtify to us, either that the earth turns round the ſun, or the ſun round the earth, in ſuch a manner as to deſcribe equal areas in equal times. But it is demonſtrated farther, that whenever bodies turn round each other, and regulate their motions by ſuch a law, the one muſt of neceſſity gravitate to the other: conſequently, if the ſun in its motion doth gravitate to the earth, action and re-action being equal and contrary, the earth muſt likewiſe gravitate towards the ſun.

Again, the ſame author has demonſtrated, that when two bodies gravitate to one another, without directly approaching one another in right lines, they muſt both of them turn round their common centre of gravity; the ſun and earth, therefore, do both turn round their common centre of gravity; but the ſun is ſo great a body in reſpect of our earth, which is as it were but a point; that the common centre of gravity of the two bodies will lie within the body of the ſun itſelf, and not far from the centre of the ſun. The earth, therefore, turns round a point, which is in the body of the ſun, and therefore it turns round the ſun.

Beſides, if the ſun moves about the earth, the earth's attractive power muſt draw the ſun towards it from the line of projection, ſo as to bend its motion into a curve; but the ſun being at leaſt 227000 times as heavy as the earth, it muſt move 227000 times as ſlowly towards the earth as the earth does toward the ſun; and conſequently the earth would fall to the ſun in a ſhort time, if it had not a very ſtrong projectile motion to carry it off. There is, indeed, no ſuch thing in nature as a heavy body moving round a light one as its centre of motion. A pebble, as Mr. Ferguſon familiarly illuſtrates this matter, faſtened to a mill-ſtone by a ſtring, may, by an eaſy impulſe, be made to circulate round the mill-ſtone; but no impulſe can make a mill-ſtone circulate round a looſe pebble, for the mill-ſtone would go off and carry the pebble along with it.

The analogy of the earth, with the planets, confirms this hypotheſis: like Jupiter, it revolves on its axis, and is accompanied by a ſatellite. An obſerver, on the ſurface of

Jupiter, would conclude, that the solar system was in motion round him, and the magnitude of that planet would render this illusion less improbable than for the earth. Is it not, therefore, reasonable to imagine, that the motion of the solar system round us is likewise only an illusion?

Let us transport ourselves in imagination to the surface of the sun, and from thence let us consider the earth and the planets. All these bodies will appear to move from west to east, already this identity in the direction indicates a motion of the earth, but that which demonstrates it evidently is the law which exists between the times of the revolutions of the planets, and their distances from the sun. They revolve round it slower, as their distances are greater, and in such a manner, that the squares of the periodic times are in proportion to the cubes of their mean distances. According to this remarkable law, the length of a revolution of the earth, supposing it in motion round the sun, should be exactly a sidereal year. Is not this an incontestible proof, that the earth moves like the other planets, and is subject to the same laws? For would it not be very strange to suppose the terrestrial globe, which hardly subtends a visible angle at the sun, immoveable amidst the other planets which are revolving round it, and that the sun should be carried with them about the earth?

The force, which serves to retain the planets in their respective orbits round the sun, balances the centrifugal force. Ought it not likewise to act upon the earth? And must not the earth oppose to this action the same centrifugal force? Thus the consideration of the celestial motions, as observed from the sun, leave no doubt of the real motion of the earth.

The principal argument against the annual motion of the earth, has been the want of an annual parallax in the fixed stars. For let T A *t* (*Plate* X. *Astronomy*, *fig.* 71.) represent the earth's orbit about the sun S, T X the axis of the earth, and *t x* parallel to T X, will represent the position of the same axis at the opposite point *t*. Suppose T X to be directed towards the star P; and it is manifest, that the axis of the earth will not be directed to the same star, when it comes to the situation *t x*, but will contain an angle x *t* P with the line *t* P, joining the earth and star, equal to the angle *t* P T, under which the diameter, T *t*, of the earth's orbit, appears to a spectator, viewed from the star P. It might be expected, therefore, that by observing the fixed star P, from the different parts of the earth's orbit, we might judge of the angle T P *t*, and consequently of the proportion of T P, the distance of the star, to T *t*, the diameter of the earth's orbit, or double distance of the sun. Yet it is certain that astronomers have not hitherto been able to discover any difference in the apparent situation of the fixed stars with respect to the axis of the earth, or to one another, that can arise from the motion of the earth: though, since the restoration of the Pythagorean doctrine of the earth's motion, they have taken great pains to examine the matter.

The seeming motion of the pole-star, observed by Mr. Flamsteed, was by some mistaken for a proof of its annual parallax; but this phenomenon has since been accounted for in the most ingenious manner by Mr. Bradley, from the motion of light combined with that of the earth in its orbit. See PARALLAX, and the sequel of this article.

The objection to the earth's motion, from there being no discernible parallax of the fixed stars, is answered by observing, that the distance of the fixed stars is so great, that the diameter of the earth's orbit bears no sensible proportion to it; so that the parallax is not to be discovered by our exactest instruments. Nor is this immense distance of the fixed stars advanced by the Copernicans merely as an hypothesis for the sake of solving the objection. For there seems great reason to suppose the fixed stars like to our sun, and hence to conclude their distance to be vastly great, since they appear to us of so faint a light, and of no sensible diameter, even in the largest telescopes.

But from the diligence and accuracy of late astronomers, we learn several curious things in confirmation of the motion of the earth about the sun, and serving to solve this only material objection against it. Accordingly, an observer on the surface of the earth has another evident proof of its motion in the phenomenon of the *Aberration*, (see ABERRATION) which is a necessary consequence of it, as we shall now explain. About the end of the 17th century, Roemer observed, that the eclipses of the satellites of Jupiter happened sooner about the oppositions of this planet, and later towards the conjunctions. This led him to suspect that light was not transmitted instantaneously from those bodies to the earth, but that it employed a sensible interval of time to traverse the diameter of the orbit of the sun. In fact, Jupiter being in his oppositions nearer to us than in the conjunctions by a quantity equal to this diameter, the eclipses ought to happen sooner to us in the first case, than in the latter, by the time which the light takes to traverse this orbit. The law of retardation, observed in these eclipses, answers so exactly to this hypothesis, that it is impossible to refuse assent to it. It appears that light employs 8′ 5″ in coming from the sun to the earth.

Now, an observer at rest would see the stars according to the directions of their rays, but this will not be the case, on the supposition that he partakes of the motion of the earth. To reduce this case to that of the observer at rest, it is sufficient to assign, in a contrary direction, both to the stars, to the light, and to the observer himself, a motion equal to that by which he is impelled, which would not change the apparent position of the stars: for it is a general law of optics, that if all the bodies of a system are impelled by a common motion, there will result no change in their respective situations. Let us imagine then, that a motion, equal and contrary to that of the observer, be given to the rays of light, and generally to all the other bodies, and let us see what phenomena should result in the apparent position of the stars. We may leave out of the question the diurnal motion of the earth, which is not, even at the equator, $\frac{1}{60}$th part of that in its orbit round the sun. We may here suppose, also, without sensible error, that all the rays which each point of the disc of a heavenly body transmits to us, are parallel to each other, and to that ray which would come from the centre of the star to the centre of the earth if it were transparent. Thus the phenomena which the stars would present to an observer, placed at the centre of the earth, and which depend on the motion of light combined with that of the earth, are nearly the same for every observer on its surface. Moreover, we may neglect the small excentricity of the terrestrial orbit.

In the interval of 8′ 5″, which the light employs to traverse the terrestrial orbit, the earth describes a small arc of this orbit, equal to 20.″2; now it follows, from the law of the composition of motion, that if through the centre of a star, we imagine a small circle parallel to the ecliptic, and whose diameter subtends in the heavens an angle of 40.″5, the direction of the motion of light, combined with the motion of the earth, and applied in a contrary direction, will meet this circumference in a point where it is intersected by a plane drawn through the centre of the star tangentially to the terrestrial orbit. The star, therefore, should move upon this circumference, and describe it

it every year in such a manner, that it should constantly be less advanced by 100 degrees, than the sun in its apparent orbit.

This phenomenon is exactly that which we have explained, after the observations of Bradley, to whom we are indebted both for the discovery and its cause. (See ABERRATION.) To reduce these stars to their true position, it is sufficient to place them in the centre of the small circle they appear to us to describe.

Their annual motion, therefore, is only an illusion produced by the combination of the motion of light with that of the earth. The relation of this motion, with the position of the sun, would lead to a suspicion, that it was only apparent, but the foregoing explanation proves it beyond a doubt. It affords a sensible demonstration of the motion of the earth round the sun, in the same manner as the increase of degrees, and of the force of gravity in going from the equator to the poles, proves its revolution on its axis.

The aberration of light affects the positions of the sun, the planets and their satellites, and comets, but in a different manner, according to their particular motions. To divest them of this, and to have the true position of the stars, let us suppose, at every instant, a motion impressed on all these bodies equal and contrary to that of the earth, which thus may be supposed at rest: this, as observed above, neither alters their positions nor appearances. Then it is evident, that a heavenly body, the moment we observe it, is no longer in the direction of the luminous ray which strikes our sight; it has left it in consequence of its real motion combined with that of the earth, which we supposed impressed in a contrary direction. The combination of these two motions, as seen from the earth, forms the apparent, or, as it is termed, the geocentric motion. We shall have then the true position of the object, by adding to the observed geocentric longitude and latitude its geocentric motion in longitude and latitude, for the interval of time which light employs to come from the heavenly body to the earth. Thus, the centre of the sun seems constantly less advanced by 62″.5 in its orbit, than if its light was transmitted to us instantaneously.

The aberration of light changes the relations of celestial phenomena, both as to space and as to duration. At the moment we see them they no longer exist. We do not see the termination of Jupiter's eclipses till twenty-five or thirty minutes after they have recovered their light, and the variations of light of some of the changeable stars precede by many years the instant of their observations. But the cause of these illusions being well understood, we can always refer the phenomena of the solar system to their true place and epoch.

The consideration of the celestial motions leads us then to displace the earth from the centre of the world where we had placed it, deceived by appearances, and by the natural propensity of man to regard himself as the principal object in nature. The globe, which we inhabit, is a planet in motion on itself and round the sun. In considering it in this point of view, all the phenomena are explained in the most simple manner, all the celestial motions become uniform, and the analogies are preserved. Like Jupiter, Saturn, and Uranus, the earth is accompanied by a satellite, it turns on itself like Venus, Mars, Jupiter, and Saturn, and probably the other planets; it like them borrows its light from the sun, moves round it in the same direction, and according to the same laws. Finally, the hypothesis of the earth's motion unites in its favour simplicity, analogy, and every thing which characterizes the true system of nature. We shall see that, following it in its consequences, the celestial phenomena are brought even in their minutest details to one single law, of which they are only the necessary developements. The motion of the earth will thus acquire all the certainty of which physical truths are susceptible. And it may result either from the great number and variety of phenomena which it explains, or from the simplicity of the laws on which it is made to depend. None of the branches of natural knowledge unite these advantages in a higher degree than the theory of the system of the world, founded on the motion of the earth. This motion ennobles our conceptions of the universe, by affording, for a measure of the distances of the heavenly bodies, an immense base, the diameter of the terrestrial orbit. By this we have accurately determined the dimensions of the planetary orbs.

Thus the motion of the earth, after having by illusions, of which it is itself the cause, retarded our knowledge of the planetary motions for a great length of time, at last conducted us to them, and that in a more accurate manner than if we had been placed in the centre of their system.

From the point of view in which the comparison of the celestial observations has placed us, let us consider the heavenly bodies, and shew the perfect identity of their appearances with those which we observe. Whether the heavens revolve round the axis of the world, or the earth moves itself in a contrary direction to the heavens, supposed at rest, it is clear that the stars will present themselves to us in the same manner. There will be no other difference, but that in the first case they will come and place themselves successively over the different terrestrial meridians, which, in the second, will place themselves under the stars. The motion of the earth being common to all bodies situated on its surface, and to the fluids which cover it, their relative motions are the same as if the earth was at rest. Thus, in a vessel whose motion is uniform, every thing moves as if the vessel were at rest. A projectile, thrown directly upwards, falls on the same spot from which it was projected; it seems to describe a vertical line to those in the vessel, but seen from the shore, it really describes a parabolic curve. Thus, the rotation of the earth cannot be sensible on its surface, except by the effects of the centrifugal force, which flattens the terrestrial spheroid at the poles, and diminishes the force of gravity at the equator; two phenomena, with which the measure of the degrees at the meridian, and of the pendulum, have made us acquainted.

In the revolution of the earth round the sun, its centre, and all the points of its axis of rotation, being moved with velocities equal and parallel, this axis remains always parallel to itself; on impressing then, at every instant, to all the parts of the earth, a motion equal and contrary to that of its centre, it would rest immoveable, like its axis of rotation. This impressed motion does not change at all the appearances of that of the sun; it only transports, in a contrary direction to the sun, the real motion of the earth. The appearances are consequently the same in the hypothesis of the earth at rest, and in that of its motion round the sun. To follow more particularly these appearances, let us imagine a radius drawn from the centre of the sun to that of the earth; this radius will be perpendicular to the plane which separates the hemisphere, which is enlightened from that which is in obscurity. A spectator, at the point where this intersects the terrestrial surface, will see the sun perpendicularly above him, and every point of the terrestrial parallel through which this radius successively passes, in consequence of its diurnal motion, will have, at noon, the sun in its zenith. Thus, whether the sun turns round the earth, or the earth round the sun, and on its own axis, this axis preserving a parallel

parallel position, it is evident that this radius will trace the same curve on the surface of the earth; it will in each case cut the same parallels to the equator, when the sun has the same apparent longitude. This luminary will be equally elevated above the horizon, and the days wil be of the same length. Thus the seasons and the days are the same in the hypothesis of the immobility of the sun, or of its motion round the earth; and the explanation of the seasons will be equally intelligible by either hypothesis. The planets all move in the same direction round the sun, but with different velocities: but the length of their revolutions increase in a greater ratio than their distances from the sun. Jupiter, for instance, employs nearly twelve years to perform its revolution; but the radius of his orbit is only five times less than that of the earth: its real velocity is, therefore, less than that of the earth. This diminution of velocity in the planets, as they recede from the sun, applies generally to all the planets, from Mercury, which is the nearest, to Uranus, which is the most remote; and it results from the laws which we shall hereafter demonstrate, that the mean velocities of the planets are reciprocally as the square roots of their mean distances from the sun.

Let us consider a planet, whose orbit is surrounded by that of the earth, and follow it from its superior to its inferior conjunction; its apparent or geocentric motion is the result of its real motion combined with that of the earth, considered as moving in a contrary direction In the superior conjunction, the real motion of the planet is contrary to that of the earth; its geocentric motion is then the sum of the two motions; and it has then the same direction as the geocentric motion of the sun, which results from the real motion of the earth transferred in a contrary direction to the sun, and thus the apparent motion of the planet is direct.

In the inferior conjunction, the motion of the planet has the same direction as that of the earth, and as it is greater, the geocentric motion preserves the same direction; but it is only the excess of the real motion of the planet above that of the earth: it has, therefore, a motion contrary to that of the sun, and consequently it is retrograde.

It is easy to conceive, that in the interval from the direct to the retrograde motion, the planet should appear without motion, or stationary, and that this will happen between the greatest elongation and the inferior conjunction, when the geocentric motion of the planet, resulting from its real motion, and that of the earth applied in a contrary direction, is directed in the same line as the vernal ray to the planet. These phenomena are entirely conformable to the motions that are observed to take place in the planets Mercury and Venus.

The motion of the planets, whose orbits comprehend those of the earth, has the same direction in their oppositions as the motion of the earth, but it is less; and being combined with this last motion, applied in a contrary direction, it takes a motion contrary to its primitive direction, the geocentric motion of the planet is then retrograde: in the conjunctions it is direct, the same as in the superior conjunctions of Mercury and Venus.

In transferring to the stars (but in a contrary direction) the motion of the earth, they should describe every year a circumference equal and parallel to the terrestrial orbit, and of which the diameter should subtend an angle equal to that which this orbit subtends at the distance of the star. This apparent motion has a great resemblance to that which results from the combination of that of the earth with that of light, and by which the stars seem annually to describe a circle parallel to the ecliptic, the angle of which subtends an arc of 125″; but it differs in this, that these stars have the same position as the sun on the first circumference; whereas, in the second, they are less advanced than the sun, by 100″. By this circumstance, the two motions may be distinguished from each other, and it appears that the first is insensible, the immense distance of the stars from us rendering insensible the angle which the terrestrial orb subtends when viewed from them. The axis of the world being nothing more than the prolongation of the earth's axis of rotation, we should refer to this axis the motion of the poles of the celestial equator, indicated by the phenomena of *precession* and *nutation*, which see. Thus, at the same time that the earth moves on its own axis, and round the sun, its axis of rotation moves very slowly round the poles of the ecliptic, but subject to small oscillations, of which the period is the same as that of the motion of the nodes of the lunar orbit.

The *figure* of the earth is a subject which has never ceased to interest the curiosity of the speculative part of mankind from the earliest dawn of science to the present day.

To its first inhabitants it must have appeared a wide extended plain, on the extremities of which the vast dome of the heavens would appear to rest. The ancients, however, had various opinions with regard to the figure of the earth. Some, as Anaximander, held it to be cylindrical; others, as Leucippus, gave it the form of a drum. But the principal opinion was, that it was flat; and the visible horizon was the boundary of the earth, and the ocean the boundary of the horizon; that the heavens and earth above this ocean were the whole visible universe, and that all beneath the ocean was Hades; and of this opinion were not only several of the ancient poets and philosophers, but also some of the Christian fathers, as Lactantius, St. Augustine, &c.

The progress of the science of astronomy is the continued triumph of the powers of intellect over the first erroneous conceptions of the senses; and its history is so connected with that of the human mind, that we cannot help feeling a strong inclination to know at what time, and by what people, the hypothesis of the spherical figure of the earth was first received.

If, in natural philosophy, the value of an hypothesis may be estimated by the number of difficult phenomena it suddenly explains, few discoveries will be found to have been more important than that which assigned to the earth its true magnitude and figure. But it is in vain that we now attempt to trace its history; it took place in those dark ages of antiquity, when the revolutions of empires were but imperfectly recorded, much less the calm speculations of a few quiet and thoughtful men.

The idea of the earth being a globe is now so familiar to us, that arguments in proof of it are almost unnecessary. We may every day meet with people who have been round it, and the most uninformed seaman can easily comprehend that he is sailing on a globular surface, when he finds that by proceeding forward in any direction, he ultimately arrives at the point from which he departed. Yet, familiar as this fact to us, many ages must have elapsed before it could have been universally received. So difficult was it to conceive how the inhabitants of the opposite hemisphere could exist with their heads downwards without great inconvenience, that we find St. Augustine, in the 5th century, vehemently contending against the possibility of the existence of antipodes. The earliest astronomical records, which can be received as authentic, do not go back farther than about 800 years before the Christian era, as at that time eclipses seem to have been both observed and registered by more than one of the eastern nations. Astronomy must then have been cultivated as a science at least for some centuries, and therefore, we may conclude with certainty, that the spheri-

cal figure of the earth was known above one thousand years before our era, and, probably, by some of the eastern nations many centuries earlier. The observations which led to the discovery were, doubtless, those of the phenomena caused by the diurnal motion of the earth, combined with those produced by change of situation, in removing towards the north or south.

We may suppose the spherical figure of the heavens to have been first established, by observing that those stars, sufficiently elevated towards the North pole, performed their entire revolution round the poles without interruption, from which it might by an easy inference be concluded, that the other stars pursued their course in the same manner when concealed from view.

The arguments for the nearly spherical or globular figure of the earth may be summed up in the following particulars: 1. When you stand upon the shore, the spherical form of the sea is evident to the eye. 2. When a ship leaves the shore, and goes out to sea, you first lose sight of the hull, and then of the mast, gradually from the bottom to the top: and when a ship approaches the shore, you first see the top of the mast, and then the lower parts gradually appear, till at last the whole ship becomes visible. These appearances could not take place if the sea were a plane, for in that case every part of the ship would disappear at once, after quitting the shore, and appear together on its approach to the shore; or rather, the hull, being the largest and most conspicuous part of the ship, would last disappear, and appear first, which is contrary to the well-known fact. But the appearances exactly correspond to the spherical or spheroidical figure of the sea, in which case the convexity of the water would produce the phenomena that are actually observed. 3. From the voyages of the navigators Magellan, sir Francis Drake, lord Anson, captain Cook, and many others, who have sailed round the earth, setting off in one direction, and after continuing their course, returning to the same place in an opposite direction; or sailing towards the east and returning west, or *vice versâ*, we may infer that the earth is nearly of a globular figure. 4. These circumnavigators, in the course of their voyage, have observed all the phenomena, both of the heavens and the earth, to correspond to, and to evince this spherical figure. 5. The moon is frequently seen eclipsed by the shadow of the earth; and in all eclipses that shadow appears circular, what way soever it be projected, whether towards the east, west, north, or south, and howsoever its diameter vary, according to the greater or less distance from the earth; hence it follows, that the shadow of the earth, in all situations, is really conical, and consequently, the body that projects it, that is, the earth, is nearly spherical. 6. In travelling towards the south, the northern stars are depressed, and we lose sight of them, and the southern stars are elevated and brought to view, and *vice versâ*; and the sun arrives at the meridian of places that are more easterly sooner than to the meridian of those towards the west, in proportion to the distance of the meridians measured upon the equator; which phenomena are owing to the sphericity of the earth. 7. The same globular figure is likewise inferred from the operation of *levelling* (which see); in which it is found necessary to make an allowance for the difference between the apparent and true level. In short, all the appearances, both upon the earth and in the heavens, are such as they should be, upon the supposition that the figure of the earth is globular, but none of them will correspond to that of a plane surface. As for the inequalities on its surface, owing to mountains and vallies, they are of no moment in the estimation of its general figure, being of no greater account, with respect to relative proportion, than the asperities on the surface of a lemon with regard to the lemon itself; or the smallest grain of sand to a common globe. Indeed the change of figure, arising from the diurnal rotation of the earth, and appearing in an elevation of the equatorial and a flattening of the polar parts, is more sensible; but this does not materially affect the popular phenomena; though the scientific astronomer knows how to make a due allowance for them. See the sequel of this article, and the article DEGREE.

When the spherical hypothesis of the earth was once admitted, a tolerable conception would soon be formed of its magnitude. A person travelling northward, and observing the pole elevated one degree more than at the place of his departure, would easily conclude he had travelled over $\frac{1}{360}$th part of the whole circumference of the earth. The first approximation that was made by a method of this kind, however inaccurate, must (compared with the state of ignorance that preceded it) have been, at that time, a most important addition to the stock of natural knowledge; and, indeed, except with a view to some very refined scientific investigations, the general idea which the ancients had of the magnitude of the earth, differs but little from that of the moderns: for we are so entirely incapable of forming any accurate idea of number or magnitude, when either exceeds a certain limit, that a traveller who is told that the distance from London to York is about 200 miles, forms, perhaps, in one sense, a more accurate idea of its distance than the philosopher in his closet, who has computed the exact number of inches by trigonometrical calculation.

The magnitude of the earth may be easily estimated by the measure of a meridional degree; but the result will be different, according to the measure that is assumed. According to Cassini, who adopted Picard's measure of a degree, the ambit or circumference of the earth is 123750720 Paris feet, or 134650777 English feet; whence, supposing the earth spherical, its diameter must be 7967 statute miles; and multiplying the square of the diameter by 3.1416, its surface will be 199407056 miles; and multiplying the cube of the diameter by the decimal .5236, we shall have 264779426393 cubic miles for the solid content of the globe of the earth. But if we take 364546 feet for the length of a degree in latitude 45° (see the table under DEGREE), we may consider this as a mean length: hence, 364546 × 360 (= 131236560 feet) will be the circumference of the earth, considered as a sphere; and since the circumference of every circle is to its radius as 6.28318 to 1, we have 6.28318 : 1 :: 131236560 : 20886964 feet, or 3955 miles, the radius of the earth; and, consequently, its diameter is 7910 miles; its surface 196563942 miles, and its solidity 212600665836 cubic miles.

Dalby makes the earth's equatorial radius 3489932 fathoms, and its semi-axis 3473656 fathoms. (Phil. Transf. vol. for 1791.) Subsequent measurements make the same respectively equal to 3491420 and 3468007 fathoms, or to 7935 and 7882 miles. (Phil. Transf. vol. for 1795.) See the article DEGREE. As an approximation to the best estimation, but without laying much stress upon it, we shall reckon the two axes of the earth respectively equal to 7977 and 7940 English miles. These are commonly called the equatorial and polar diameters of the earth. Hence we may deduce the solid contents of the earth. One of the rules for finding the solid contents of a spheroid, according to the doctrine of mensuration, is to multiply two-thirds of the revolving axis by the area of the generating ellipse, (*viz.* the ellipse, by the revolution of which the spheroid is generated,) and the product will be the content of the spheroid.

ſpheroid. (See SPHEROID.) The axes, then, being aſſumed, as above ſtated, 7940 and 7977 miles reſpectively, the area of the generating ellipſe is (7940 × 7977 × 0.7854 =) 49745178,252; and its area multiplied by two-thirds of the longer axis, gives the ſolidity equal to (49745178.252 × $\frac{2}{3}$ × 7977 =) 264544857944.136 cubic miles. This determination evidently reſts upon the ſuppoſition that no conſiderable vacuity exiſts within the body of the earth. But there are reaſons for ſuppoſing that the earth is more denſe towards the centre than towards the ſurface. (See De la Lande's Aſtron. vol. ii. art. 3589.) And independently of this, all the mineralogical and geological obſervations ſhew, that the earth is not homogeneous. For the method of eſtimating the mean denſity of the earth, ſee the article DENSITY.

It is not exactly known to whom we are indebted for the firſt ſuggeſtion of the oblate figure of the earth.

Picard, in his meaſure of the earth, publiſhed in 1671, ſpeaks of a conjecture propoſed to the academy, that ſuppoſing the diurnal motion of the earth, heavy bodies ſhould deſcend with leſs force at the equator than at the poles, and obſerves, that for the ſame reaſon, there ſhould be a difference in the length of the pendulum vibrating ſeconds in different latitudes.

It was in this ſame year that Richer was ſent to Cayenne, and among other objects of his voyage, he was charged by the academy to obſerve the length of the pendulum vibrating ſeconds. He returned in 1672, and mentions his obſervation of the pendulum as the moſt important he had made. The ſame meaſure which had been marked at Cayenne on a rod of iron, according to the length which had been found neceſſary to make the pendulum vibrate ſeconds, being brought back, and compared with that marked at Paris, the difference was found to be a line and a quarter, that at Cayenne being the ſhorteſt. The vibrations of the pendulum on which the experiment was made were very ſmall, and continued ſenſible for 52 minutes of time, and were compared with an excellent clock which vibrated ſeconds. Moreover, the clock which Richer took to Cayenne having been adjuſted to beat ſeconds at Paris, retarded two minutes a day at Cayenne, ſo that no doubt remained of the diminution of the force of gravity at the equator.

This was the firſt direct proof of the diurnal motion of the earth. Huygens was then led to ſuſpect that the ſame cauſe might produce a protuberance of the equatorial parts of the earth, and a correſponding depreſſion of the poles. Caſſini had already obſerved the oblate figure of Jupiter, which analogy ſtrongly favoured the ſuppoſition of a ſimilar phenomenon on the earth. The moſt obvious method of aſcertaining the fact being by direct meaſurement, aſtronomers were ſent to various parts of the world to meaſure the value of different degrees: of the reſult of their labours we have given a moſt ample detail under DEGREE.

Huygens was certainly the firſt perſon who attempted to determine the figure of the earth by direct calculation; but he aſſumed an hypotheſis, which, ſince the diſcovery of the law of univerſal gravitation, has been found to be inadmiſſible: this hypotheſis ſuppoſes that the whole of the attractive force reſides in the centre of the earth, and that its power varies as the ſquare of the diſtance. Upon this ſuppoſition Huygens computes the ellipticity of the earth to be $\frac{1}{577}$, the centrifugal force at the equator being $\frac{1}{289}$ of the force of gravity.

Newton, upon the ſuppoſition of the earth's having been an homogeneous fluid, eſtimates the ellipticity at $\frac{1}{230}$.

But Clairaut was the firſt mathematician who gave a general ſolution of this problem, adapted to the hypotheſis of a variable denſity. The reſult which he obtained from his inveſtigation was as curious as unexpected; it appeared that if the denſity of the ſtrata, of which the earth is compoſed, increaſes towards the centre, the ellipticity will be leſs than in the hypotheſis of Newton, and greater than in that of Huygens; and moreover, that the fraction expreſſing the ellipticity being added to the fraction expreſſing the augmentation of gravity at the poles, will together always make a conſtant quantity, which is equal to $\frac{5}{2}$ of the fraction which expreſſes the proportion which the centrifugal force at the equator bears to that of gravity. We ſhall find that it is by means of this theorem that we are enabled to aſcertain the true figure of the earth by experiments on pendulums, in a more accurate manner than can be done by the meaſurement of degrees.

We ſhall now ſubjoin the whole theory of this ſubject as given by La Place, and for his calculations ſhall ſubſtitute thoſe which are derived from taking into conſideration the meaſurements that have been made in England and Sweden, which bring the reſult much nearer to the true ſpheroidical figure than the degrees that had been taken by La Place, in the ſecond volume of La Mechanique Celeſte.

The force of gravity towards the planets is compoſed of the attractions of all their particles. If their maſs was fluid, and without motion, their ſtrata would be ſpherical, thoſe nearer the centre being the more denſe. The force of gravity at their exterior ſurface, and at any diſtance whatever without the ſphere, would be exactly the ſame, as if the whole maſs of the planet was compreſſed into the centre of gravity. It is in conſequence of this remarkable property, that the ſun, the planets, comets, and ſatellites, act upon each other, very nearly, as if they were ſo many material points. At very great diſtances the attraction of the particles of a body of any figure, which are the moſt remote, and thoſe which are neareſt the particle attracted, compenſate each other in nearly the ſame manner as if they were united in the centre of gravity, and if the ratio of the dimenſions of the body be conſidered as a very ſmall quantity of the firſt order, this reſult will be exact to a quantity of the ſecond order. But in a ſphere, it is rigorouſly true, and in a ſpheroid differing but little from a ſphere, it is of the ſame order as the product of its excentricity, by the ſquare of the ratio of its radius to the diſtance of the point attracted. This property of the ſphere of attracting, as if its maſs was concentrated in its centre, contributes greatly to the ſimplicity of the motions of the heavenly bodies. It does not belong excluſively to the law of nature; it equally appertains to the law of the attraction varying proportionally to the ſimple diſtance, and cannot belong to any other law, but thoſe formed by the addition of theſe two. And of all the laws which render the force of gravity nothing, at an infinite diſtance, that of nature is the only one in which the ſphere poſſeſſes this property.

According to this law, a body placed within a ſpherical ſtratum of uniform thickneſs, is equally attracted by all its parts, ſo as to remain at reſt in the midſt of the various attractions which act upon it. The ſame circumſtance takes place in an elliptic ſtratum, when the exterior and interior ſurfaces are ſimilar and ſimilarly ſituated. Suppoſing, therefore, the planets to be ſpheres of homogeneous matter, the force of gravity in their interior muſt diminiſh as the diſtance from the centre, for the exterior part relatively to the attracted particle contributes nothing to its gravity, which entirely conſiſts of the attraction of the internal ſphere, whoſe radius is equal to the diſtance of this point from the centre. But this attraction is equal to the maſs of the ſphere divided by the ſquare of the radius, and the maſs is as the cube of this ſame radius. The force of gravity on the attracted

attracted particle is therefore equal $\frac{R^3}{R^2}$, or, ſimply, to the radius. But if, (as is probably the caſe,) the ſtrata are more denſe as they approach the centre, the force of gravity will diminiſh in a leſs ratio than in the caſe of homogeneity. But the rotatory motion of the planets cauſes them to differ a little from the ſpherical figure, the centrifugal force ariſing from this motion cauſing the particles ſituated at the equator to recede from the centre, and produce a flattening of the poles.

Let us conſider, firſt, the effects of this circumſtance in the moſt ſimple caſe of the earth's being an homogeneous fluid; and the whole force of gravity reſiding in its centre, and varying reciprocally as the ſquare of the diſtance from this point. It will then be eaſy to prove that the terreſtrial ſpheroid is an ellipſoid of revolution, for if we conceive two columns of fluids communicating with each other at the centre, (*Plate* X. *Aſtron. fig.* 72.) one terminating at the pole, the other at any point in the ſurface, theſe two columns ought to be in equilibrio. The centrifugal force alters nothing of the weight of the column directed to the pole, but diminiſhes the weight of the other column. This force is nothing at the centre of the earth, and at the ſurface is proportional to the radius of the terreſtrial parallel or very nearly as the coſine of the latitude, but the whole of this force is not entirely employed in diminiſhing the force of gravity: for theſe two forces, making an angle with each other equal to the latitude, the centrifugal force decompoſed according to the direction of gravity is weakened in the ratio of the coſine of this angle to radius. At the ſurface of the earth the centrifugal force diminiſhes the force of the gravity by the product of the centrifugal force at the equator by the ſquare of the coſine of the latitude, thus, the mean value of this denomination in the length of a fluid column is the half of this product, and ſince the centrifugal force is $\frac{1}{289}$ of the force of gravity at the equator, this value is $\frac{1}{578}$ of the force of the gravity multiplied by the ſquare of the coſine of the latitude. And ſince it is neceſſary, for the maintenance of the equlibrium, that the column by its length ſhall compenſate the diminution of its weight, it ſhould ſurpaſs the polar column by $\frac{1}{578}$ of its length multiplied by the above coſine. And the augmentation of the radii from the pole to the equator, being proportional to the ſquares of theſe coſines, we conclude that the earth would be an ellipſoid of revolution, the equatorial and polar axis of which were in the proportion of 578 to 577.

To determine the law of gravity at the ſurface of the earth in this caſe, we ſhould obſerve that the force of gravity at any point on this ſurface is leſs than that at the pole, from its being ſituated farther from the centre, this diminution is nearly equal to the double of the augmentation of the terreſtrial radius; it is equal, therefore, to the product of the $\frac{1}{288}$th part of the force of gravity by the ſquare of the coſine of the latitude. The centrifugal force diminiſhes likewiſe the force of gravity by the ſame quantity; thus, by the union of theſe two cauſes, the diminution of gravity from the pole to the equator is equal $\frac{1}{144\frac{1}{2}} = 0.00694$ multiplied by the ſquare of the coſine of the latitude.

But it is found by experience, both from the meaſures of various degrees, and determination of the lengths of pendulums, that the ellipticity is greater than $\frac{1}{578}$, and the diminution of the force of gravity leſs than 0.00694, for we ſhall find the diminution of the force of gravity experimentally determined to be about 0.005.

We may therefore conclude, that the force of gravity is not directed to a ſingle point, but is compoſed of the joint attractions of all particles of the earth.

This being the caſe, the law of gravity depends on the figure of the terreſtrial ſpheroid, which depends itſelf on the law of gravity. It is this mutual dependence of the two unknown quantities on each other, that renders the inveſtigation of the figure of the earth very difficult. But, fortunately, the elliptic figure, the moſt ſimple next to the ſphere, ſatisfies the condition of equilibrium of a fluid maſs, ſubject to a motion of rotation, and of which all the particles attract each other reciprocally as the ſquares of the diſtance.

Newton, upon this hypotheſis, and ſuppoſing the earth a homogeneous fluid, found the ratio of the equatorial to the polar axis to be 230 to 229.

To determine the law of the variation of the force of gravity upon this hypotheſis, we may conſider two different points ſituated on the ſame radius drawn from the centre to the ſurface of an homogeneous fluid in equilibrio. It has been before obſerved, that all the elliptic ſtrata, ſituated without a point, contribute nothing to its gravity; the reſulting force of all the attractions which act on it, is derived entirely from the attraction of the interior ſpheroid, ſimilar to the entire ſpheroid, and whoſe ſurface paſſes through the point in queſtion. The ſimilar and ſimilarly ſituated particles of theſe two ſpheroids attract the interior point, and the correſponding point of the exterior ſurface, proportionally to their maſſes divided by the ſquares of their diſtances. Theſe maſſes are in the two ſpheroids as the cubes of their ſimilar dimenſions, and the ſquares of their diſtances are as the ſquares of theſe dimenſions. The attractions, then, on ſimilar particles, are proportional therefore to theſe dimenſions. From which it follows, that the entire attraction of the two ſpheroids are in the ſame ratio, and the directions parallel. The centrifugal forces of the two points now under conſideration are likewiſe proportional to the ſame dimenſions. Therefore the force of gravity in each of them being the reſult of theſe two forces, will likewiſe be proportionate to their diſtances from the centre of the fluid maſs.

Now, if we conceive two fluid columns directed, as before, to the centre of the ſpheroid, one from the pole, the other from any point on the ſurface, it is evident, that if the ellipticity of the ſpheroid is very ſmall, that is, if it differs but little from a ſphere, that the force of gravity decompoſed according to the directions of theſe columns will be nearly the ſame as the total gravity.

Dividing, therefore, theſe columns into an equal number of parts infinitely ſmall and proportional to their lengths, the weight of the correſponding parts will be to each other as the products of the lengths of the columns by the force of gravity at the points of their ſurface where they terminate. The whole weight of theſe columns will therefore be to each other in this ratio. And as theſe weights muſt be equal to be in equilibrio, the force of gravity at their ſurface muſt conſequently be reciprocaly as the length of theſe columns. Thus the length of the radius of the equator ſurpaſſing the radius at the pole a 230th part, the force of gravity at the pole ſhould likewiſe exceed that at the equator a 230th part. This ſuppoſes the eliptic figure ſufficient for the equilibrium of a fluid homogeneous maſs. This Maclaurin has demonſtrated in a beautiful manner, from which it reſults, that the equilibrium is rigoroſuſly poſſible, and that if the ellipſoid differs little from a ſphere, the ellipticity will be equal $\frac{5}{4}$ths of the quantity which expreſſes the proportion of the centrifugal force to that of gravity under the equator. To the ſame motion of rotation, there may exiſt two correſponding figures of equilibrium. But the equilibrium cannot exiſt with every motion of rotation. The ſhorteſt

period of rotation of an homogeneous fluid in equilibrio of the same density as the earth is 0.10089 of a day, and this limit varies reciprocally as the square root of the density.

When the rotation becomes more rapid, the fluid mass becoming more flattened at the poles, its period of rotation becomes less, and ultimately falls within the appropriate limits of a state of equilibrium. After a great many oscillations, the fluid, in consequence of the friction and resistances which it experiences, fixes itself at last in that state which is *unique*, and determined by the primitive motion of rotation.

The preceding results afford us an easy method of verifying the hypothesis of the homogeneity of the earth. The irregularity of the measured degrees may be supposed to leave too much uncertainty, as to the ellipticity, to enable us to decide if it really is such as the above hypothesis requires. But the regular increase of the force of gravity from the equator to the pole, as determined by experiments on the pendulum, is sufficient to throw great light upon the subject. In taking, as unity, the force of gravity at the equator, its increase at the pole, according to the hypothesis of homogeneity, should be equal $\frac{1}{232} = 0.00435$. But by observation (as will hereafter be shewn,) this increase is 0.005; the earth, therefore, is not homogeneous. And, indeed, it is natural to suppose, that the density of the strata increase as they approach the centre; it is even necessary for the stability of the equilibrium of the waters of the ocean, that their density should be less than the mean density of the earth; otherwise, when agitated by the winds and other causes, they would overflow their limits, and inundate the adjoining continents. The homogeneity of the earth being thus excluded, by observation, we must, to determine its figure, suppose the sea covering a nucleus composed of different strata, diminishing in density from the centre to the surface. Clairaut has demonstrated, that the equilibrium is still possible, in the supposition of an elliptic figure at the surface, and of the strata of the interior nucleus. In the most probable hypothesis, relative to the law of the densities and ellipticities of these strata, the ellipticity of the earth is less than in the case of homogeneity, and greater than if the force of gravity was directed to a single central point; but the increase of the force is greater than in the first case, and less than in the second. But there exists, between the increase of the force of gravity, taken as unity at the equator and the ellipticity of the earth, this remarkable analogy, that in all the hypotheses relative to the constitution of the internal nucleus which the sea incloses, the ellipticity of the earth is just so much less than that which would take place in the case of homogeneity, as the augmentation of the force of gravity exceeds that which should exist, according to the same supposition, and reciprocally; so that the fractions expressing the ellipticity and the augmentation of the force of gravity, always, together, make a constant quantity equal $\frac{5}{2}$ds of the fraction $\frac{1}{289}$, which expresses the ratio of the force of gravity to the centrifugal force at the equator. This, on the earth, is equal 0.0086500.

In supposing an elliptic figure to the strata of the terrestrial spheroid, the increase of its radii, the increase of the force of gravity, and the diminution of the degrees from the pole to the equator, will vary as the squares of the cosine of the latitude; and these are connected with the ellipticity of the earth in such a manner, that the total increase of the radii is equal to the ellipticity; and the total diminution of the degree is equal to the ellipticity, multiplied by three times the degree at the equator, (see DEGREE, where this has been demonstrated); and the total increase of the force of gravity is equal to the force of gravity at the equator, multiplied by the excess of 0.0086500 above the ellipticity. Thus, the ellipticity of the earth may be determined, either by direct measurement of degrees, or by observations on the length of the pendulum.

The observations of the pendulum give 0.005 for the increase of the force of gravity, which, taken from $\frac{1}{115.5}$, gives $\frac{1}{578}$ for the ellipticity of the earth. If this hypothesis of the ellipse be conformable to nature, it should agree with the various measurements that have been made in different countries to ascertain the value of the meridional degrees. We have seen how discordant many of these measures are, when compared with the above hypothesis; nevertheless, since La Place was occupied with these investigations, the late measurements in England and Sweden appear to give the general result of the earth's figure nearer to a regular ellipse, than could be at that time inferred from the measure of Maupertuis.

To embrace, in the most general manner possible, the theory of the figure of the earth and planets, it is necessary to determine the attraction of spheroids differing little from spheres, and formed of strata variable both in figure and density, according to any law whatever. It will remain, then, to determine the figure which will agree with the equilibrium of a fluid expanded over its surface; for we must imagine the planets covered with a fluid similar to the earth, or their figure would be entirely arbitrary.

A remarkable equation of partial differences, relative to the attraction of spheroids, lead the author, without the aid of integrations, to general expressions for the radii of the spheroids; for the attractions upon any points whatever, either within, on the surface, or without it; for the condition of the equilibrium of the fluids that surround them; for the law of gravity, and for the variation of the degrees at the surface.

All these quantities are connected with each other by analogies extremely simple; from which results an easy method of verifying all the hypotheses that may be formed to represent either the variation of the force of gravity, or that of the values of different degrees of the meridian.

Thus Bouguer, with a view of reconciling the degrees measured at the equator in France and in Lapland, supposed the earth to be a spheroid of revolution, in which the increase of the degrees, from the equator to the pole, was proportional to the fourth power of the sine of the latitude. This hypothesis is shewn to be defective.

The above-mentioned expressions give a direct and general solution of the problem, which consists in determining the figure of a fluid mass in equilibrio, supposing it subjected to a movement of rotation, composed of an infinity of fluids of different densities, whose particles attract each other directly as their masses, and inversely as the squares of their distances. In this general supposition, the fluid necessarily takes the form of an elliptoid of revolution, of which all the strata are elliptic, whose densities diminish, at the same time that their ellipticities increase from the centre to the surface.

The limits of ellipticity, of the whole ellipsoid, are $\frac{1}{4}$ and $\frac{1}{2}$ of the ratio of the centrifugal force, of the force of gravity at the equator.

The first limit is relative to the hypothesis of homogeneity, and the second to the supposition of the strata, infinitely near the centre being infinitely dense; and, consequently, the whole mass of the spheroid acting as if concentrated in that point. In the latter case, the force of gravity being directed to a single point, and varying inversely as the square of the distance, the figure of the earth would be such

such as has been above determined; but, in the general hypothesis, the line which determines the direction of the force of gravity, from the centre to the surface of the spheroid, is a curve, every element of which is perpendicular to the stratum through which it passes.

It is remarkable, that the variations observed in the length of the pendulum, follow, pretty correctly, the law of the squares of the cosines of the latitudes; at the same time that the variations in the measured degrees differ very sensibly from this law. The general theory of the attractions of spheroids afford a simple explanation of this phenomenon; it shews us that the terms which, in the value of the terrestrial radius, differ from this law, become more sensible in the expression of the force of gravity, and still more sensible in the expression of degrees, where they may acquire a value sufficiently great to produce the phenomenon under consideration.

This theory likewise shews us, that the limits of the total increase of the force of gravity, taken at the equator as unity, are the products of 2 and $\frac{5}{4}$, the ratio of the centrifugal force, to the force of gravity under the equator; the first limit referring to the case of an infinite density at the centre; the second to the case of homogeneity. The increase, as derived from observation, being between these limits, indicates that the strata are more dense, as they approach the centre, conformable to the laws of hydrostatics. Thus, the theory seems to accord with observation, as far as could be expected, considering our ignorance of the internal constitution of the earth.

To determine the Figure of the Earth from the following Observations of the Length of the Pendulum.

Place of Observation.	Lat. in decimal Deg.	Length of the Pend. vibrating, Centes. Seconds of Mean Time.	Corrected Length.	Error *.
1. Peru	0.°00	0.″99669	0.99676	+ 0.00007
2. Porto-Bello	10.61	0.99689	0.99692	+ 0.00003
3. Pondicherry	13.25	0.99710	0.99700	− 0.00010
4. Jamaica	20.00	0.99745	0.99730	− 0.00015
5. Petit-Goare	30.50	0.99728	0.99732	+ 0.00004
6. Cape of Good Hope	37.69	0.99877	0.99852	− 0.00025
7. Toulouse	48.44	0.99950	0.99945	− 0.00005
8. Vienna	53.57	0.99987	0.99991	+ 0.00004
9. Paris	54.26	1.00000	0.99997	− 0.00003
10. Gotha	56.63	1.00[illegible]	0.00002	− 0.00004
11. London	57.22	1.00018	1.00023	+ 0.00005
12. Petersburg	64.72	1.00074	1.0008[illegible]	+ 0.00012
13. Ponoi	66.60	1.00101	1.00100	− 0.00001
14. Avengsberg	74.22	1.00137	1.00155	+ 0.00018
15. Pello	74.53	1.00148	1.00157	+ 0.00009

* The sum of the positive errors will nearly be equal to the sum of the negative, according to the required condition of the problem.

Mr. La Place's method of finding the most probable ellipsis, corresponding to a set of observations similar to the above, or that which shall satisfy the following conditions; namely, that the sum of all the errors shall = 0, and the sum of all the errors taken positively, a minimum.

Let $a^{(1)}$, $a^{(2)}$, $a^{(3)}$, be the observed lengths of the pendulum; $k^{(1)}$, $k^{(2)}$, $k^{(3)}$, the squares of the sines of the corresponding latitudes.

Suppose these lengths to be expressed by this formula, $z + ky$. And let $x^{(1)}$, $x^{(2)}$, $x^{(3)}$, be the errors of observation. Then we shall have the following equations:

$$\left.\begin{array}{l} a^{(1)} - z - k^{(1)} y = x^{(1)} \\ a^{(2)} - z - k^{(2)} y = x^{(2)} \\ a^{(3)} - z - k^{(3)} y = x^{(3)} \\ \\ a^{(n)} - z - k^{(n)} y = x^{(n)} \end{array}\right\} \text{A.}$$

Add these equations, and divide their sum by n, making the quotient equal to zero; the condition being, that the sum of the errors = 0; then,

$$\text{A} - z - ky = 0. \quad \text{B.}$$

Subtract this equation from each of the equations A, separately, and new equations will be obtained of the following form:

$$\left.\begin{array}{l} b^{(1)} - q^{(1)} y = x^{(1)} \\ b^{(2)} - q^{(2)} y = x^{(2)} \\ b^{(3)} - q^{(3)} y = x^{(3)} \end{array}\right\} \text{O.}$$

&c. &c.

Compute the quotients $\frac{b^{(1)}}{q^{(1)}}$, $\frac{b^{(2)}}{q^{(2)}}$, $\frac{b^{(3)}}{q^{(3)}}$, &c. and arrange them according to their magnitudes, neglecting their signs. Let the quotients thus arranged be denoted thus:

$$b^{(1)},\ b^{(2)},\ b^{(3)}. \quad \text{P.}$$

And observe the order of the first terms of equations O, which correspond to them.

Then to find that value of y, which shall render the sum of all the errors taken positively a minimum; add the quantities $b^{(1)}$, $b^{(2)}$, $b^{(3)}$, till their sum begins to surpass half the sum of all these quantities added together; and calling this sum F, a quantity r may be so determined, that

$$\left.\begin{array}{l} b^{(1)} + b^{(2)} + b^{(3)} \ \cdot\ \cdot + b^{(r)} > 2\text{F} \\ b^{(1)} + b^{(2)} + b^{(3)} \ \cdot\ \cdot + b^{(r-1)} < \tfrac{1}{2}\text{F} \end{array}\right\} \text{Q.}$$

Then $y = b^{(r)}$, because, according to the present method, that error is to be supposed zero, which corresponds to that length in the equations O, which gives this value of y. The value of Z may then be obtained by the following equation:

$$\text{Z} = \text{A} - \text{K}y.$$

Application of this Method to the above Observations.

The observed lengths of the pendulum, with the squares of the sines of the latitude of the places of observation, give the following equations:

Obs. Length.	Sin.² L.	
0.99669	$- z - y\ 0.00000 = x^{(1)}$	
.99689	$- z - y\ 0.02752 = x^{(2)}$	
.99710	$- z - y\ 0.04270 = x^{(3)}$	
.99745	$- z - y\ 0.09549 = x^{(4)}$	
.99728	$- z - y\ 0.10016 = x^{(5)}$	
.99877	$- z - y\ 0.31142 = x^{(6)}$	
.99950	$- z - y\ 0.47551 = x^{(7)}$	
.99987	$- z - y\ 0.55596 = x^{(8)}$	A.
1.00000	$- z - y\ 0.56672 = x^{(9)}$	
1.00006	$- z - y\ 0.57624 = x^{(10)}$	
1.00018	$- z - y\ 0.61244 = x^{(11)}$	
1.00074	$- z - y\ 0.72307 = x^{(12)}$	
1.00101	$- z - y\ 0.74909 = x^{(13)}$	
1.00137	$- z - y\ 0.84478 = x^{(14)}$	
1.00148	$- z - y\ 0.84829 = x^{(15)}$	

These

These added together, and divided by 15, give

$$0.99923 - z - y\,0.43529 = 0. \quad \text{B.}$$

This equation, taken successively from every one of the equations A, gives O as follows:

$$\left.\begin{array}{l}
-0.00254 + y\,0.43529 = x^{(1)} \\
-0.00234 + y\,0.40777 = x^{(2)} \\
-0.00213 + y\,0.39259 = x^{(3)} \\
-0.00178 + y\,0.33980 = x^{(4)} \\
-0.00195 + y\,0.33513 = x^{(5)} \\
-0.00046 + y\,0.12387 = x^{(6)} \\
0.00027 - y\,0.04022 = x^{(7)} \\
0.00064 - y\,0.12067 = x^{(8)} \\
0.00077 - y\,0.13143 = x^{(9)} \\
0.00083 - y\,0.14093 = x^{(10)} \\
0.00095 - y\,0.17715 = x^{(11)} \\
0.00151 - y\,0.28778 = x^{(12)} \\
0.00178 - y\,0.31380 = x^{(13)} \\
0.00214 - y\,0.40949 = x^{(14)} \\
0.00225 - y\,0.41300 = x^{(15)}
\end{array}\right\} \text{O.}$$

The quotients $\frac{b^{(1)}}{q^{(1)}}$, $\frac{b^{(2)}}{q^{(2)}}$, arranged as above directed, will stand thus:

0.0067131
0.0058886
0.0058586
0.0058352
0.0058186
0.0057385
0.0056724
0.0054479
0.0054255
0.0053627
0.0053037
0.0052471
0.0052384
0.0052260
0.0037136

The first term of which, $b^{(1)}$, corresponds to $\frac{b^{(7)}}{q^{(7)}}$; the second term, $b^{(2)}$, corresponds to $\frac{b^{(10)}}{q^{(10)}}$. The whole correspond in the following order:

7, 10, 9, 1, 5, 2, 13, 15, 3, 11, 8, 12, 4, 14, 6.

The sum of the first six is less than half the sum of all the terms: therefore r, in equation Q, is equal to 7.

Now the 7th term corresponds to the 13th, in the equations O.

The value of y is therefore to be found from this equation, where $x^{(13)} = 0$.

Therefore $y = \frac{0.00178}{0.31380} = 0.0056724$.

And from equation B; $z = 0.99676$ = the length of the pendulum at the equator.

But this value of y is the fraction sought, which, according to the theory of Clairaut, should, with another fraction expressing the ellipticity, make together the constant quantity 0.0086500.

Therefore, the ellipticity $= 0.00865 - 0.0056724 = 0.0029776 = \frac{1}{335.7}$.

Such is the determination of La Place; in which it appears to us that a mistake has been committed in employing y as found by the above equations, instead of its value, found by making the pendulum at the equator equal unity.

The rule of La Place, in his own words, is as follows:

Let $\alpha\varepsilon$ be the excess of the length of the pendulum at the pole above that at the equator, divided by the length of the latter; then,

$$\alpha\varepsilon = \alpha\left(\tfrac{1}{2}\phi - h\right),$$

$$\text{And } \alpha\varepsilon + ah = \frac{5}{2}\alpha\phi = .00865.$$

To apply this rule:

$$z = 0.9967600 = \text{pendulum at the equator.}$$
$$\alpha + y \times \text{sin.}^2 90^\circ = 1.0024324 = \text{pendulum at the pole.}$$

Excess $= .0056724$, which, divided by .9967600, gives $\alpha\varepsilon = 0.0056908$.

And the ellipticity $ah = 0.00865 - \alpha\varepsilon = 0.0089592 = \frac{1}{307.93}$.

Table of the Length of the Pendulum to every 10° of Latitude, calculated by the above Formula.

0°	1.0000000
10°	1.0001716
20°	1.0006657
30°	1.0014227
40°	1.0023513
50°	1.0033395
60°	1.0042681
70°	1.0050251
80°	1.0055192
90°	1.0056908

In the following calculation, we have introduced the value of the degree measured in England by colonel Mudge, and substituted the northern degree of Swanberg, instead of that of Maupertuis, which was taken by La Place. The reader will see that the result is much more satisfactory.

To determine the most probable Ellipse from actual Measurement of Degrees.

	Latitude.	Toises.	Arc Meas.	Error.
1. Peru	0° 0′	56753	3	+0.5
2. India	12° 32′	56763	1	−14
3. Cape of Good Hope	33° 18′	57037	1	+137
4. Pennsylvania	39° 12′	56888	1	−70
5. Italy, Boscovich	43° 1′	56979	1	−12
6. France	46° 12′	57018.5	10	−0.5
7. Austria	47° 47′	57074	1.5	+41
8. England	52° 2′ 20″	57068	3	−2
9. Sweden	66° 20′ 10″	57196	1.5	+14

$$\left.\begin{array}{l}
1.\ 170259 - 3z - y\,0.00000^{(1)} \\
2.\ \ 56763 - z - y\,0.04709^{(2)} \\
3.\ \ 57037 - z - y\,0.30156^{(3)} \\
4.\ \ 56888 - z - y\,0.39946^{(4)} \\
5.\ \ 56979 - z - y\,0.46541^{(5)} \\
6.\ 570185 - 10z - y\,5.20930^{(6)} \\
7.\ \ 85611 - 1.5z - y\,0.82275^{(7)} \\
8.\ 171204 - 3z - y\,1.86486^{(8)} \\
9.\ \ 85794 - 1.4z - y\,1.25835^{(9)}
\end{array}\right\} \text{A.}$$

$1310720 - 23z - y\,10.36878$, which, divided by 23, gives equation $\text{A} - z - Py = 0$.

$$56988 - z - y\,0.45081 = 0.$$

This

This equation, taken from equations A, gives the equations O, thus:

$$\left.\begin{array}{rl} 1. & -235 + y\,0.45081 = x^{(1)} \\ 2. & -225 + y\,0.40372 = x^{(2)} \\ 3. & +\ 49 + y\,0.14925 = x^{(3)} \\ 4. & -100 + y\,0.05135 = x^{(4)} \\ 5. & +\ 9 - y\,0.01460 = x^{(5)} \\ 6. & +\ 30 - y\,0.07012 = x^{(6)} \\ 7. & +\ 86 - y\,0.09769 = x^{(7)} \\ 8. & +\ 80 - y\,0.17081 = x^{(8)} \\ 9. & -208 - y\,0.38809 = x^{(9)} \end{array}\right\} \text{O.} \quad \begin{array}{r} 521 \\ 557 \\ 328 \\ 194 \\ 616 \\ 435 \\ 880 \\ 468 \\ 536 \end{array}$$

$$\begin{array}{r|l|l} 880 & 7 & y\ 0.14653 \\ 616 & 5 & y\ 0.01460 \\ 557 & 2 & y\ 0.40372 \\ 536 & 9 & y\ 0.58213 \\ 521 & 1 & y\ 1.35243 \\ 468 & 8 & y\ 0.51243 \\ 435 & 6 & y\ 0.70120 \\ 328 & 3 & y\ 0.14925 \\ 194 & 4 & y\ 0.05135 \end{array}$$

The fifth term of the above co-efficients is the first that begins to surpass the half sum of the whole, and it corresponds to N° 1, from which term in equations O, y is to be deduced.

$$\text{Since } -235 + y\,0.45081 = 0,$$
$$y = 521.$$

Substituting this value in equation

$$56988 - z - y\,0.45081$$
$$z = 56753.$$

And the ellipticity, which is equal to $\frac{521}{3 \times 56753} = \frac{1}{327}$.

The ellipticity obtained by La Place, in his "Mecanique Celeste," is $\frac{1}{312}$.

Calculation repeated with only the five measures that seem most deserving of confidence.

	°	′	″	Toises.	
1. Peru	0	0	0	56753	2
2. India	12	32	0	56763	1
3. France	46	12	0	57018.5	10
4. England	52	2	20	57068	3
5. Sweden	66	20	10	57196	1.5

$$\left.\begin{array}{l} 56753 - z - y\,0.00000 = x^{(1)} \\ 56763 - z - y\,0.04709 = x^{(2)} \\ 57018.5 - z - y\,0.52093 = x^{(3)} \\ 57068 - z - y\,0.62162 = x^{(4)} \\ 57196 - z - y\,0.83890 = x^{(5)} \end{array}\right\} \text{A.}$$

$$\begin{array}{r} 113506 - 2z - y\,0.00000 \\ 56763 - z - y\,0.4709 \\ 570185 - 10z - y\,5.20930 \\ 171204 - 3z - y\,1.86486 \\ 85794 - 1.5z - y\,1.25835 \end{array}$$

These equations, added together, and divided by the sum of the multipliers, give

$$56997 - z - y\,0.47883$$

This, subtracted from each of the equations A, gives the equations O.

$$\left.\begin{array}{l} 244 - y\,0.47883 = x^{(1)} \\ 234 - y\,0.43174 = x^{(2)} \\ -21.5 + y\,0.04210 = x^{(3)} \\ -71 + y\,0.14279 = x^{(4)} \\ -199 + y\,0.36007 = x^{(5)} \end{array}\right\} \text{O.}$$

$$\begin{array}{r|l|l} 552 & 5 & y\ 54010 \\ 542 & 2 & y\ 43174 \\ 510.7 & 3 & y\ 42100 \\ 510 & 1 & y\ 95766 \\ 497 & 4 & y\ 42837 \end{array}$$

The third term is the first that surpasses the half sum of the five terms, which answers to N° 3, therefore the value of y is to be deduced from its corresponding equation, and is equal to 510.7, which number expresses the excess in toises of the polar above the equatorial degree; z, the equatorial degree, is deduced from equation $56997 - z - y\,47883$, by substituting the value of $y = 510.7$. Hence $z = 56752.5$.

The ellipticity, which is equal $\frac{510.7}{3 \times 56752.5}$, (see DEGREE,) is thus found equal $\frac{1}{333.4}$.

	Observations.	Observations corrected.	Error.
Peru	56753	56752.5	+ 0.5
India	56763	56776	− 13
France	57018.5	57018.5	0
England	57068	57070	− 2
Sweden	57196	57181.8	+ 14.2

If we take the ellipticity a mean between this last determination, and that given by the pendulum, it will be $\frac{1}{310}$, and nearer than this, it will probably never be known.

Investigation of Clairaut's theorem, on which the above calculations are founded.

Let us suppose a sphere of solid matter, equally dense at equal distances from the centre, and covered with a less dense fluid, and let us suppose that the whole has a form suitable to the velocity of its rotation. It is this form that we are to find out. With this view, let us suppose, that all the matter by which the solid globe or nucleus is denser than the fluid is collected in the centre. We have seen that this will make no change in the gravitation of any particle of the recumbent fluid.

Thus we have a solid globe covered with a fluid of the same density, and besides the mutual gravitation of the particles of the fluid, we have a force of the same nature, acting on every one of them directed to the central redundant matter.

Now let the globe liquefy or dissolve. This can induce no change of force on any particle of the fluid. Let us then determine the form of the new fluid spheroid, which will maintain itself in rotation. This being determined, let the globe again become solid. The remaining fluid will not change its form, because no change is induced on the force acting on any particle of the fluid. Call this hypothesis A.

In order to determine the state of equilibrium, or the form which insures it, which is the chief difficulty, let us form another hypothesis B, differing from A only in this circumstance, that the matter collected in the centre, instead of attracting the particles of the incumbent fluid, with a force decreasing in the inverse duplicate ratio of their distances, attracts

attracts them with a force increasing in the direct ratio of their distances, keeping the same intensity at the distance of the pole as in hypothesis A. This fictitious hypothesis, similar to Hermann's, is chosen, because a mass so constituted will maintain the form of an accurate elliptical spheroid, by a proper adjustment of the proportion of its axis to the velocity of its rotation. This will easily appear, for we have seen that the mutual gravitation of the particles of the elliptical fluid spheroid produces in each particle a force which may be resolved into two forces, one of them perpendicular to the axis, and proportionate to the distance from it, and the other perpendicular to the equator, and proportional to the distance from its plane. There is now, by hypothesis B, superadded on each particle a force proportional to its distance from the centre, and directed to the centre. This may also be resolved into a force perpendicular to the axis, and another perpendicular to the equator, and proportional to their distances from them. Therefore, the whole combined forces acting on each particle, may be thus resolved into two forces in those directions and those proportions. Therefore, a mass so constituted, will maintain its elliptical form, provided the velocity of its rotation be such that the whole force at the pole and the equator are inversely as the axis of the generating ellipse.

We are to ascertain this form, or this required magnitude, of the centrifugal force. Having done this, we shall restore to the accumulated central matter its natural gravitation, or its action on the fluid in the inverse duplicate ratio of the distances, and then see what change must be made on the form of the spheroid in order to restore the equilibrium.

Let B A *b a* (*fig.* 73.) be the fictitious elliptical spheroid of hypothesis B. Let B E *b e* be the inscribed sphere. Take E G perpendicular to C E, to represent the force of gravitation of a particle in E to the central matter corresponding to the distance C E or C B. Draw C G: draw also A I perpendicular to C A, meeting C G in I. Describe the curve G L R, whose ordinates G E, L A, R M, &c. are proportional to $\frac{1}{CE^2}$, $\frac{1}{CA^2}$, $\frac{1}{CM^2}$, &c. These ordinates will express the gravitations of the particles E, A, M, &c. to the central matter by hypothesis A.

In hypothesis A the gravitation of A is represented by A L; but in hypothesis B it is represented by A I. For in hypothesis B, the gravitations to this matter are as the distances. E G is the gravitation of E in both hypotheses. Now $EG : AL = CA^2 : CE^2$; but $EC : AI = CE : CA$. In hypothesis A the weight of the column A E is represented by the space A L G E, but by A I G E in hypothesis B. If, therefore, the spheroid of hypothesis B was in equilibrio, while turning round its axis, the equilibrium is destroyed by merely changing the force acting on the column E A.

There is a loss of pressure or weight sustained by the column E A. This may be expressed by the space L G I, the difference between the two areas E G I A and E G L A. But the equilibrium may be restored, by adding a column of fluid A M, whose weight A L R M shall be equal to L G I, which is very nearly equal $\frac{LI \times AE}{2}$.

In order to find the height of this column, produce G E on the other side of E, and make E F to E G as the density of the fluid to the density by which the nucleus exceeded it. E F will be to E G as the gravitation of a particle in E to the globe (now of the same density with the fluid) is to its gravitation to the redundant matter collected in the centre. Now, take D E to represent the gravitation of E to the fluid contained in the concentric spheroid E $\beta e \beta$, which is somewhat less than its gravitation to the sphere E B *e b*. Draw C D N. Then A N represents the gravitation of A to the whole fluid spheroid. In like manner, N I is the united gravitation of A to both the fluid and the central matter, in the same hypothesis. But in hypothesis A, this gravitation is represented by N L.

Let N O represent the centrifugal force affecting the particle A, taken in due proportion to N A or N L, its whole gravitation in hypothesis A. Draw C K O. D K will be the centrifugal force at E. The space O K G I will express the whole sensible weight of the fluid in A E, according to hypothesis B, and O K G L will express the same, according to hypothesis A. L G I is the difference, to be compensated by means of a due addition A M.

This addition may be defined by the quadrature of the spaces G E A L and G L I. But it will be abundantly exact to suppose that G L R sensibly coincides with a straight line, and then to proceed in this manner. We have, by the nature of the curve G L R,

$$AL : EG = EC^2 : AC^2$$

Also HA, or $EG : AI = EC : AC$

Therefore $AL : AI = EC^3 : AC^3$.

Now, when a line changes by a very small quantity, the variation of a line proportional to its cube is thrice as great as that of the line proportional to the root. H I is the quantity proportional to E A the increment of the root E C. I L is proportional to the variation of the cube, and is therefore very nearly equal to thrice H I.

Therefore since $EG : HI = EC : AE$. we may state $EG : LI = EC : 3AE$,

or $3EG : LI = EC : AE$.

Now, Q O L R may be considered as equal to Q R × A M, or as equal to K G × A M, and L G I may be considered as equal to $LI \times \frac{1}{2}AE$, and $2KG \times AM = LI \times AE$.

Therefore $2KG : AE = LI : AM$

but $EC : AE = 3EG : LI$

therefore $2KG \times EC : AE^2 = 3EG : AM$

and $2KG : \frac{AE^2}{EC} = 3EG : AM$

and $2KG : 3EG = \frac{AE^2}{EC} : AM$

That is, twice the sensible gravity at the equator is to thrice the gravitation to the central matter as a third proportional to radius and the elevation of the equator is to the addition necessary for producing the *equilibrium* required in hypothesis A.

This addition may be more readily conceived by means of a construction. Make $AE : Ee = 2KG : 3EG$. Draw *e a* parallel to E A, and draw C *e m*, cutting A N in *m*. Then *a m* is the addition that must be made to the column A C. A similar addition must be made to every diameter C T, making $2KG : 3EG = \frac{TV^2}{CV} : Tt$, and the whole will be *in equilibrio*.

This determination of the ellipticity will equally suit those cases where the fluid is supposed denser than the solid nucleus, or where there is a central hollow. For E G may be taken negatively, as if a quantity of matter were placed in the centre acting with a repelling or centrifugal force on the fluid. This is represented on the other side of the axis B *b*. The space *g i l* in this case is negative, and indicates a diminution of the column *a e*, in order to restore the *equilibrium*.

It is evident that the figure resulting from this construction is not an accurate ellipse. For, in the ellipse, T t would be in a constant ratio to V T, whereas it is as V T^2 by our construction. But it is also evident that in the cases of small deviation from perfect sphericity, the change of figure from the accurate ellipse of hypothesis B is very small. The greatest deviation happens when E e is a maximum. It can never be sensibly greater in proportion to A E than $\frac{3}{5}$ of A E is in proportion to E C, unless the centrifugal force F D be very great in comparison of the gravity D E. In the case of the earth, where E A is nearly $\frac{1}{230}$ of E C, if we suppose the mean density of the earth to be five times that of sea water, $a\,m$ will not exceed $\frac{1}{217444}$ of E C, or $\frac{1}{92}$ of E A.

We are not to imagine that, since central matter requires an addition A M to the spheroid, a greater density in the interior parts of this globe requires a greater equatorial protuberancy than if all were homogeneous; for it is just the contrary. The spheroid to which the addition must be made is not the figure suited to a homogeneous mass, but a fictitious figure employed as a step to facilitate investigation. We must therefore define its ellipticity, that we may know the shape resulting from the final adjustment.

Let f be the density of the fluid, and n the density of the nucleus, and let $n - f$ be $= q$, so that q corresponds with E G of our construction, and expresses the redundant central matter (or the central deficiency of matter, when the fluid is denser than the nucleus). Let B C or E C be r, A E be x, and let g be the mean gravity (primitive), and c the centrifugal force at A. Lastly, let π be the circumference when the radius of the circle is 1.

The gravitation of B to the fluid spheroid is $\frac{2}{3}\pi f r$, and its gravitation to the central matter is $\frac{2}{3}\pi q r$. The sum of these, or the whole gravitation of B, is $\frac{2}{3}\pi n r$. This may be taken for the mean gravitation on every point of the spheroidal surface.

But the whole gravitation of B differs considerably from that of A.

C A, or C E, is to $\frac{1}{5}$ A E as the primitive gravity of B to the spheroid is to its excess above the gravitation (primitive) of A to the same. That is, $r : \frac{1}{5}x = \frac{2}{3}\pi f r : \frac{2}{15}\pi f x$, and $\frac{2}{15}\pi f x$ expresses this excess.

In hypothesis B, we have C E to C A as the gravitation of B or E to the central matter is to the gravitation of A to the same. Therefore C E is to E A as the gravitation of E to this matter is to the excess of A's gravitation to the same. This excess of A's gravitation is expressed by $\frac{2}{3}\pi q x$, for $r : x = \frac{2}{3}\pi q r : \frac{2}{3}\pi q x$.

Without any sensible error, we may state the ratio of g to c as the ratio of the whole gravitation of A to the centrifugal tendency excited in A by the rotation. Therefore $g : c = \frac{2}{3}\pi n r : \frac{2\pi n r c}{3g}$, and this centrifugal tendency of the particle A is $\frac{2\pi n r c}{3g}$. This is what is expressed by N O in our construction.

The whole difference between the gravitations of B and A is therefore $\frac{2}{15}\pi f x - \frac{2}{3}\pi q x + \frac{2\pi n r c}{3g}$. The gravitation of B is to this difference as $\frac{2}{3}\pi n r$ to $\frac{2}{15}\pi f x - \frac{2}{3}\pi q x + \frac{2\pi n r c}{3g}$ or (dividing all by $\frac{2}{3}\pi n$) as r to $\frac{f x}{5n} - \frac{q x}{n} + \frac{c r}{g}$.

Now the equilibrium of rotation requires that the whole polar force be to the sensible gravitation at the equator as the radius of the equator to the semiaxis. Therefore we must make the radius of the equator to its excess above the semiaxis as the polar gravitation to its excess above the sensible equatorial gravitation. That is, $r : x = r : \frac{f x}{5n} - \frac{q x}{n} + \frac{c r}{g}$, and therefore $x = \frac{f x}{5n} - \frac{q x}{n} + \frac{c r}{g}$. Hence we have $\frac{c r}{g} = x \times \frac{q x}{n} - \frac{f x}{5n}$. But $q = n - f$. Therefore $\frac{c r}{g} = x + \frac{n x}{n} - \frac{f x}{n} - \frac{f x}{5n}$, $= x + x - \frac{6 f x}{5n}$, $= 2x - \frac{6 f x}{5n} = x \times \left(2 - \frac{6 f}{5n}\right)$

Wherefore $x = \frac{c r}{g \times \left(2 - \frac{6 f}{5n}\right)}$, $= \frac{5 n c r}{g \times 10 n - 6 f}$, which is more conveniently expressed in this form $x = \frac{5 c r}{2 g} \times \frac{n}{5n - 3f}$. The species, or ellipticity of the spheroid, is $\frac{x}{r}$, $= \frac{5 c}{2 g} \times \frac{n}{5n - 3f}$.

Such then is the elliptical spheroid of hypothesis B; and we saw that, in respect of form, it is scarcely distinguishable from the figure which the mass will have when the fictitious force of the central matter gives place to the natural force of the dense spherical nucleus. This is true at least in all the cases where the centrifugal force is very small in comparison with the mean gravitation.

We must therefore take some notice of the influence which the variations of density may have on the form of this spheroid. We may learn this by attending to the formula

$$\frac{x}{r} = \frac{5 c}{2 g} \times \frac{n}{5n - 3f}.$$

The value of this formula depends chiefly on the fraction $\frac{n}{5n - 3f}$.

If the density of the interior parts be immensely greater than that of the surrounding fluid, the value of this fraction becomes nearly $\frac{1}{3}$, and $\frac{x}{r}$ becomes nearly $= \frac{c}{2g}$, and the ellipse nearly the same with what Hermann assigned to a homogeneous fluid spheroid.

If $n = 5f$; then $\frac{n}{5n - 3f} = \frac{5}{22}$; and in the case of the earth, $\frac{x}{r}$ would be nearly $= \frac{1}{508.6}$, making an equatorial elevation of nearly seven miles.

If $n = f$, the fraction $\frac{n}{5n - 3f}$ becomes $\frac{1}{2}$, and $\frac{x}{r} = \frac{5c}{4g}$, which we have already shewn to be suitable to a homogeneous spheroid, with which this is equivalent. The protuberance or ellipticity in this case is to that when the nucleus is incomparably denser than the fluid in the proportion of 5 to 2. This is the greatest ellipticity that can obtain when the fluid is not denser than the nucleus.

Between these two extremes, all other values of the formula

formula are competent to homogeneous ſpheroids of gravitating fluids, covering a ſpherical nucleus of greater denſity, either uniformly denſe or conſiſting of concentric ſpherical ſtrata, each of which is uniformly denſe.

From this view of the extreme caſes, we may infer in general, that as the incumbent fluid becomes rarer in proportion to the nucleus, the ellipticity diminiſhes. M. Bernouilli (Daniel), miſled by a gratuitous aſſumption, ſays in his theory of the tides, that the ellipticity produced in the aërial fluid which ſurrounds this globe will be 800 times greater than that of the ſolid nucleus; but this is a miſtake, which a juſter aſſumption of *data* would have prevented. The aërial ſpheroid will be ſenſibly leſs oblate than the nucleus.

It was ſaid that the value of the formula depended chiefly on the fraction $\frac{n}{5n-3f}$. But it depends alſo on the fraction $\frac{5c}{2g}$, increaſing or diminiſhing as c increaſes or diminiſhes, or as g diminiſhes or increaſes. It muſt alſo be remarked that the theorem $\frac{x}{r} = \frac{5c}{4g}$ for a homogeneous ſpheroid was deduced from the ſuppoſition that the eccentricity is very ſmall. When the rotation is very rapid, there is another form of an elliptical ſpheroid, which is in that kind of *equilibrium*, which, if it be diſturbed, will not be recovered, but the eccentricity will increaſe with great rapidity, till the whole diſſipates in a round flat ſheet. But within this limit, there is a kind of ſtability in the *equilibrium*, by which it is recovered when it is diſturbed. If the rotation be too rapid, the ſpheroid becomes more oblate, and the fluids which accumulate about the equator, having leſs velocity than that circle, retard the motion. This goes on however ſome time, till the true ſhape is overpaſſed, and then the accumulation relaxes. The motion is now too ſlow for this accumulation, and the waters flow back again towards the poles. Thus an oſcillation is produced by the diſturbance, and this is gradually diminiſhed by the mutual adheſion of the waters, and by friction, and things ſoon terminate in the reſumption of the proper form.

When the denſity of the nucleus is leſs than that of the fluid, the varieties which reſult in the form from a variation in the denſity of the fluid are much greater, and more remarkable. Some of them are even paradoxical. Caſes, for example, may be put, (when the ratio of n to f differs but very little from that of 3 to 5,) where a very ſmall centrifugal force, or very ſlow rotation, ſhall produce a very great protuberance, and, on the contrary, a very rapid rotation may conſiſt with an oblong form like an egg. But theſe are very ſingular caſes, and of little uſe in the explanation of the phenomena actually exhibited in the ſolar ſyſtem. The *equilibrium* which obtains in ſuch caſes may be called a *tottering equilibrium*, which, when once diſturbed, will not be again recovered, but the diſſipation of the fluid will immediately follow with accelerated ſpeed. Some caſes may be imagined, where there is a deficiency of matter in the centre, or even a hollow.

The chief diſtinction between the caſes of a nucleus covered with an equally denſe fluid, and a denſe nucleus covered with a rarer fluid, conſiſts in the difference between the polar and equatorial gravities; for we ſee that the difference in ſhape is inconſiderable. It has been ſhewn already that, in the homogeneous ſpheroid of ſmall eccentricity, the exceſs of the polar gravity above the ſenſible equatorial gravity is nearly equal to $\frac{gx}{5r}$ (for $r : \frac{1}{5}x = g : \frac{gx}{5r}$). When, in addition to this, we take into account the diminution c, produced by rotation, we have $\frac{gx}{5r} + c$ for the whole difference between the polar and the ſenſible equatorial gravity. But, in a homogeneous ſpheroid, we have $x = \frac{5cr}{4g}$. Therefore the exceſs of polar gravity in a homogeneous revolving ſpheroid is $\frac{c}{4} + e$ or $\frac{5c}{4}$. We may diſtinguiſh this exceſs in the homogeneous ſpheroid by the ſymbol E.

But, in hypotheſis B, the equilibrium of rotation requires that r be to x as g to $\frac{gx}{r}$, and the exceſs of polar gravity in this hypotheſis is $\frac{gx}{r}$. But we have alſo ſeen that in this hypotheſis $\frac{x}{r} = \frac{5c}{2g} \times \frac{n}{5n-3f}$. Therefore the exceſs of polar gravity in this hypotheſis is $\frac{5c}{2} \times \frac{n}{5n-3f}$. Let this exceſs be diſtinguiſhed by the ſymbol ε.

The exceſs of polar gravity muſt be greater than this in hypotheſis A. For, in that hypotheſis the equatorial gravity to the fluid part of the ſpheroid is already ſmaller. And this ſmaller gravity is not ſo much increaſed by the natural gravitation to the central matter, in the inverſe duplicate ratio of the diſtance, as it was increaſed by the fictitious gravity to the ſame matter, in the direct ratio of the diſtances. The ſecond of the three diſtinctions, between the gravitations of B and A, was $-\frac{qx}{n}$. This muſt now be changed into $+\frac{2qx}{n}$, where $-\frac{qx}{n}$ is repreſented by HI in *fig.* 72; and the exceſs, forming the compenſation for hypotheſis A, is repreſented by H L, nearly double of H I, and in the oppoſite direction, diminiſhing the gravitation of A. The difference of theſe two ſtates is $\frac{3qx}{n}$, by which the tendency of A to the central matter in hypotheſis A falls ſhort of what it was in hypotheſis B. Therefore, as $\frac{fx}{5n} - \frac{qx}{n} + \frac{cr}{g}$ is to $\frac{3qx}{n}$, ſo is the exceſs ε to a quantity ε', which muſt be added to ε, in order to produce the difference of gravities e, conformable to the ſtatement of hypotheſis A. Now, in hypotheſis B, we had $x = \frac{fx}{5n} - \frac{qx}{n} + \frac{cr}{g}$, and we may, without ſcruple, ſuppoſe x the ſame in hypotheſis A. Therefore $\varepsilon : \varepsilon' = x : \frac{3qx}{n}, = 1 : \frac{3q}{n}$, and $\varepsilon' = \varepsilon \times \frac{3q}{n} = \varepsilon \times \frac{3n-3f}{n}, = \frac{5c}{2} \times \frac{n}{5n-3f} \times \frac{3n-3f}{n}, = \frac{5c}{2} \times \frac{3n-3f}{5n-3f}$. Add to this ε, which is $\frac{5c}{2} \times \frac{n}{5n-3f}$, and we obtain for the exceſs e of polar gravity in hypotheſis A $= \frac{5c}{2} \times \frac{4n-3f}{5n-3f}$.

Let us now compare this exceſs of polar gravity above the

the ſenſible equatorial gravity in the three hypotheſes: 1st, A, ſuited to the fluid ſurrounding a ſpherical nucleus of greater denſity: 2d, B, ſuited to the ſame fluid, ſurrounding a central nucleus which attracts with a force proportional to the diſtance: and 3d, C, ſuited to a homogeneous fluid ſpheroid, or enclofing a ſpherical nucleus of equal denſity. Theſe exceſſes are

A $\frac{5c}{2} \times \frac{4n-3f}{5n-3f}$.

B $\frac{5c}{2} \times \frac{n}{5n-3f}$.

C $\frac{5c}{4}$, or $\frac{5c}{4} \times \frac{5n-3f}{5n-3f}$.

It is evident that the ſum of A and B is $\frac{5c}{2} \times \frac{5n-3f}{5n-3f}$, which is double of C, or $\frac{5c}{4} \times \frac{5n-3f}{5n-3f}$, and therefore C is the arithmetical mean between them.

Now we have ſeen that $\frac{5c}{2g} \times \frac{4n-3f}{5n-3f}$ expreſſes the ratio of the exceſs of polar gravity to the mean gravity in the hypotheſis A. We have alſo ſeen that $\frac{5c}{2g} \times \frac{n}{5n-3f}$ may ſafely be taken as the value of the ellipticity in the ſame hypotheſis. It is not perfectly exact, but the deviation is altogether inſenſible in a caſe like that of the earth, where the rotation and the eccentricity are ſo moderate. And laſtly, we have ſeen that the ſame fraction that expreſſes the ratio of the exceſs of polar gravity to mean gravity, in a homogeneous ſpheroid, alſo expreſſes its ellipticity, and that twice this fraction is equal to the ſum of the other two.

Hence may be derived a beautiful theorem, firſt given by M. Clairaut, that "the fraction expreſſing twice the ellipticity of a homogeneous revolving ſpheroid is the ſum of two fractions, one of which expreſſes the ratio of the exceſs of polar gravity to mean gravity, and the other expreſſes the ellipticity of any ſpheroid of ſmall eccentricity, which conſiſts of a fluid covering a denſer ſpherical nucleus."

If therefore any other phenomena give us, in the caſe of a revolving ſpheroid, the proportion of polar and equatorial gravities, we can find its ellipticity, by ſubtracting the fraction expreſſing the ratio of the exceſs of polar gravity to the mean gravity from twice the ellipticity of a homogeneous ſpheroid. Thus, in the caſe of the earth, twice the ellipticity of the homogeneous ſpheroid is $\frac{2}{115}$. A medium of ſeven compariſons of the rate of pendulums gives the proportion of the exceſs of polar gravity above the mean gravity $= \frac{1}{156}$. If this fraction be ſubtracted from $\frac{1}{115}$, it leaves $\frac{1}{89}$ for the medium ellipticity of the earth. Of theſe ſeven experiments, five are ſcarcely different in the reſult. Of the other two, one gives an ellipticity not exceeding $\frac{1}{335}$. The agreement in general is incomparably greater than in the forms deduced from the compariſons of degrees of the meridian. All the compariſons that have been publiſhed concur in giving a conſiderably ſmaller eccentricity to the terraqueous ſpheroid than ſuits a homogeneous maſs, and which is uſually called Newton's determination. It is indeed his determination, on the ſuppoſition of homogeneity; but he expreſsly ſays, that a different denſity in the interior parts will induce a different form, and he points out ſome ſuppoſititious caſes, not indeed very probable, where the form will be different. Newton has not conceived this ſubject with his uſual ſagacity, and has made ſome inferences that are certainly inconſiſtent with his law of gravitation.

That the protuberancy of the terreſtrial equator is certainly leſs than $\frac{1}{231}$ proves the interior parts to be of a greater mean denſity than the exterior, and even gives us ſome means for determining how much they exceed in denſity. For by making the fraction $\frac{5c}{2g} \times \frac{4n-3f}{5n-3f} = \frac{1}{180}$ as indicated by the experiments with pendulums, we can find the value of n.

The length of the ſeconds pendulum is the meaſure of the accelerating force of gravity. Therefore let l be this length at the equator, and $l + d$ the length at the pole. We have $\frac{5c}{2g} \times \frac{4n-3f}{5n-3f} = \frac{d}{l}$, whence $\frac{4n-3f}{5n-3f} = \frac{2gd}{5cl}$. This equation, when properly treated, gives $\frac{n}{f} = \frac{15cl - 6gd}{10cl - 10gd}$, &c. &c.

We have information very lately of the meaſurement of a degree, by major Lambton in the Myſore in India, with excellent inſtruments. It lies in lat. 12° 32′, and its length is 60494 Britiſh fathoms. We are alſo informed by Mr. Melanderhielm of the Swediſh academy, that the meaſure of the degree in Lapland, by Maupertuis, is found to be 208 toiſes too great. This was ſuſpected.

The ſame principles may be applied to any other planet as well as to this earth. Thus, we can tell what portion of the equatorial gravity of Jupiter is expended in keeping bodies on his ſurface, by comparing the time of his rotation with the period of one of his ſatellites. We find that the centrifugal force at his equator is $\frac{8}{53}$ of the whole gravity, and from the equation $\frac{5cr}{4g} = x$, we ſhould infer that if Jupiter be a homogeneous fluid or flexible ſpheroid, his equatorial diameter will exceed his polar axis nearly 10 parts in 113, which is not very different from what we obſerve; ſo much however as to authorize us to conclude that his denſity is greater near the centre than on his ſurface.

Theſe obſervations muſt ſuffice as an account of this ſubject. Many circumſtances, of great effect, are omitted, that the conſideration might be reduced to ſuch ſimplicity as to be diſcuſſed without the aid of the higher geometry. The ſtudent who wiſhes for more complete information muſt conſult the elaborate performances of Euler, Clairaut, D'Alembert, and La Place. The diſſertation of Thomas Simpſon on the ſame ſubject is excellent. The diſſertation of F. Boſcovich will be of great ſervice to thoſe who are leſs verſant in the fluxionary calculus, that author having every where endeavoured to reduce things to a geometrical conſtruction. To theſe we would add the Coſmographia of Friſius, as a very maſterly performance on this part of the ſubject.

Under the article DEGREE we gave a very ample extract from the account which Col. Mudge had publiſhed in the Philoſophical Tranſactions. This great operation has been ſince concluded by a continuation of the former arc, as far as Burleigh-moor, near the mouth of the Tees in the north of Yorkſhire. The whole amplitude meaſured is now 3° 57′ 13″.4. The particulars of this continuation have not yet been laid before the public, but they will ſoon be publiſhed by the Board of Ordnance. But the writer of this

article having, through the politeneſs of Col. Mudge, been favoured with the moſt important reſults relating to it, we have the ſatisfaction of being able to preſent them to our readers.

The bearings of the ſides of the triangles uſed in finding the meridional diſtance from Burleigh-moor to Dunnoſe, from the ſeveral parallels to the meridian of Burleigh-moor, will be as follows:

Greenhoe-moor from Burleigh-moor	9°	7′	2″	S.W.
Hemingbrough-ſpire from Greenhoe-moor - - -	5	35	45	S. E.
Clifton-beacon from Hemingbrough-ſpire - - -	24	50	42	S,W.
Hatherſedge from Clifton-beacon -	62	0	3	S.W.
Orpit from Hatherſedge - -	5	18	6	S. E.
Bardon-hill from Orpit - -	21	13	23	S. E.
Arbury-hill from Bardon-hill -	71	35	11	S. E.
Brill from Arbury-hill - -	12	22	34	S. E.
Whitehorſe-hill from Brill - -	50	24	0	S.W.
Highclere from Whitehorſe-hill -	27	39	53.5	S. E.
Butſer-hill from Highclere -	34	12	30.5	S. E.
Dunnoſe from Butſer-hill -	21	6	26	S.W.

Theſe bearings give the diſtances from the meridian of, and perpendicular at Burleigh-moor, as follows:

Greenhoe-moor from the meridian	9658.8	W.	60186.4
Hemingbrough-ſpire -	13145	E.	293404.2
Clifton-beacon - -	39203.2	W.	406462.9
Hatherſedge-beacon -	120635.6	W.	449759.8
Orpit - - -	111242.2	W.	550982.9
Bardon-hill - -	62248.2	W.	677661.5
Arbury-hill - -	38228.2	W.	856508.2
Brill - - -	6822.8	W.	999633.1
Whitehorſe-hill - -	119782.4	W.	1093081.4
Highclere - -	69376.7	W.	1189233.3
Butſer-hill - -	13847	E.	1311654.3
Dunnoſe - - -	36778	W.	1442802.9

In the Philoſophical Tranſactions of the Royal Society for the year 1793, the diſtance of Clifton-beacon (Beacon-hill) from the perpendicular to the meridian of Dunnoſe, is ſhewn to be 1036334.4 feet, and its diſtance from the ſame meridian is ſtated in the following page as being 4770 feet. If the calculation there ſpecified be carried from Clifton-beacon to Burleigh-moor, through the ſame triangles as uſed in determining the diſtance from Burleigh-moor to the point where a line from Dunnoſe parallel to the perpendicular cuts the meridian of that ſtation, we ſhall have the following bearings for computation, *viz.*

Clifton-beacon from Hatherſedge -	61°	52′	17″	N. E.
Hemingbrough-ſpire from Clifton-beacon - -	24	42	56	N. E.
Greenhoe-moor from Hemingbrough-ſpire - -	5	42	50.5	N.W.
Burleigh-moor from Greenhoe-moor	8	59	15	N. E.

Aſſuming the diſtance of Clifton-beacon from the meridian of Dunnoſe as above-mentioned to be 4470 feet, and from the perpendicular at that ſtation as 1036334.4 feet, we ſhall get

	Feet.		Feet.	
Hemingbrough-ſpire from the meridian	47323.7	E.	1149511.1	from the perpendr.
Greenhoe-moor from do.	23992.6	E.	1382676.6	
And Burleigh-moor	33514.8		1442884.7	

Now the latitude of Dunnoſe is $\frac{7}{17}''$ greater than the latitude of the point where the parallel from that ſtation cuts the meridian of Burleigh-moor $\frac{7}{17}''$ of a ſecond in the heavens, correſponds to 42 feet on the ſurface of the earth. Hence 1442802.9 + 42 = 1442845 feet may be taken for the diſtance between the parallels of Burleigh-moor and Dunnoſe, as derived from the firſt mode of calculation.

In like manner the latitude of Burleigh-moor being $\frac{11}{30}''$ leſs than the latitude of the point where a line from that ſtation parallel to the perpendicular at Dunnoſe cuts its meridian, we ſhall have 1442884.7 − 37.4 = 1442847.3 feet, for the diſtance between the parallels as determined by carrying up the calculations with the direction of the meridian obſerved at Dunnoſe in the year 1797. Theſe reſults differ ſomething more than two feet, and at a mean may be taken as 1442846 feet, to which, adding 6.5 feet, the diſtance of the ſtation from the point where the ſector was ſet up at Dunnoſe, we get 1442853.8 feet for the true meridional diſtance.

In the paper preſented to the Royal Society, and printed in the Philoſophical Tranſactions for the year 1803, giving an account of the meaſurement of an arc of the meridian, the difference of latitude between the parallels of Dunnoſe and Clifton, in Yorkſhire, is ſhewn to be 2° 50′ 23″.38; the terreſtrial ſubſtance of the arc being 1036337 feet. (See page 487 of the ſame volume.)

If the former operation as well as the preſent one be ſuppoſed correct, their reſults muſt be conſiſtent, unleſs we ſuppoſe the plumb line of the ſector at Burleigh-moor to have been affected by attraction, ariſing from the earth's unequal denſity, in a greater or leſs degree than at Clifton-beacon. Setting aſide the conſideration of elliptical arcs not being proportional to angles formed by the meeting of the verticals or interſections of the radii of curvatures at their extremities, yet, in the preſent caſe, the total arc not exceeding two degrees, we may uſe a ſtatement of ſimple proportion. Taking, therefore, the terreſtrial arc between Dunnoſe and Clifton as 1036337, and its ſubtenſe in the heavens as 2° 50′ 23″.38; and alſo the total meridional diſtance between the parallels of Dunnoſe and Burleigh-moor as 1442853.8 feet, we ſhall have 1036337 feet : 2° 50′ 23″.38 (10223″.38) :: 1442847.8 feet : 14233.6 = 3° 57′ 13″.6, the ſubtenſe of that arc, or the difference of latitude between thoſe parallels; but this arc has been found, by obſervation, to be 3° 57′ 13″.4, almoſt exactly the ſame as the computed reſult.

The length of the degree on the meridian at the middle point between Dunnoſe and Burleigh-moor, of which the latitude is 52° 34′ 45″, is 60822.6 fathoms. In the account of the former meaſurement, the length of the degree in 52° 2′ is ſtated to be 60820 fathoms, which is nearly the ſame. Were the earth an ellipſoid, and the diameter of its polar and equatorial axis in the ratio of 229 to 230, the degree in 52° 34′ ſhould be nearly 60830 fathoms, if the length of that in 52 be taken 60820.

From this paragraph commences the account of the meaſurement between the parallels of Blackdown, in Dorſetſhire, and Delamere-foreſt, in Cheſhire, the ſtation on Delamere-foreſt being nearly 10 miles eaſt from Cheſter.

When the great circular inſtrument was placed over the point at Delamere-foreſt, the direction of the meridian was obſerved. The bearing of the ſtaff at Kilſare, from the north meridian, was found, as may be ſeen from the obſervations made at that ſtation, to be 138° 1′ 31″. The angle between Aſhley-heath and the ſame ſtaff was alſo taken and ſeen to be 73° 24′ 7″.5. Theſe two angles give 31° 25′ 38″.5 for the ſouth-eaſt bearing of Aſhley-heath from the meridian of Delamere-foreſt with Blackdown, a principal ſtation in Dorſetſhire, gives the bearings of the following ſides from that meridian, *viz.*

Aſhley-

Ashley-heath from Delamere forest	31° 25′ 38″.5	S. E.
Brown-clay-hill from Ashley-heath	16 38 10	S W.
Malvern-hill from Brown-clay-hill	23 25 12	S. E.
Treleet-beacon from Malvern-hill	32 14 58.5	S.W.
Dundry-beacon from Treleet-beacon	6 37 9.75	S.E.
Mendip hill from Dundry-beacon	19 4 46	S. E.
Ash beacon from Mendip-hill -	3 28 51.75	S. E.
Mintern from Ash beacon -	5 22 58	S. E.
Blackdown from Mintern -	10 30 53.5	S.W.

These bearings, with their respective sides, give,

Ashley-heath from the meridian	67472.1	E. 110418.2	from the perpend.
Brownclay-hill from do.	19203.2	E. 279161.0	
Malvern-hill from do.	77902.2	E. 407476.5	
Treleet-beacon	5975.3	W. 538989.9	
Dundry-beacon	9628.2	E. 665692.9	
Mendip-hill	32246.2	E. 731085.9	
Ash-beacon	368962.2	E. 807525.7	
Mintern	42446.6	E. 866431.5	
Blackdown.	31546.3	E. 925158.5	

The parallel of Blackdown cuts the meridian of Delamere forest 30 feet farther southward than the parallel to the perpendicular, therefore 925158+30=925188.5 feet, is the correct distance between the parallels of latitude of the two stations.

The bearings of Minster, Ash-beacon, Mendip, and Dundry-beacon, from the parallels to the meridian and perpendicular at Blackdown, are given in the Philosophical Transactions for the year 1800.

If the calculation be carried on from the side of Dundry-beacon and Mendip, through the same series of triangles as before used, we shall have,

Treleet-beacon from Dundry-beacon	6° 1′ 26″	N.W.
Malvern-hill from Treleet beacon	32 20 43	N. E.
Brownclay-hill from Malvern-hill	23 19 27	N.W.
Ashley-heath from Brownclay-hill	16 43 55	N. E.
Delamere-forest from Ashley-heath	31 19 58	N.W.

These bearings, with their respective sides, and the distance from Dundry-beacon to the meridian and perpendicular, *viz* 21488 feet W. and 259503 feet, give

Treleet-beacon from the meridian.	35980.2	W. 386230.2	feet from the perp.
Malvern-hill	47221.4	E. 517612.2	
Brownclay-hill	11250.8	W. 653225.7	
Ashley-heath	37288.9	E. 814689.7	
Delamere-forest	30000.7	W. 925214.7	

From the meridional distance thus found (925214.7 feet) 34 feet must be subtracted, the perpendicular at Dunnose cutting the meridian 34 feet north of the parallel of Delamere forest, therefore, 925214.7 − 34 = 925180.7 feet for the corrected distance. By calculating with the bearings from Delamere-forest downwards, the distance has been found to be 925188.5 feet, giving a difference of 9 feet nearly, between the two results; the mean, 925184.6 feet, may be taken for the true meridional distance between the two stations.

The distance between the parallels of Blackdown and Dunnose is accurately 25005.3 feet, as proved in the Philosophical Transactions for 1800. Therefore, 925184.6 + 25005.3 = 950189.9 feet, is the true distance between the parallels of those stations.

Now we have portions of two meridians, springing from the same southern parallel, and running up the extent of 3° 57′ 13″.4, and the other of 2° 36′ 12″.2. If the surface of the earth, in the seat of our operations, be uniform in its meridional figure, the subtense of the arc, between Dunnose and Delamere-forest, should be nearly in the ratio of their amplitudes; this being the case, we shall have 1442853.8 feet (the meridional distance between Dunnose and Burleigh-moor) 3° 57′ 13″.6, its amplitude : : 950189.9 feet (the meridional distance between Dunnose and Delamere-forest) : 2° 36′ 13″.38 the amplitude of its arc. From the observations made at Delamere-forest, with the zenith sector, in 1806, combined with those at Dunnose in 1802, with the same instrument, it is found that the difference in latitude of those is 2° 36′ 12″.2, making a difference of 1″ nearly between the calculated and observed amplitudes, constituting a difference, setting aside the consideration of the spheroidal figure of the earth, of $\frac{1}{15}$ths of a second in one degree. Perhaps, under the consideration of each meridional line being obtained independently of each other, and admitting that neither of them can be measured with perfect accuracy together with the chance of the amplitudes being, in some small degree, either in excess or defect, we may consider the result as sufficiently consistent and satisfactory, and take 60823 fathoms, in the latitude of 52° 34′ (or the centre of England) as the length of one degree.

Amplitude of the arc comprised by the parallels of latitude of Dunnose and Burleigh-moor, near the mouth of the Tees, in the north of Yorkshire = 3° 57′ 13″.4.

Amplitude of the arc comprised by the parallels of latitude of Dunnose and Delamere-forest station = 2° 36′ 12″.2.

N. B. The observations made with the zenith sector at Burleigh-moor and Delamere-forest were numerous, and when reduced agreed well with each other.

Since writing the article DEGREE, we have been favoured by Mr. Troughton with a rule for placing the repeating circle exactly in the plane of two given objects, and which will be found extremely useful to such of our readers as may have occasion to use that excellent instrument.

Rule.—For placing the reflecting circle in the plane which passes through the eye of the observer, and the two objects whose angular distance is about to be taken.

First, set the tripod of the instrument with one of its feet-screws as near as you can guess in a line with that object, which of the two, you judge to be nearest the horizon; and with the plane of the circle vertical, and the lower telescope horizontal (both to the exactness of two or three minutes), bring the telescope to the object, partly by turning in azimuth, and partly by screwing or propping the foot-screw.

Next, turn the circle round upon the cross-axis of the stand, until it seems by the eye to occupy the proper position; and then, a second time bring the telescope to the object by the foot screw and turning in azimuth.

Lastly, complete the operation, by bringing the upper telescope to the other object, by its own proper motion, in conjunction with that of turning round the cross-axis.

The principle of the above rule is this; the cross-axis of the stand and lower telescope being made parallel, and pointed to the object; the circle may be turned round that axis without changing the angular position of the telescope.

EARTH, *Magnetism of.* All the observations, and all the experiments that have been made, concerning this grand natural agent, tend to prove, that all magnetism is derived from the earth; or, that the earth is the great and original magnet. Iron, which, if not the only one, is at least by far the principal metallic substance with which magnetism is concerned, has been liberally scattered by the hand of nature amongst its works. In all the intermediate states, from its most oxydated to its best metallic form, iron is to be met with

with in greater or leſs quantity in every part of the earth, from the ſurface to as great a depth as mankind has been able to penetrate. In great many places, vaſt maſſes of iron are found, which are in great meaſure magnetic; and out of which the natural magnets are obtained.

It can hardly be doubted, that the collected magnetical action of all theſe maſſes of iron, and of ferruginous bodies, forms the magnetic power of the earth; and that of courſe the earth, taking it altogether, muſt be conſidered as a complete, though heterogeneous, magnet.

If we compare the phenomena of this grand terreſtrial magnet with thoſe which are uſually exhibited by ſuch ſmall magnets as are in uſe amongſt philoſophers, the ſimilarity will be found ſo very great and ſtriking, as to leave no farther doubt with reſpect to their being exactly the ſame in kind, though vaſtly different in ſize. A ſmall magnetic needle, laid pretty near a larger magnet, diſpoſes itſelf in the direction of the poles of the latter; and alters its inclination, according as it is ſituated nearer to, or farther from, any one of thoſe poles. The compaſſes commonly uſed in navigation, and the dipping needles, which are nothing more than ſmall magnets laid near a large one (*viz.* the earth), ſhew exactly the ſame phenomena. The progreſſive variation of the magnetic needle upon the ſurface of the earth has been alleged as a peculiar phenomenon, which could not be imitated by laying a ſmall magnetic needle near a common magnet. But the cauſe of this is, that the ſmall magnets, which are uſually employed in philoſophical experiments, are not liable to thoſe alterations to which the earth is neceſſarily ſubject; and to which alterations the variation of the magnetic needle is moſt evidently owing. In fact, if a ſmall compaſs be laid within a moderate diſtance of a pretty large magnet, be it natural or artificial, and this magnet be ſubjected to the ſame alterations as the earth is ſubject to, the needle of the ſmall compaſs will be found to alter its direction accordingly. Theſe alterations principally are the action of one magnet upon another, the action of heat and cold, the effects of chemical compoſition and decompoſition, and a local derangement. The approximation of two or more magnets towards each other, or their ſeparation, produces a very conſiderable alteration in the powers of any one of them: and ſuch ſeparation or approximation may be eaſily conceived to be produced within the earth by the action of volcanoes, of earthquakes, &c. Mr. Canton ſhewed, in a moſt deciſive manner, that the action of a magnet is diminiſhed by heat, and increaſed by cold; upon which facts, Dr. Lorimer eſtabliſhed his rational hypotheſis of the variation. (See DECLINATION.) Mr. Cavallo's experiments, deſcribed in the fourth part of his "Treatiſe on Magnetiſm," ſhew that the action of acids, and particularly of the ſulphuric acid, upon iron, produces a remarkable alteration, with reſpect to its magnetic attraction. See MAGNETISM.

Reaſoning then upon theſe facts, we muſt naturally conclude, that ſince the body of the earth contains ferruginous bodies in various ſtates, ſituations, and ſizes; the magnetic needle muſt be directed by the united actions of all thoſe bodies. But as thoſe bodies are undergoing a continual alteration, ariſing from the viciſſitudes of heat and cold, from chemical action, and other cauſes, their united effects muſt act differently upon the needle at different times: whence the variation of its direction is derived. At Naples, the magnetic needle is generally agitated during an eruption of mount Veſuvius. To all theſe, we may add another cauſe of alteration in the direction of the magnetic needle, which is the *aurora borealis*; for, though we are as yet ignorant of the cauſe of that ſurpriſing phenomenon, yet is is certain that the magnetic needle is frequently diſturbed during the appearance of the *aurora borealis*.

Following the analogy between the phenomena of the earth and thoſe of ſmall magnets, it is well known, that when a piece of iron is brought within a certain diſtance of a magnet, the iron itſelf becomes inſtantly a magnet. The very ſame thing takes place when the earth is conſidered as the magnet. Thus, take a bar of ſoft iron, about two or three feet in length, and about an inch or two in thickneſs, (a common kitchen poker is very fit for the experiment,) and place it ſtraight up; or, which is much better, place it in the direction of the magnetical line, which is indicated by the dipping needle. Put a magnetic needle upon a pin, and, holding the pin in your hand, preſent the needle ſucceſſively to the various parts of the bar, from top to bottom, and you will find, that, in this iſland, the lower half of the bar is poſſeſſed of the north polarity, capable of repelling the north, and of attracting the ſouth, pole of the needle; and the upper half is poſſeſſed of the ſouth polarity, capable of repelling the ſouth, and of attracting the north, pole of the needle. The attraction is ſtrongeſt at the very extremities of the bar, where, if the bar be pretty long, it will even attract ſmall iron filings. It diminiſhes from the extremities towards the middle; and it vaniſhes at about the middle, where no one pole of the needle is attracted in preference to the other. In ſhort, in that ſituation, the iron bar is as much a magnet as any piece of iron that ſtands within the influence of a common magnet. If you turn the bar upſide down, that extremity of it which was poſſeſſed of a ſouth magnetic polarity, when it ſtood uppermoſt, will now become poſſeſſed of a north polarity; and the other extremity will become poſſeſſed of the ſouth polarity. In the ſouthern parts of the world, the lower part of the iron bar ſhews a ſouth polarity; or, in general, when in any part of the world the iron bar is ſituated in the magnetic line, each extremity of the bar will acquire the polarity correſpondent to the pole of the earth neareſt to it. When iron bars remain for a number of years in a ſituation nearly parallel to the magnetical line, they generally acquire a permanent magnetiſm; and ſuch is the caſe with curtain-irons, iron croſſes on the tops of churches, ſteeples, &c.

The only phenomenon, which has not been obſerved to take place with reſpect to the earth, and which is the moſt ſtriking property of a common magnet, is the attraction of a piece of iron. For inſtance, if a piece of iron be preſented to either of the poles of a common magnet, it will be powerfully attracted by it; but if it be preſented to the middle of the ſurface of the magnet, the attraction will be hardly perceptible, or next to nothing. Now, in conformity to this, it might be expected, that a piece of iron would be attracted more powerfully downwards, when near the poles of the earth, than when near the equator; and this attraction, being combined with the attraction of gravitation, ought to be manifeſted by the difference of the weights of the ſame piece of iron, when weighed near the poles, and when weighed near the equator: for, if the magnetic attraction of the earth upon it be at all ſenſible, the piece of iron ought to weigh more in the former caſe than in the latter. We are inclined to believe, that if this experiment were tried, with all the precautions which may be deemed neceſſary, it would be found to anſwer; *viz.* that the ſame piece of iron would be found to weigh more near the poles, and leſs near the equator.

The magnetic poles of the earth do not coincide with its aſtronomical poles, nor are they directly oppoſite to each other. But this is likewiſe the caſe with the common na-

tural

tural magnets, and even with moſt of the artificial ones; though, in the latter, the uniformity of the ſubſtance and of the ſhape may be carefully attended to. This diſpoſition of the poles evidently ariſes from the heterogeneous nature of the materials in the ſmall magnets, and eſpecially in the earth. It is owing to the ſame irregular diſpoſition of materials, that the lines of declination follow ſeveral odd and circuitous directions, as is ſhewn under the article DECLINATION *of the Magnetic Needle*. The hypotheſis of an internal magnet, or of two internal magnets, which were ſuppoſed to exiſt, and to move in a peculiar manner, within the body of the earth, and to which the variation of the needle was attributed, cannot poſſibly demand a formal refutation at the preſent time, when the concurrence of various facts and obſervations evidently ſhew its abſurdity.

The great queſtion is, whether the earth has only two magnetic poles, or more than two, as is the caſe with ſeveral irregular ſmall magnets; and, likewiſe, where are thoſe poles actually ſituated? But it is much to be regretted, that, in anſwer to this queſtion, we can offer nothing beſides conjectures.

With reſpect to the number of the poles, we may pretty well judge, (from the remarkable circumſtance that the lines of declination do not croſs each other,) that the earth has only two; *viz.* that on its northern parts there muſt be a magnetic polarity, which attracts the north pole of the magnetic needle; and on its ſouthern parts there muſt be a magnetic polarity, which attracts the ſouth pole of the needle. It is generally ſuppoſed, that thoſe magnetic poles lie on the ſurface of the globe; but if we attentively conſider the ſituation which they may more likely have, it will appear that, in all probability, they are not ſituated near the ſurface of this globe, but at ſome depth below it: at leaſt, this muſt be the caſe with the ſouth pole; for, ſince the water of the ſea is incapable of magnetiſm, and the ſouthern hemiſphere, eſpecially about the ſouth pole, contains a great deal more water than land, it is plain that the ſouth magnetic pole muſt be ſituated at leaſt near the bottom of the ſea: in conſequence of which, the variation of the needle in that hemiſphere muſt be different from what it would be, if the magnetic pole were ſituated on the ſurface of the terraqueous globe. The ſame obſervation may be made with reſpect to the ſituation of the north magnetic pole. Beſides this, we muſt alſo conſider the irregularities ariſing from the unequal and irregular ſituation of land and ſea; it being natural to conceive, that large tracts of land on one ſide of the magnetic needle will draw it away from the real meridian: whereas, a large ocean cannot produce any ſuch effect. This, however, is ſubject to a great deal of variety, ariſing from the nature of the land, the depth of the ſea, the nature of the ground at the bottom of the ſea, &c.

With reſpect to the latitudes and longitudes of the magnetic poles of the earth, we are ſtill leſs ſatisfactorily informed. Mr. Euler, in the "Memoirs of the Academy of Berlin," places the north magnetic pole in lat. 75°; Lemonnier, in his "Lois du Magnetiſme," places it in lat. 73°; Buffon places it in lat. 71°; La Lande places it in lat. 77° 4′; and Churchman of America places it in lat. 60°. The longitude of the above-mentioned pole, La Lande ſuppoſes to be 110° 35′ W. of Paris. But from the obſervations made at Hudſon's bay, the longitude of the ſame from Paris ſeems to be 86°, (a mean of the two is 98°). Euler makes it 115°; Buffon makes it 100°; and Lemonnier makes it only 50°.

The ſituation of the ſouth magnetic pole is ſtill more doubtful. Dr. Lorimer ſays, "It is very remarkable, that when captain Cook, in his ſecond voyage, croſſed the line of no declination, which paſſes through the continent of New Holland, the declination of his compaſs altered about 14° in two days' run: again, in his laſt voyage, though not ſo far ſouth, the alteration of the declination, in proportion to the diſtance, was greater than uſual near to that line. The dipping needle likewiſe ſhews a conſiderable degree of inclination upon this line. In ſhort, from various conſiderations, it would appear, that if this earth has the common properties of a natural magnet with only two poles, one of them muſt be ſituated in this line; and, though not within the 60° of latitude, as Mr. Euler imagined, yet it may poſſibly be found not far from the 70°. If, therefore, it appears practicable to fail to the 70° of ſouth latitude, or beyond it, about the meridian of Botany Bay, keeping in eaſt declination; and then to run weſtward, till the weſt declination becomes evident; if, at the ſame time, they have a dipping needle on board, that without much trouble could give the magnetic inclination at ſea with a tolerable degree of accuracy, and about a hundred weight of ſoft iron, with a good balance, I cannot help thinking that ſome curious diſcovery might be made.

"The ingenious Mr. Maupertuis, in his letter to the king of Pruſſia, on the advancement of the ſciences, among other curious articles, having mentioned a northern voyage, adds, "to obſerve the phenomena of the load-ſtone, on the very ſpot from whence it is ſuppoſed to draw its original influence." But ſuch voyages were not in the power of Frederick the Great. It is to our preſent gracious ſovereign, George III., that the world will ever be indebted for ſuch noble, extenſive, and diſintereſted undertakings. All acceſs to the north pole having been proved impracticable, by the voyages of lord Mulgrave and captain Cook, it now only remains to be determined, whether it is poſſible to come at the ſouth magnetic pole; which, for the reaſons already mentioned, ſeems at leaſt more probable, if it be judiciouſly attempted." Cavallo's Magnetiſm, p. 262, &c.

The laſt obſervations which need be added to this article relate to the various magnetic force in different parts of the earth, and at ſome height above it.

In theſe northern parts of the world, it has been obſerved that, *ceteris paribus*, the north end of a magnet is the ſtrongeſt; and the contrary is ſaid to be the caſe in the ſouthern parts of the earth. Thus, in the above-mentioned experiment of the bar of ſoft iron, which acquires magnetiſm from the earth, its lower extremity generally ſhews the ſtrongeſt power. Mr. Humboldt found, that the intenſity of the magnetic force increaſes from the equator to the poles, excepting trifling local irregularities. He found that the ſame compaſs, which at Paris performed 245 oſcillations in 10 minutes, performed not more than 211 in Peru; and it conſtantly varied in the ſame direction; *viz.* the number of the oſcillations always decreaſed in approaching the equator, and it always increaſed in advancing towards the north. (Journal de Phyſique, an. 13.) In an aeroſtatic voyage of Meſſrs. Guy Luſac, and Biot, performed in Auguſt, 1804, when they aſcended to the height of 13,124 Engliſh feet, it was obſerved that the magnetic property ſhewed no appreciable diminution from the ſurface of the earth to the above-mentioned height. Its action within thoſe limits was conſtantly manifeſted by the ſame effects, and according to the ſame laws. This was determined by the oſcillation of a magnetic needle.

EARTH, *Theory of the*. Under the article COSMOGONY we have given a concise abſtract of the opinions of the ancient

ancient philosophers concerning the universe, the bodies of which it consists, and the time and manner of their formation. These particulars are also detailed, with some variety and amplification, under the biographical articles of the most eminent philosophers of antiquity and the denominations by which their respective systems are distinguished. Under the article CHAOS, we have briefly recited the sentiments of several ancient and modern philosophers, concerning the primitive state of the earth, and under the article CREATION, we have given the scriptural account of its formation into an habitable globe. We proposed in this place to detail the modern theories of the earth, commencing with that of Des Cartes; but we have already, in some degree, anticipated our intention by the statements, which we were under a necessity of introducing under the article DELUGE, for the purpose of illustrating the causes and effects of that memorable catastrophe. It now remains that we should supply what is wanting, in order to render our account of the different theories of the earth as complete as the nature and limits of this work will allow.

In the terraqueous globe some writers have distinguished three parts or regions, *viz.* 1. The external part or crust, which is that from which vegetables arise, and animals are nourished. 2. The middle, or intermediate part, which is possessed by fossils, extending farther than human labour has ever yet penetrated. 3. The internal, or central, part, which is unknown to us, though many authors have supposed it to be of a magnetic nature; by others, it has been conjectured to be a mass, or sphere of fire; by others, an abyss, or collection of waters, surrounded by the strata of earth; and by others, a hollow, empty space, inhabited by animals, who have their sun, moon, planets, and other conveniencies within the same. Others divide the body of the globe into two parts, *viz.* the external part, which they call the cortex, including the whole depth or mass of the strata of the earth; and the internal, which they call the nucleus, being of a different nature from the former, and possessed of fire, water, or the like; but it is needless to dwell on these fanciful conjectures.

The figure of the earth has been already ascertained, and described under a preceding article (see EARTH, in *Astronomy*); and here it will be sufficient to observe, that the natural cause of this figure is, according to sir Isaac Newton, the great principle of attraction, which the Creator has assigned to all the matter of the universe; and by which, whatever be its precise origin or the intermediate instruments of its operation in subordination to the energy of the Deity, all bodies, and all the parts of bodies, mutually attract one another. In conformity to the operation of this principle of gravity combined with the diurnal rotation of the earth on its axis, our globe, like other planetary bodies, similarly circumstanced, is higher under the equator than at the poles; so that its figure is nearly that of an oblate spheroid, swelling out towards the equatorial parts, and flattened, or contracted, towards the poles. If the earth was originally in a fluid state, or composed of yielding materials, its revolution round its axis would necessarily make it assume such a figure; because the centrifugal force being greatest towards the equator, the parallels of diurnal rotation increasing towards this limit, the fluid, or yielding matter, would there rise and swell most: and that its figure really should be so now, seems necessary, in order to keep the sea in the equinoctial regions, from overflowing the earth about these parts.

The external part of the globe either exhibits inequalities, as mountains or vallies; or it is plain and level; or dug in channels, fissures, beds, &c. for rivers, lakes, seas, &c. These inequalities in the face of the earth are supposed, by most naturalists, to have arisen from a rupture or subversion of the earth by the force either of the subterraneous fires or waters. The earth, in its natural and original state, Des Cartes, and after him Burnet, &c. (see the sequel of this article) suppose to have been perfectly round, smooth, and equable; and they account for its present rude and irregular form principally from the great deluge. In the external, or cortical part of the earth, we discover various strata, which are supposed by some to have existed in the primitive earth, and which others have ascribed to the sediments of various floods; the waters of which being replete with materials of different kinds, as they dried up or oozed through, deposited these various matters, which in time hardened into strata of stone, sand, coal, clay, &c.

The Aristotelian philosophy, with regard to the universe (for an account of which, see ARISTOTLE, PERIPATETICS, and also COSMOGONY) was superseded by that of Des Cartes, which was, in fact, a revival of the Atomic (see ATOMIC,) or that of DEMOCRITUS and EPICURUS, with some corrections and emendations. (See CARTES and CARTESIAN.) This of course was supplanted by the NEWTONIAN system. (See NEWTON and NEWTONIAN.) It is hardly necessary to observe, that the Cartesian cosmogony was somewhat modified by Mr. Hutchinson, who attempted to graft his on the authority of revelation, literally interpreted. The subordinate agents in his cosmogony were fire, light, and air; the operations of which he and his followers have unsuccessfully endeavoured to explain and to accommodate to the system of nature.

Some of the principal difficulties that occur in forming a satisfactory theory of the earth are those that relate to its figure, the distribution of its water, the origin and permanence of its mountains, the disposition of its internal strata, and the introduction of vegetable and marine productions, such as leaves, &c. and shells into the most solid rocks of marble and limestone.

The *first* theory we shall mention, is that of Mr. Thomas Burnet, who was a man of genius and taste, and who was the first who treated of this subject in a systematic manner, in his "Telluris Theoria sacra, &c." published at London in the year 1680. Under the splendour of his conceptions and the elegance of his style, he has had the art to conceal feeble arguments, and erroneous principles of philosophy. His work, though it acquired great reputation, was criticised by many of the learned, and particularly by Keill, in a treatise, entitled "An Examination of the Theory of the Earth." Burnet supposes that the primeval earth was a fluid mass, composed of heterogeneous materials, the heaviest of which descended to the centre, and there formed a hard and solid body. The water was collected round this body, and all lighter fluids, particularly the air, ascended above the water or encompassed the whole. Between the orbs of water and air was interposed an oily matter, upon which the impure earthy particles, blended with the air, descended, and formed with it a crust of earth and oil. This crust was the first habitable part of the earth, and the abode of men and other animals. The earth in this state had no variety of seasons, because its equator was supposed to be coincident with the plane of the ecliptic. The soil, formed in the manner above stated, was light and rich, and adapted to the various purposes of vegetation. The surface of the earth was level and uniform, without mountains, seas, or other inequalities. In this state it remained about 16 centuries; till by degrees the heat of the sun dried the forementioned crust, and produced at first superficial and afterwards deeper fissures, so as thoroughly to penetrate it. The earth at

length was rent in pieces, and the waters gushed out, with such force and in such abundance, as to overwhelm the dry land and occasion the universal deluge. After a certain period the water subsided into the cavities that were left between the solid masses of earth; and as these cavities were filled with water, the earth appeared in the most elevated parts, and the lower parts or valleys were occupied by the water, which formed the ocean. See DELUGE.

This theory, announced in England by Burnet, is said to have been first communicated by Francesco Patrizio, a professor at Ferrara and Rome, above a century before, in a dialogue, entitled "Il Lamberto." M. Buffon has not unaptly styled this theory an elegant romance; the product of mere imagination, and unsupported by any observed phenomena.

About the same time the celebrated Leibnitz published, in the Leipsic Transactions, a sketch of an opposite system, under the title of "Protogæa." According to this writer, the earth, and also the other planets, were originally fixed and luminous stars, which, after burning for many ages, were extinguished from a deficiency of combustible matter, and became opake bodies. The fire, by fusion of the matter composing the earth, produced a vitrified crust; so that the basis of all terrestrial bodies is glass, of which sand and gravel are the fragments. The other species of earth resulted from a mixture of sand with water and fixed salts; and, when the crust had cooled, the moist particles, which had been elevated in the form of vapour, fell down and formed the ocean. These waters at first covered the whole surface, and even overtopped the highest mountains: and the author alleges that the shells and other spoils of the ocean, which every where abound, are indelible proofs of the sea's having formerly covered the earth. This theory, though ingenious, is altogether hypothetical, and inapplicable to the present state of the earth.

The signal changes that have taken place on the surface of the earth were long ago ascribed by Xanthus, the Lydian, to earthquakes and subterraneous fires, which have from time to time elevated and depressed the bed of the sea, which is thus rendered very unequal; and thus he accounted for the immense quantities of shells and fossils, found on the summits of the highest mountains. Our countryman, Ray, revived this opinion, in his "Physico-Theological Discourses," published in the year 1692. This author supposes that the waters, which originally overflowed the earth, gradually subsided, that dry land first appeared in the territories that are adjacent to the spots inhabited by the progenitors of our race immediately after their creation: and that, as it extended itself by degrees, a considerable time elapsed before the waters had retired to their proper beds. During this interval, the shell-fish having multiplied, were universally distributed by the agitation of the waters; and when the bottom of the sea was raised by the earthquakes which accompanied the deluge, and formed the mountains, beds of marine productions were thrown up along with it.

For an account of Dr. Woodward's theory, we refer to the article DELUGE.

Mr. Whiston, who published his "New Theory of the Earth," at London, in 1708, begins with an account of the creation of the world; and he alleges, probably not without reason, (see CREATION,) that the description of Moses, in the first chapter of Genesis, is not an exact, or philosophical account of the creation and origin of the universe; but only an historical narrative of the formation of the terrestrial globe. The earth, in his estimation, formerly existed in a chaotic state; and at the time mentioned by Moses, it merely received a form, situation, and consistence, suitable to the habitation of mankind. Accordingly, he says, that the primitive earth was an uninhabitble comet, subject to such alternations of heat and cold, that its constituent matter, being sometimes liquefied and sometimes frozen, was in the form of a chaos, or an abyss, surrounded with utter darkness; so that as the sacred writer says, *darkness covered the face of the deep*. This chaos (see CHAOS) was the atmosphere of the comet, a body composed of heterogeneous materials, in the centre of which was a globular, solid, hot nucleus, about 2000 leagues in diameter. This was an extensive mass of a dense fluid, the various materials of which were agitated and blended in the utmost confusion. Such he conceives to have been the condition of the earth at the era of the creation. But in proportion as the eccentricity of the comet's orbit decreased, and it became more nearly circular, the materials of the circumambient fluid arranged themselves according to their specific gravities, and formed the earth, the water, and the air. Thus the immense volume of chaos was reduced to a sphere of moderate magnitude, including the unchanged central nucleus, which retained its primeval heat, which the author calculates may continue 6000 years. An earthy substance, consisting of the heavier parts of the chaotic atmosphere, mixed with aqueous particles, encompassed the central globe of fire, and was enclosed by a body of water, round which was formed the crust of earth destined to be the habitation of mankind. On this crusted surface there were irregularities, composed of the heaviest parts of the earth, which sunk deeply into the subjacent fluid, and formed plains and valleys; whilst those of less weight remained at a greater elevation, and constituted mountains. We shall here observe, that, according to Mr. Whiston, the annual motion of the earth commenced when it received its new form; but that its diurnal motion was not given to it till the fall of Adam; that the ecliptic intersected the tropic of Cancer in a point precisely opposite to the situation of Paradise, which lay on the N.W. frontier of Assyria; that, before the deluge, the year began at the autumnal equinox, and that the orbits of the earth and planets were then perfect circles; that the deluge commenced in the manner related under that article, on the 18th of November, in the year of the Julian period 2365, or 2349 B. C., and that before the deluge, the solar and lunar year were the same, and consisted of exactly 360 days, but that the figure of the earth was changed from that of a sphere into a spheroid. This latter effect was produced by the centrifugal force resulting from the diurnal motion of the earth, and by the attraction of the comet; for the earth, when passing through the tail of the comet, was so situated, that its equatorial parts were nearest to it; and, of course, the comet's attraction, concurring with the earth's centrifugal force, elevated the equatorial regions with the greater facility; because the crust was broken in an infinite number of places, and because the flux and reflux of the abyss pushed more violently against the equator than any where else. In accounting for the changes, which the earth has undergone in consequence of the deluge, Mr. Whiston adopts Woodward's theory, and coincides with him in his remarks on the present state of the earth.

In 1729, M. Bourguet projected a theory of the earth, but did not live to execute the system which he had planned. The fundamental propositions of his theory were the following: that the earth was formed at once, and not successively;—that its figure and disposition demonstrate, that it was formerly in a fluid state;—that the present condition of the earth is very different from what it was for some ages after its first formation;—that the matter of the globe was originally

originally ſofter than after its ſurface was changed ;—that the condenſation of its ſolid parts diminiſhed gradually with its velocity ; ſo that after a certain number of revolutions round its axis, and round the ſun, its original ſtructure was ſuddenly diſſolved ;—that this happened at the vernal equinox ;—that the ſea-ſhells inſinuated themſelves into the diſſolved matters ;—that the earth, after this diſſolution, aſſumed its preſent form ;—and that, as ſoon as the fire, or heat, operated upon it, its conſumption gradually begun, and, at ſome future period, it will be blown up with a dreadful exploſion, accompanied with a general conflagration, which will augment the atmoſphere, and diminiſh the diameter of the globe ;—and then the earth, inſtead of ſtrata of ſand, or clay, will conſiſt only of beds of calcined materials, and mountains compoſed of amalgams of different metals.

In 1740, Lazaro Moro, an Italian geologiſt, publiſhed a work at Venice, in which he partially adopts the hypotheſis of Ray. His profeſſed deſign was to account for the remains of marine animals found in mountains at a diſtance from the ſea. With this view, he conjectured, that the earth, in general, and its mountains in particular, were elevated from the bottom of the ſea by the force of ſubterraneous fires, which began to burn ſoon after the creation. At firſt a portion of land was raiſed up, in which no ſhells are found, as the ocean had not then been ſtocked with fiſh. Afterwards, large quantities of ſhells and other marine ſubſtances were thrown up with the ſoil, and diſpoſed in ſtrata, according to their ſpecific gravity. But how the ſtrata were conſolidated, and the ſhells were found in the ſtrata mineralized, he has not informed us. Mr. Raſpe, in his "Specimen Hiſtoriæ Naturalis Globi Terraquei," publiſhed at Leipzic, A. D. 1763, inclines to the hypotheſis of Moro.

For other theories by Scheuchzer, Steno, Hooke, De La Pryme, &c. &c. we refer to the article DELUGE.

The theory of M. Buffon next claims our particular notice. The author has embelliſhed it with the beauties of language, and rendered it plauſible and intereſting, by an elaborate diſcuſſion of the arguments, which he alleges in ſupport of it, and of the objections which he conceived might be urged againſt it. We can only preſent to view ſome of its moſt prominent features, and refer thoſe, who wiſh for further ſatisfaction and amuſement, to his own account of it. The earth, and alſo the other planets, were, according to the hypotheſis of M. Buffon, portions of the body of the ſun, which were detached from it by the oblique ſtroke of a comet. Theſe maſſes of igneous particles, iſſuing from the ſun in the form of torrents and not of globes, and afterwards aſſuming a globular figure by the mutual attraction of their parts, receded from it with an accelerated motion to ſuch a diſtance, as to admit of their acquiring a circular, or elliptical movement round the ſun. Their revolutions on their axes he aſcribes to the obliquity of the original ſtroke impreſſed by the comet. By means of the rotatory motion of the earth, on its axis, and of the fluidity of the matter, of which it conſiſted at its firſt formation, it acquired the figure of an oblate ſpheroid. The earth, being removed to a conſiderable diſtance from the ſun, gradually cooled ; and the vapours, which in their expanded ſtate reſembled the tail of a comet, condenſed by degrees, and fell down in the form of water upon the ſurface. The water depoſited a ſlimy ſubſtance, mixed with ſulphur and ſalts, part of which was carried, by the motion of the waters, into the perpendicular fiſſures of the ſtrata, and produced metals, and the reſt remaining on the ſurface gave riſe to the vegetable mould, which abounds in different places, with more or leſs of animal or vegetable particles, the organization of which is not obvious to the ſenſes. The interior parts of the globe were originally compoſed of vitrified matter, which the author apprehends to be their preſent ſtate. Above this vitrified matter were placed thoſe bodies, which the fire had reduced to the ſmalleſt particles, as ſands, which are merely portions of glaſs ; and above theſe pumice ſtones and the ſcoriæ of melted matter, which produced the different clays. The whole was covered with water to the depth of 500 or 600 feet, which originated from the condenſation of the vapours, when the earth began to cool. This water depoſited a ſtratum of mud, mixed with all thoſe matters, which are capable of being ſublimed, or exhaled by fire ; and the air was formed of the moſt ſubtle vapours, which, from their levity, roſe above the water. "Such," ſays our author, "was the condition of the earth, when the tides, the winds, and the heat of the ſun, began to introduce changes on its ſurface. The diurnal motion of the earth, and that of the tides, elevated the waters in the equatorial regions, and neceſſarily tranſported thither great quantities of ſlime, clay, and ſand ; and, by thus elevating thoſe parts of the earth, they, perhaps, ſunk thoſe under the poles about two leagues, or the 230th part of the whole : for the waters would eaſily reduce into powder pumice ſtones, and other ſpongy parts of the vitrified matter upon the ſurface ; and thus excavate ſome places and elevate others, which, in time, would produce iſlands and continents, and all thoſe inequalities on the ſurface, which are more conſiderable towards the equator, than towards the poles. Indeed, both the land and ſea have moſt inequalities between the tropics, as is evident from the incredible number of iſlands peculiar to thoſe regions."

In order to accommodate his theory to the preſent ſtate of the globe, he ſurveys and recounts the phenomena which it exhibits, and the parts of which it conſiſts, in their various diſpoſitions and arrangements, as far as our obſervation is capable of being extended.

The ſurface of this immenſe globe exhibits to our obſervation, heights, depths, plains, ſeas, marſhes, rivers, caverns, gulfs, and volcanoes, "without any apparent order in the diſpoſition of them." Upon penetrating into the bowels of the earth, we diſcover metals, minerals, ſtones, bitumens, ſands, earth, waters, and every kind of matter, placed, as it were, by accident, and without any obvious deſign. After a more accurate inſpection, we find ſunk mountains, caverns filled up, ſhattered rocks, whole countries ſwallowed up, new iſlands emerged from the ocean, heavy ſubſtances placed above light ones, and hard bodies incloſed in ſoft ones ; all of them blended in confuſion, and forming a chaos, that reſembles the ruins of a world.

In examining the bottom of the ſea, this author ſays, we perceive it to be equally irregular with the ſurface of the dry land, preſenting to our notice hills and valleys, plains and hollows, rocks and earths of every kind. Iſlands are obſerved to be the ſummits of vaſt mountains ; and other mountains have their tops nearly on a level with the ſurface of the ocean. In the ſea are likewiſe diſcovered currents, which flow rapidly in various directions. We likewiſe perceive numerous agitations and convulſions in the ocean, which are owing to volcanoes, whoſe mouths, though ſituated many fathoms below the ſurface, vomit forth torrents of fire. In other parts we diſcern ſmooth and calm regions, which, nevertheleſs, are equally dangerous to the mariner. The bottom of the ocean, and the ſhelving ſides of rocks, produce many ſpecies of plants in great abundance as well as variety. Its ſoil conſiſts of ſand, gravel, rocks, and ſhells ; in ſome places a fine clay, in others a compact earth. Upon the whole, the bottom of the ſea exactly reſembles the dry land which we inhabit.

In

In a ſurvey of the dry land our author finds, that the great chains of mountains lie nearer to the equator than to the poles; that thoſe of the old continent tend more from eaſt to weſt than from ſouth to north, and in the new continent they have a contrary direction. He obſerves, that the eminent angles of one mountain are conſtantly oppoſite to the concave angles of the neighbouring mountains, and that they are of equal dimenſions; whether they be ſeparated by an extenſive plain or a ſmall valley. Oppoſite hills, he obſerves, are nearly of the ſame height; and mountains generally occupy the middle of continents, iſlands and promontories dividing them by their greateſt length. The direction of the principal rivers is nearly perpendicular to the coaſts of the ſeas, into which they diſcharge themſelves; and during the greateſt part of their courſe they follow the direction of the mountains from which they ſpring. The ſea-coaſts are generally bordered with rocks of marble and other hard ſtones; or, rather, with earth and hard accumulated by the waters of the ſea, or depoſited by rivers. On oppoſite coaſts, ſeparated by ſmall intervals of ſea the different ſtrata or beds of earth are compoſed of the ſame materials. Volcanoes, ſays our author, never exiſt but in very high mountains; ſome are extinguiſhed; and ſome are connected with others by ſubterraneous paſſages, and their eruptions frequently happen at the ſame time. Lakes and ſeas communicate with one another in a ſimilar manner. Mediterranean or inland ſeas receive large ſupplies of water from many large rivers without any augmentation of their bounds; and, therefore, probably diſcharge part of their ſupply by ſubterraneous paſſages.

In the proſecution of his inquiry and examination, our author finds that the upper ſtratum of the earth is univerſally the ſame ſubſtance; that this ſubſtance, from which all animal and vegetable ſubſtances derive their nouriſhment, is merely a compoſition of the decayed parts of animal and vegetable bodies, reduced into particles ſo ſmall, that their former organic ſtate is not diſtinguiſhable. Upon a deeper penetration he finds the real earth, beds of ſand, brimſtone, clay, ſhells, marble, gravel, chalk, &c. Theſe beds are parallel to one another, and of the ſame thickneſs. In neighbouring hills, beds or ſtrata of the ſame materials are uniformly found at the ſame levels, however the hills may be ſeparated. Strata of every kind, even of the moſt ſolid rocks, are uniformly divided by perpendicular fiſſures. Shells, ſkeletons of fiſhes, marine plants, &c. are often found in the bowels of the earth, and on the tops of mountains, even at the greateſt diſtance from the ſea: and theſe ſhells, fiſhes, and plants, are exactly ſimilar to thoſe which exiſt in the ocean. Petrified ſhells are found every where in great quantities, not only included in rocks of marble and lime-ſtone, as well as in earths and clays, but actually incorporated and filled with the ſubſtances in which they are incloſed. Upon the whole he concludes, from repeated obſervations, that marbles, lime-ſtones, chalks, marles, clays, and ſands, and almoſt all terreſtrial ſubſtances, wherever ſituated, are full of ſhells and other ſpoils of the ocean.

From this ſurvey, all the particulars of which we cannot enumerate, Mr. Buffon deduces the following concluſions, *viz.*

The changes which the earth has undergone during the laſt two or three thouſand years are inconſiderable, when compared with the great revolutions which muſt have happened in thoſe ages that immediately ſucceeded the creation. For, as terreſtrial ſubſtances could only acquire ſolidity by the continued action of gravity, it is eaſy to demonſtrate, that the ſurface of the earth was at firſt much ſofter than it is now; and, conſequently, that the ſame cauſes, which at preſent produce but ſlight and almoſt imperceptible alterations during the courſe of many centuries, were then capable of producing very great revolutions in a few years. It appears indeed, to be an incontrovertible fact, that the dry land which we now inhabit, and even the ſummits of the higheſt mountains, were formerly covered with the waters of the ſea; for ſhells, and other marine bodies, are ſtill found upon the very tops of mountains. It likewiſe appears, that the waters of the ſea have remained for a long ſeries of years upon the ſurface of the earth; becauſe, in many places, ſuch immenſe banks of ſhells have been diſcovered, that it is impoſſible ſo great a multitude of animals could exiſt at the ſame time. This circumſtance ſeems likewiſe to prove, that, although the materials on the ſurface of the earth were then ſoft, and, of courſe, eaſily diſunited, moved, and tranſported, by the waters; yet theſe tranſportations could not be ſuddenly effected. They muſt have been gradual and ſucceſſive, as ſea-bodies are ſometimes found more than 1000 feet below the ſurface. Such a thickneſs of earth or of ſtone could not be accumulated in a ſhort period. Although it ſhould be ſuppoſed, that, at the deluge, all the ſhells were tranſported from the bottom of the ocean, and depoſited upon the dry land; yet, beſide the difficulty of eſtabliſhing this ſuppoſition, it is clear, that, as ſhells are found incorporated in marble and in the rocks of the higheſt mountains, we muſt likewiſe ſuppoſe, that all theſe marbles and rocks were formed at the ſame time, and at the very inſtant when the deluge took place; and that, before this grand revolution, there were neither mountains, nor marbles, nor rocks, nor clays, nor matter of any kind, ſimilar to what we are now acquainted with, as they all, with few exceptions, contain ſhells, and other productions of the ocean. Beſides, at the time of the univerſal deluge, the earth muſt have acquired a conſiderable degree of ſolidity, by the action of gravity for more than ſixteen centuries. During the ſhort time the deluge laſted, therefore, it is impoſſible that the waters ſhould have overturned and diſſolved the whole ſurface of the earth, to the greateſt depths that mankind have been able to penetrate.

It is certain, that the waters of the ſea have, at ſome period or other, remained for a ſucceſſion of ages upon what we now know to be dry land; and, conſequently, that the vaſt continents of Aſia, Europe, Africa, and America, were then the bottom of an immenſe ocean, replete with every thing which the preſent ocean produces. It is likewiſe certain, that the different ſtrata of the earth are horizontal and parallel to each other. This parallel ſituation muſt, therefore, be owing to the operation of the waters, which have gradually accumulated the different materials, and given them the ſame poſition that water itſelf invariably aſſumes. The horizontal poſition of ſtrata is almoſt univerſal: in plains, the ſtrata are exactly horizontal. It is only in the mountains that they are inclined to the horizon; becauſe they have originally been formed by ſediments depoſited upon an inclined baſe. Theſe ſtrata muſt have been gradually formed, and they are not the effect of any ſudden revolution; becauſe nothing is more frequent than ſtrata compoſed of heavy materials placed above light ones, which never could have happened, if, according to ſome authors, the whole had been blended and diſſolved by the deluge, and afterwards precipitated. On this ſuppoſition every thing ſhould have had a different aſpect from what now appears. The heavieſt bodies ſhould have deſcended firſt, and every ſtratum ſhould have had a ſituation correſponding to its ſpecific gravity. In this caſe, we ſhould not have ſeen ſolid rocks or metals placed above light ſand, nor clay under coal.

Another circumſtance demands our attention. No cauſe

but the motion and ſediments of water could poſſibly produce the regular poſition of the various ſtrata of which the ſuperficial part of this earth is compoſed. The higheſt mountains conſiſt of parallel ſtrata, as well as the loweſt valleys. Of courſe, the formation of mountains cannot be imputed to the ſhocks of earthquakes, or to the eruptions of volcanoes. Such ſmall eminences, as have been raiſed by volcanoes or convulſions of the earth, inſtead of being compoſed of parallel ſtrata, are mere maſſes of weighty materials blended together in the utmoſt confuſion. But this parallel and horizontal poſition of ſtrata muſt neceſſarily be the operation of a uniform and conſtant cauſe.

We are, therefore, authoriſed to conclude, ſays our author, from repeated and incontrovertible facts and obſervations, that the dry and habitable part of the earth has for a long time remained under the waters of the ſea, and muſt have undergone the ſame changes which are at preſent going on at the bottom of the ocean.

The ocean, from the creation of the ſolar ſyſtem, has been conſtantly ſubject to a regular flux and reflux. Theſe motions, which happen twice in twenty-four hours, are principally occaſioned by the action of the moon, and are greater in the equatorial regions than in other climates. The earth likewiſe performs a rapid motion round its axis, and, conſequently, has a centrifugal force, which is alſo greateſt at the equator. This laſt circumſtance, independent of actual obſervations, proves, that the earth is not a perfect ſphere, but that it muſt be more elevated under the equator than at the poles. From theſe two combined cauſes, the tides, and the motion of the earth, it may be fairly concluded, that although this globe had been originally a perfect ſphere, its diurnal motion, and the ebbing and flowing of the tides, muſt neceſſarily, in a ſucceſſion of time, have elevated the equatorial parts, by gradually carrying mud, earth, ſand, ſhells, &c. from other climates, and depoſiting them at the equator. On this ſuppoſition, the greateſt inequalities on the ſurface of the earth ought to be, and, in fact, are found in the neighbourhood of the equator. Beſides, as the alternate motion of the tides has been conſtant and regular ſince the exiſtence of the world, is it not evident, that, at each tide, the water carries from one place to another a ſmall quantity of matter which falls to the bottom as a ſediment, and forms thoſe horizontal and parallel ſtrata that every where appear? The motion of the waters, in the flux and reflux, being always horizontal, the matter tranſported by them muſt neceſſarily take the ſame parallel direction after it is depoſited.

To this reaſoning, it may be objected, that, as the flux is equal to, and regularly ſucceeded by, the reflux, the two motions will balance each other; or, that the matter brought by the flux will be carried back by the reflux; and, conſequently, that this cauſe of the formation of ſtrata muſt be chimerical, as the bottom of the ocean can never be affected by a uniform alternate motion of the waters; far leſs could this motion change its original ſtructure, by creating heights, and other inequalities.

But, in the firſt place, as the author replies, the alternate motion of the waters is by no means equal; for the ſea has a continual motion from eaſt to weſt: beſides, the agitations occaſioned by the winds produce great inequalities in the tides. It will likewiſe be acknowledged, that, by every motion in the ſea, particles of earth, and other materials, muſt be carried from one place, and depoſited in another; and that theſe collections of matter muſt aſſume the form of parallel and horizontal ſtrata. Farther, a well-known fact will entirely obviate this objection. On all coaſts, where the ebbing and flowing are diſcernible, numberleſs materials are brought in by the flux, which are not carried back by the reflux. The ſea gradually increaſes on ſome places, and recedes from others, narrowing its limits, by depoſiting earth, ſand, ſhells, &c. which naturally take a horizontal poſition. Theſe materials, when accumulated and elevated to a certain degree, gradually ſhut out the water, and remain for ever in the form of dry land.

But, to remove every doubt concerning this important point, let us examine more cloſely the practicability of a mountain's being formed at the bottom of the ſea, by the motion and ſediments of the water. On a high coaſt which the ſea waſhes with violence during the flow, ſome part of the earth muſt be carried off by every ſtroke of the waves. Even where the ſea is bounded by rock, it is a known fact, that the ſtone is gradually waſted by the water; and, conſequently, that ſmall particles are carried off by the retreat of every wave. Theſe particles of earth or ſtone are neceſſarily tranſported to ſome diſtance. Whenever the agitation of the water is abated, the particles are precipitated in the form of a ſediment, and lay the foundation of a firſt ſtratum, which is either horizontal, or inclined, according to the ſituation of the ſurface upon which they fall. This ſtratum will ſoon be ſucceeded by a ſimilar one, produced by the ſame cauſe; and thus a conſiderable quantity of matter will be gradually amaſſed, and diſpoſed in parallel beds. In proceſs of time, this gradually accumulating maſs will become a mountain in the bottom of the ſea, exactly reſembling, both in external and internal ſtructure, thoſe mountains which we ſee on the dry land. If there happened to be ſhells in that part of the bottom of the ſea where we have ſuppoſed the ſediments to be depoſited, they would be covered, filled, and incorporated, with the depoſited matter, and form a part of the general maſs. Theſe ſhells would be lodged in different parts of the mountains, correſponding to the times they were depoſited. Thoſe which lay at the bottom, before the firſt ſtratum was formed, would occupy the loweſt ſtation; and thoſe which were afterwards depoſited, would be found in the more elevated parts.

It has been conceived, that the agitation produced by the winds and tides is only ſuperficial, and affects not the bottom, eſpecially when it is very deep. But it ought to be remembered, that, whatever be the depth, the whole maſs is put in motion by the tides at the ſame time; and that, in a fluid globe, this motion would be communicated even to the centre. The power which occaſions the flux and reflux is penetrating; it acts equally upon every particle of the maſs. Hence the quantity of its force, at different depths, may be determined by calculation. Indeed, this point is ſo certain, that it admits not of diſpute.

We cannot, therefore, heſitate in pronouncing, that the tides, the winds, and every other cauſe of motion in the ſea, muſt produce heights and inequalities in its bottom; and that theſe eminences muſt uniformly be compoſed of regular ſtrata, either horizontal or inclined. Theſe heights will gradually augment; like the waves which formed them, they will mutually reſpect each other; and if the extent of the baſe be great, in a ſeries of years they will form a vaſt chain of mountains. Whenever eminences are formed, they interrupt the uniform motion of the waters, and produce new motions, known by the name of currents. Between two neighbouring heights in the bottom of the ocean, there muſt be a current, which will follow their common direction, and, like a river, cut a channel, the angles of which will be alternately oppoſite through the whole extent of its courſe. Theſe heights muſt continually increaſe; for, during the flow, the water will depoſite its ordinary ſediment upon their ridges, and the waters which are impelled by the current will force along,

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from great diſtances, quantities of matter, which will ſubſide between the hills, and, at the ſame time, ſcoop out a valley with correſponding angles at their foundation. Now, by means of theſe different motions and ſediments, the bottom of the ocean, though formerly ſmooth, muſt ſoon be furrowed and interſperſed with hills and chains of mountains, as we actually find it at preſent. The ſoft materials of which the eminences were originally compoſed, would gradually harden by their own gravity. Such of them as conſiſted of ſandy and cryſtalline particles, would produce thoſe enormous maſſes of rock and flint in which we find cryſtals and other precious ſtones. Others, compoſed of ſtony particles mixed with ſhells, give riſe to thoſe beds of lime-ſtone and marble, in which vaſt quantities of ſea ſhells are ſtill found incorporated. Laſtly, all our beds of marble and chalk have derived their origin from particles of ſhells mixed with a pure earth, collected and depoſited at particular places in the bottom of the ſea. All theſe ſubſtances are diſpoſed in regular ſtrata; they all contain heterogeneous matter, and vaſt quantities of ſea-bodies ſituated nearly in proportion to their ſpecific gravities. The lighter ſhells are found in chalk; the heavier in clay and lime-ſtone. Theſe ſhells are uniformly ſiled with the matter in which they are found, whether it be ſtone or earth. This is an inconteſtible proof, that they have been tranſported along with the matter that fills and ſurrounds them, and that this matter was then in the form of an impalpable powder. In a word, all thoſe ſubſtances, the horizontal ſituation of which has ariſen from the waters of the ſea, invariably preſerve their original poſition.

If we inveſtigate more minutely the ſituation of thoſe materials which compoſe the ſuperficial part of the globe, we ſhall find that the different ſtrata of ſtones in quarries are almoſt all horizontal, or regularly inclined. Thoſe founded upon hard clay, or other ſolid matter, are evidently horizontal, eſpecially in plains. The diſpoſition of quarries, where flint or browniſh free-ſtone is found in detached portions, is indeed leſs regular. But even here the uniformity of nature is not interrupted; for the horizontal or regularly inclining poſition of the ſtrata is apparent in granite and brown free-ſtone, wherever they exiſt in large connected maſſes. This poſition is univerſal, except in flint and brown free-ſtone in ſmall detached portions, ſubſtances the formation of which was poſterior to thoſe juſt now mentioned. The ſtrata of granite, vitrifiable ſand, clays, marbles, calcareous ſtones, chalk, and marles, are always parallel or equally inclined. In theſe the original formation is eaſily diſcoverable; for the ſtrata are exactly horizontal, and very thin, being placed above each other like the leaves of a book. Beds of ſand, of ſoft and hard clay, of chalk, and of ſhells, are likewiſe either horizontal or uniformly inclined. Strata of every kind preſerve the ſame thickneſs through their whole extent, which is often many leagues, and might, by proper obſervations, be traced ſtill farther. In a word, the diſpoſition of ſtrata, as deep as mankind have hitherto penetrated, is the ſame.

Thoſe beds of ſand and gravel which are waſhed down from mountains, muſt, in ſome meaſure, be excepted from the general rule. The ſtrata formed by rivers are not very ancient; they are eaſily diſtinguiſhed by their frequent interruptions, and the inequality of their thickneſs. But the ancient ſtrata uniformly preſerve the ſame dimenſions through their whole extent. Beſides, theſe modern ſtrata may be diſtinguiſhed, with certainty, by the form of the ſtones and gravel they contain, which bear evident marks of having been rolled, ſmoothed, and rounded, by the motion of water. The ſame obſervation may be made with regard to thoſe beds of turf, and corrupted vegetables, which are found in marſhy grounds, immediately below the ſoil: they have no claim to antiquity, but have derived their exiſtence from ſucceſſive accumulations of decayed trees and other plants. The ſtrata of ſlime, or mud, which occur in many places, are alſo recent productions, formed by ſtagnating waters, or the inundations of rivers. They are not ſo exactly horizontal, nor ſo uniformly inclined, as the more ancient ſtrata, produced by the regular motions of the ſea. In ſtrata formed by rivers, we meet with river, but ſeldom with ſea-ſhells; and the few which occur are broken, detached, and placed without order. But, in the ancient ſtrata, there are no river-ſhells; the ſea-ſhells are numerous, well preſerved, and all placed in the ſame manner, having been tranſported and depoſited at the ſame time, and by the ſame cauſe. From whence could this beautiful regularity proceed? Inſtead of regular ſtrata, why do we not find the matters compoſing the earth huddled together without order? Why are not rocks, marbles, clays, marles, &c. ſcattered promiſcuouſly, or joined by irregular or vertical ſtrata? Why are not heavy bodies uniformly found in a lower ſituation than light ones? It is eaſy to perceive, that this uniformity of nature, this ſpecies of organization, this union of different materials by parallel ſtrata, without regard to their weights, could only proceed from a cauſe equally powerful and uniform as the motions of the ſea, produced by regular winds, by the tides, &c.

Theſe cauſes act with ſuperior force under the equator than in other climates; for there the tides are higher, and the winds more uniform. The moſt extenſive chains of mountains are likewiſe in the neighbourhood of the equator. The mountains of Africa and Peru are the higheſt in the world, often extending through whole continents, and ſtretching to great diſtances under the waters of the ocean. The mountains of Europe and Aſia, which extend from Spain to China, are not ſo elevated as thoſe of Africa and South America. According to the relations of voyagers, the mountains of the north are but ſmall hills, when compared with the mountains of the equatorial regions. Beſides, in the northern ſeas, there are few iſlands; but, in the torrid zone, they are innumerable. Now, as iſlands are only the ſummits of mountains, it is apparent, that there are more inequalities on the ſurface of the earth near the equator, than in northerly climates.

Thoſe prodigious chains of mountains which run from weſt to eaſt in the Old Continent, and from north to ſouth in the New, muſt have been formed by the general motion of the tides. But the origin of the leſs conſiderable mountains and hills muſt be aſcribed to particular motions, occaſioned by winds, currents, and other irregular agitations of the ſea.

Our author next proceeds to anſwer ſome queſtions, which require ſolution, in conſequence of the theory which he has advanced. How, *e. g.* is that earth, which has been inhabited by us and our anceſtors for ages, become an immenſe continent, dry, compact, and removed from the reach of the water, and exalted to ſuch a height above the waters, if it was formerly the bottom of an ocean? In reply to this, and ſimilar enquiries, the author ſays, we daily obſerve the ſea gaining ground on certain coaſts, and loſing it on others. We know, that the ocean has a general and uniform motion from eaſt to weſt; that it makes violent efforts againſt the rocks and the low grounds which encircle it; that there are whole provinces which human induſtry can hardly defend from the fury of the waves; and that there are inſtances of iſlands which have but lately emerged from the waters, and of regular inundations. Hiſtory informs us of inundations and deluges of a more extenſive nature. Should not all theſe

these circumstances convince us, that the surface of the earth has experienced very great revolutions, and that the sea may have actually given up possession of the greatest part of the ground which it formerly occupied? For example, let us suppose, that the Old and New Worlds were formerly but one continent, and that by a violent earthquake, the ancient Atalantis of Plato was sunk. What would be the consequence of such a mighty revolution? The sea would necessarily rush in from all quarters, and form what is now called the Atlantic ocean; and vast continents, perhaps those which we now inhabit, would, of course, be left dry. This great revolution might be effected by the sudden failure of some immense cavern in the interior part of the globe, and an universal deluge would infallibly succeed. Such a revolution, however, has happened, and in the opinion of the author, happened naturally; for, if a judgment of the future is to be formed from the past, we have only to attend carefully to what daily passes before our eyes. It is a fact, established by the repeated observation of voyagers, that the ocean has a constant motion from east to west. This motion, like the trade-winds, is not only perceived between the tropics, but through the whole temperate climates, and as near the poles as navigators have been able to approach. As a necessary consequence of this motion, the Pacific ocean must make continual efforts against the coasts of Tartary, China, and India; the Indian ocean must act against the east coast of Africa; and the Atlantic must act in a similar manner against all the eastern coasts of America. Hence the sea must have gained, and will always continue to gain, on the east, and to lose on the west. This circumstance alone would be sufficient to prove the possibility of the change of sea into land, and of land into sea. If such is the natural effect of the sea's motion from east to west, may it not reasonably be supposed, that Asia, and all the eastern continent, is the most ancient country in the world? and that Europe, and part of Africa, especially the west parts of these continents, as Britain, France, Spain, &c. are countries of a more recent date?

But, beside the constant motion of the sea from east to west, other causes concur in producing the effect just mentioned. There are many lands lower than the level of the sea, and are defended by a narrow isthmus of rock only, or by banks of still weaker materials. The action of the waters must gradually destroy these barriers; and, consequently, such lands must then become part of the ocean. Besides, the mountains are daily diminishing, part of them being constantly carried down to the valleys by rains. It is likewise well known, that every little brook carries earth, and other matters, from the high grounds into the rivers, by which they are at last transported to the ocean. By these means the bottom of the sea is gradually filling up, the surface of the earth is approaching to a level, and nothing but time is wanting for the sea's successively changing places with the land.

We shall give, says our author, some certain and recent examples of the changes of sea into land, and of land into sea. At Venice, the bottom of the sea is constantly rising: if the canals had not been carefully kept clean, the moats and city would, long ere now, have formed a part of the continent. The same thing may be said of most harbours, bays, and mouths of rivers. In Holland the bottom of the sea is elevated in many places; the gulf of Zuderzee and the straits of the Texel cannot receive such large vessels as formerly. At the mouth of almost every river, we find small islands, and banks of earth and sand brought down from the higher grounds; and it is incontrovertible, that the sea is constantly dammed up, wherever great rivers empty themselves. The Rhine is lost in the sands which itself has accumulated. The Danube, the Nile, and all large rivers, after having transported great quantities of slime, sand, &c. never more arrive at the sea by a single channel; they split into branches, the intervals of which consist of the materials which they themselves have transported. Marshes are daily drained; lands, abandoned by the sea, are now plowed and sown; we navigate whole countries now covered by the waters; in a word we see so many instances of land changed into water, and water into land, that we must be convinced of the continual, though slow, progress of such changes in all places. Hence the gulfs of the ocean will in time become continents; the isthmuses will be changed into straits; and the tops of the mountains will be metamorphosed into shoaly rocks in the sea.

The waters, therefore, have covered, and may still cover, every part of the earth which is now dry. In the investigation of the causes of those perpendicular fissures with which the earth abounds, our author's reasoning is as follows.

As the various materials which constitute the different strata were transported by the waters, and deposited in the form of sediments, they would at first be in a very diluted state, and would gradually harden and part with the superfluous quantity of water they contained. In the process of drying, they would naturally contract, and of course split at irregular distances. These fissures necessarily assumed a perpendicular direction; because, in this direction, the action of gravity of one particle upon another is equal to nothing; but it acts directly opposite in a horizontal situation: the diminution in bulk could have no sensible effect but in a vertical line. The contraction of the parts in drying, not the contained water forcing an issue, as has been alleged, is the cause of perpendicular fissures; for it has often been remarked, that the sides of these fissures, through their whole extent, correspond as exactly as the two sides of a split piece of wood. Their surfaces are rude and irregular. But, if they had taken their rise from the motion of water, they would have been smooth and polished.

Perpendicular fissures vary greatly as to the extent of their openings. Some are about half an inch, or an inch, others a foot or two feet; some extend several fathoms, and give rise to those vast precipices which so frequently occur between opposite parts of the same rocks in the Alps and other high mountains. It is plain, that the fissures, the openings of which are small, have been occasioned solely by drying. But those which extend several feet are partly owing to another cause; namely, the sinking of the foundation upon one side, while that of the other remained firm. If the base sinks but a line or two, when the height of the rock is considerable, an opening of several feet, or even fathoms, will be the consequence. When rocks are founded on clay or sand, they sometimes slip a little to a side; and the fissures are of course augmented by this motion. Those large openings, those prodigious cuts, which are to be met with in rocks and mountains, could not be produced by any other means than the sinking of immense subterraneous caverns which were unable longer to sustain their incumbent load. But these cuts or intervals in mountains are not of the same nature with perpendicular fissures: they appear to have been ports opened by the hand of nature for the communication of nations. This seems to be the intention of all large openings in chains of mountains, and of those straits by which different parts of the ocean are connected; as the straits of Thermopylæ, of Gibraltar, &c.; the gaps or ports in Mount Caucasus, the Cordeliers, &c. A simple separation, by the drying of the matter, could not produce this effect: large portions of earth must have been sunk, swallowed

ſwallowed up, or thrown down. See EARTHQUAKE and VOLCANO.

The greateſt changes upon the ſurface of the earth are occaſioned by rains, rivers, and torrents from the mountains. Theſe derive their origin from vapours raiſed by the ſun from the ſurface of the ocean, and are tranſported by the winds through every climate. The progreſs of theſe vapours, which are ſupported by the air, and tranſported at the pleaſure of the winds, is interrupted by the tops of the mountains, where they accumulate into clouds, and fall down in the form of rain, dew, or ſnow. At firſt, theſe waters deſcended into the plains without any fixed courſe; but they gradually hollowed out proper channels for themſelves. By the power of gravity, they ran to the bottom of the mountains, and, penetrating or diſſolving the lower grounds, they carried along with them ſand and gravel, cut deep furrows in the plains, and thus opened paſſages to the ſea, which always receives as much water by rivers as it loſes by evaporation. The windings in the channels of rivers have uniformly correſponding angles on their oppoſite banks; and as mountains and hills, which may be regarded as the banks of the valleys by which they are ſeparated, have likewiſe ſinuoſities with correſponding angles, this circumſtance ſeems to demonſtrate, that the valleys have been gradually formed by currents of the ocean, in the ſame manner as the channels of rivers have been produced.

Our author concludes from previous reaſoning, that the flux and reflux of the ocean have produced all the mountains, valleys, and other inequalities on the ſurface of the earth; that currents of the ſea have ſcooped out the valleys, elevated the hills, and beſtowed on them their correſponding directions; that the ſame waters of the ocean, by tranſporting and depoſiting earth, &c. have given riſe to the parallel ſtrata; that the waters from the heavens gradually deſtroy the effects of the ſea, by continually diminiſhing the height of the mountains, filling up the valleys, and choaking the mouths of rivers; and, by reducing every thing to its former level, they will, in time, reſtore the earth to the ſea, which, by its natural operations, will again create new continents, interſperſed with mountains and valleys, every way ſimilar to thoſe which we now inhabit. See Buffon's Nat. Hiſt. vol. i. Eng. Tranſl. by Smellie.

To this theory, however elegantly diſplayed and plauſibly ſupported by its ingenious author, ſeveral objections have been ſuggeſted by thoſe who are converſant with ſubjects of this nature. The original formation of the earth has been thought hypothetical by all, and by many fanciful. That a torrent of igneous particles ſhould recede from the ſun with an accelerated motion, acquire at a certain diſtance a globular figure, an elliptic motion, and a rotation round its axis, is very improbable, not to ſay unphiloſophical. The formation of mountains by winds and tides, the previous diſſolution of terreſtrial ſubſtances after vitrification by the ſun's heat, the analogy between mountains on dry land and iſlands in the ſea, and the confuſed diſpoſition of the earth's ſtrata, are circumſtances pertaining to our author's theory, which, with all his ingenuity, he has not been able ſatiſfactorily to explain and to eſtabliſh. Indeed, it is altogether incredible that the cavities of the earth ſhould contain a body of water equal in height to the moſt elevated mountains; nor is it conceivable, how the caverns of the ſea, after having raiſed up a quantity of ſand, earth, and ſhells, ſhould depoſit them again in parallel and horizontal beds; nor how torrents ſhould have exiſted at the bottom of the ocean capable of producing theſe effects, and of penetrating the ſtrata of mountains, and of dividing them into hills and vallies. Of this theory it has been juſtly obſerved, that the author introduces the action of water to deſtroy mineral bodies, and afterwards to give them a new arrangement into ſtrata; but that he makes no proviſion for the conſolidation of theſe ſtrata, nor for their angular elevation; nor has he any adequate means for explaining the unſtratified rocks, and the irregularities of the ſurface of the earth.

Profeſſor Pallas, in a "Diſſertation on the Origin and Structure of Mountains," publiſhed A.D. 1779, refutes the opinion that they were formed in the ocean. From undoubted facts he attempts to prove, that the great chain of primitive mountains, that binds together the various parts of the globe, could not have been the production of waters. This chain is granite, with a baſis of quartz, mixed with ſpars, mica, and ſmall portions of baſalt, ſcattered without order, and in irregular fragments. This rocky ſubſtance, and the ſand produced by its decompoſition, form the baſis of all the continents. Granite, ſays this author, is never found in ſtrata, or beds, but in blocks, or maſſes, which exhibit no veſtige of organic impreſſion. The ſecondary and tertiary mountains he ſuppoſes to be of a more recent origin:—the former having been produced by the decompoſition of granite; and the latter having ariſen from the wrecks of the ſea, elevated and tranſported by volcanic eruptions and conſequent inundations. See MOUNTAIN.

Of the theory of Mr. Whitehurſt, as far as it concerns the deluge, we have already given ſome account under that article. We ſhall here introduce ſome further particulars. This author agrees with many others, in ſuppoſing that the earth was originally in a ſtate of fluidity; and hence he concludes, that it has not exiſted from eternity, as ſome perſons have imagined. Its fluidity he infers from its oblate ſpheroidical form. In this fluid ſtate, its component parts were uniformly blended together, without any difference of weight, and formed a maſs of uniform conſiſtence from the ſurface to the centre; ſo that the globe, at its firſt formation, was unfit for the ſupport of animal or vegetable life. The component parts of this chaos, being heterogeneous, or endued with peculiar laws of elective attraction, ſimilar bodies were diſpoſed to unite and to form ſelect ſubſtances of various denominations, as air, water, earth, &c.; and then the chaos was progreſſively formed into a habitable world. As ſoon as the oblate ſpheroidical figure of the earth was completed, the component parts began to act more freely, according to their affinities; that is, the particles of air united to thoſe of air, thoſe of water to water, and thoſe of earth to earth; and from this union reſulted their ſpecific gravities. Accordingly, thoſe parts that were the moſt denſe approached towards the centre of gravity, and thoſe of the greateſt levity aſcended towards the ſurface; and as air is about 800 times ſpecifically lighter than water, the former was ſooner freed from the general maſs than the latter, and formed a kind of muddy impure atmoſphere, which ſurrounded the newly formed globe. Water ſucceeded the air, and encompaſſed the earth in one immenſe ocean. In proceſs of time, theſe elements were purified, and became fit for animal life. From this ſeparation of the component parts, and their aggregation into ſolid bodies, the following conſequences enſued: as the ſun and moon were coeval with the chaos, the ſolids could not uniformly ſubſide from every part of the ſurface, and become equally covered by water; for as the ſeparation of the ſolids and fluids proceeded, the tides increaſed, and removed the former from one place to another without any preciſe order. Hence the ſea became unequally deep; and whilſt theſe inequalities were gradually advanced, dry land at length appeared, and ſeparated the waters which had univerſally covered the earth. The primitive iſlands, being thus formed,

formed, became firm and dry, and fit for the reception of animals and vegetables. In this progreſſion of things, ſeveral days and nights muſt have preceded the ſun's firſt appearance in the heavens, or its becoming viſible on the fourth day, agreeably to the account of ſcripture. Previouſly to the formation of the primitive iſlands, the ocean was purified and ſtocked with marine animals; which became enveloped and buried in the mud, by the continual action of the tides: and this was more eſpecially the caſe with ſhell-fiſh, which were leaſt able to diſentangle themſelves. Theſe marine animals, being thus imbedded in the earth at various depths, bear ſufficient teſtimony, that they were interred at ſucceſſive periods of time; and that they were created before the formation of the primitive iſlands and terreſtrial animals. The beds occupied by marine ſhells, the remains of thoſe animals that periſhed on the ſpot where they were depoſited, were originally the bottom of the ocean. As to the mountains and continents, Mr. Whitehurſt apprehends, that they are the effects of ſubterraneous fire, and produced at a period of time very diſtant from that of the creation of the world, when the ſtrata had acquired firmneſs and coheſion, and the teſtaceous matter had aſſumed a ſtony hardneſs. For further particulars, ſee DELUGE.

Mr. Kirwan (Iriſh Tranſ. vol. vi.) agrees with many other writers, in ſuppoſing that the primæval earth, at leaſt as far as reſpects its ſuperficial parts, to a certain depth, was in a ſoft or liquid ſtate. This he infers from its preſent ſpheroidical ſhape, and alſo from ſome geological obſervations, which he has adduced. Its interior and more central parts, he conceives, contained, at the time of its creation, and for many ſubſequent centuries, immenſe empty caverns, which conſiſted of materials of ſufficient ſolidity to reſiſt the preſſure of the enormous maſs of liquid ſubſtance that reſted upon them. The liquidity of the ſuperficial parts muſt have proceeded either from igneous fuſion or ſolution in water. The former cauſe he rejects, and adopts the latter, which he endeavours to eſtabliſh. The aqueous fluid, which ſerved as a menſtruum for this ſolution, was heated, as he imagines, to at leaſt 33 degrees, and poſſibly much higher; and it contained the eight generic earths, all the metallic and ſemimetallic ſubſtances now known, the various ſimple ſaline ſubſtances, and the whole tribe of inflammables, ſolid and liquid, variouſly diſtributed. Hence he concludes, that elementary fire, or the principle of heat, muſt have been coeval with the creation of matter; and that the general properties of gravitation and elective attraction may be ſuppoſed of equal date. The proportion, as he ſuppoſes, of the different materials contained in the chaotic fluid, to each other, was nearly the ſame as that which they at preſent bear to each other; the ſiliceous earth being by far the moſt copious, next to that the ferruginous, then the argillaceous and calcareous, and, laſtly, the magneſian, barytic, Scottiſh, and Jargonic, in the order now named, the metallic ſubſtances (except iron) moſt ſparingly. M. Buffon and Dr. Hutton, however, have excluded calcareous earth from the number of the primæval, aſſerting that the maſſes of it which we now obſerve proceed from ſhell-fiſh. Mr. Kirwan replies, that the ſuppoſition of ſhell-fiſh, or any animals, poſſeſſing the power of producing any ſimple earth is unfounded; and that before the exiſtence of any fiſh, the ſtony maſſes that enclofe the baſon of the ſea muſt have exiſted, and among theſe there is not any one in which calcareous earth is not found. In a fluid conſtituted like that juſt mentioned, it is evident, ſays our author, from the laws of elective attraction, that the various ſolids diffuſed through it muſt ſoon have coaleſced in various proportions, according to the laws of this attraction, and the preſence or proximity of the ingredients, and thus have cryſtallized into different groups, which deſcended to and were depoſited upon the inferior ſolid kernel of the globe. In thoſe tracts, in which the ſiliceous, and next to it the argillaceous, earth moſt abounded, (ſuch tracts being the moſt extenſive,) granite and gneiſs ſeem to have been firſt formed, in the manner which the author has explained. The high degree of heat, ariſing from different concurring cauſes which exiſted in the earth, diſengaged all the oxygen contained in the contiguous chaotic fluid; and this uniting partly with more metallic iron, partly with the ſulphurated and partly with the carbonic and bituminous ſubſtances, muſt have occaſioned a ſtupendous conflagration, the effects of which may well be ſuppoſed to have extended even to the ſolid baſis on which the chaotic fluid repoſed, and to have ſplit it to an unknown extent. Theſe volcanic eruptions were attended with important conſequences: the firſt muſt have been the diffuſion of a conſiderable heat through the whole maſs of the chaotic fluid, by which means the oxygen and mephitic airs diſperſed through it muſt have been extricated, and thus gradually formed the atmoſphere. The ſecond production was that of fixed air from the union of oxygen with the ignited carbon; and this at firſt roſe into and diffuſed itſelf through the atmoſphere; but in proportion as the chaotic fluid cooled, it was gradually abſorbed by it. This abſorption occaſioned the precipitation, and more or leſs regular cryſtallization of the calcareous earth; the greater part of which, being much more ſoluble than the other earths, ſtill remained in ſolution, after the others had been for the moſt part depoſited.

The immenſe maſſes concreted and depoſited on the interior nucleus of the earth formed the "primitive mountains." The formation of "plains" is eaſily underſtood: for in the wide intervals of diſtant mountains, after the firſt cryſtallized maſſes had been depoſited, the ſolid particles ſtill contained in the chaotic fluid, but too diſtant from each other's ſphere of attraction to concrete into cryſtals, and particularly thoſe that are known to be leaſt diſpoſed to cryſtallize, and alſo to have leaſt affinity to water, were gradually and uniformly depoſited. Of this nature argillaceous particles are known to be, intermixed, as we may well imagine, with a large proportion of ſiliceous and ferruginous particles, of all the moſt abundant, and ſome particles of the other earths: and by theſe compound and ſlightly concreted earths, the ſurface of plains was originally covered. In proceſs of time, theſe earths received an increaſe from the decompoſition of primitive mountains, which was an event of much poſterior date.

The next important event, neceſſary to fit the globe for the reception of land animals, was the diminution and receſs of the chaotic fluid, in the boſom of which the mountains were formed, and the conſequent diſcloſure of the dry land. By the operation of the preceding volcanoes, the bed of the ocean was ſcooped, moſt probably in the ſouthern hemiſphere: but no change or tranſpoſition of the ſolid materials depoſited from the chaotic fluid could lower its level, unleſs the inferior nucleus of the globe could receive it within its hollow and empty caverns. This admittance it gained through the numerous riſts occaſioned by the antecedent fires: at firſt rapidly, afterwards more ſlowly, in proportion as the perpendicular height of the fluid was diminiſhed; and thus the emerged continent, conſiſting of mountains and plains, was gradually laid bare and dried, and, by drying, conſolidated. The diſcloſure of the actual continents appears to have been gradual. The tracts at firſt uncovered were thoſe whoſe height over the preſent ſeas amounts to 8500 or 9000 feet, or more. This height comprehends moſt of the eaſtern ſummits of Siberia, between latitude 49° and

and 55°, and of the extenſive regions of Great Tartary, Tibet, the deſert of Coby or Chamo, and China, reaching in ſome places to latitude 35°, and extending in the northern parts from the ſources of the Irtiſh, long. 95°, and in the more ſouthern from the heads of the Ganges and Burrampooter, long. 80°, Hoanho and Porentſho to long. 190° at the eaſt, and perhaps ſtill farther into the unknown parts of Eaſtern America. In Europe, only the ſummits of the Alps, Pyrenées, and of a few other mountains, were uncovered; but in America, the narrow but long chain of the Cordeliers muſt have raiſed its ſummits far above the ocean.

When the level of the ancient ocean was lowered to the height of 8500 or 9000 feet, and not before, it began to be ſtocked with fiſh. That the creation of the fiſh, ſays Mr. Kirwan, was ſubſequent to the emerſion of the tracts juſt mentioned, and to the reduction of the waters to the height now ſtated, is proved by the obſervations of all who have viſited thoſe countries. In theſe elevated tracts, no marine ſhells or petrifactions are found in the body of any mountain, nor in any ſtone, not even in lime-ſtone, though it abounds particularly about the ſources of the Amour. Hence our author concludes, that theſe tracts, which, like all others, were formed in the boſom of the primitive ocean, were uncovered before the creation of fiſh; and ſince they contain lime-ſtone, that this ſtone does not neceſſarily and univerſally originate from comminuted ſhells, as Buffon and others have advanced. No petrifactions or ſhells are incorporated in the rocks or ſtrata, that form ſeveral other lofty mountains. This is atteſted by De la Peroufe with reſpect to the Pyrenées, which, nevertheleſs, are moſtly calcareous. Nor are any found in Santo Velino, the higheſt of the Appennines, the height of which is 8300 feet; whereas they abound in thoſe that are lower. In the Savoyan Alps, Salenche, Saleve Mole, the Dole, all of which are calcareous, but below the height of 7000 feet, contain petrifactions; but the Buet, which is alſo for the greater part calcareous, but whoſe height exceeds 10,000 feet, contains none. (Sauſſure, paſſim.) After this elevated tract of the globe had been uncovered, there is no reaſon to ſuppoſe that it long remained diveſted of vegetables or unſtocked with animals, as it was fitted to receive them. The author proceeds to adduce ſeveral reaſons, which, in his opinion, prove, that the retreat of the ſea from the lower parts of our preſent continents was gradual, and not fully effected till after the lapſe of ſeveral centuries. (See CONTINENT and MOUNTAIN.) This retreat of the ſea continued, as our author imagines, until a few centuries before the deluge. Its ceſſation, long before this cataſtrophe took place, he infers from the hardneſs which the mountains muſt have acquired, to withſtand the ſhocks they muſt then have undergone. To acquire this hardneſs a long period of time was neceſſary, both for their deſiccation and the infiltration of thoſe particles, to which the ſtrata of ſecondary mountains owe their ſolidity. Our author cloſes his theory of the primitive earth with an attempt to accommodate it to the Moſaic account of the creation. For his application of it to the deluge, we refer to that article.

We now proceed to give an account of two other theories of the earth, which have ſuperſeded moſt of the others already recounted, and each of which has had its learned and zealous advocates. The firſt of theſe is that of Dr. James Hutton, the detail of which occupies a conſiderable part of the firſt volume of the Edinburgh Tranſactions. The author begins an elaborate developement and explication of his theory by obſerving, that in order to acquire a comprehenſive view of the mechaniſm of the globe, by which it is adapted to the purpoſe of being a habitable world, it is neceſſary to diſtinguiſh three different bodies, which compoſe the whole, *viz.* a ſolid body of earth, an aqueous body of ſea, and an elaſtic fluid of air. The central body of the globe is ſuppoſed, without ſufficient reaſon, as our author imagines, to be ſolid and inert; the fluid body of water, which by gravitation is reduced to a ſpherical form, and by the centrifugal force of the earth's rotation to an oblate figure, is eſſential to the conſtitution of the world, as it affords the means of life and motion to animals of various kinds, as it is the ſource of growth and circulation to the organized bodies of the earth, and as it is the receptacle of our rivers, and the fountain of our vapours; the irregular body of land raiſed above the level of the ocean, although it be the ſmalleſt part of our globe, is the moſt intereſting, as plants grow on its ſurface, and animal life, and alſo vegetation, are ſuſtained by it. The ſurrounding body of atmoſphere is no leſs neceſſary than the other parts, in a variety of reſpects ſufficiently obvious, and which it is needleſs for us to recite. Having thus deſcribed the mechaniſm of the globe, our author proceeds to enumerate ſome of thoſe powers by which motion is produced and activity imparted to the mere machine.

Theſe are the projectile or progreſſive power, that of gravitation, whence it derives its rotatory motions; the influence of light and heat, of cold and condenſation; and the powers of electricity and magnetiſm. Moreover, a ſolid body of land, our author obſerves, could not have anſwered the purpoſe of a habitable world, without a ſoil adapted to the growth of plants: and this ſoil conſiſts merely of the materials that are collected from the deſtruction of the ſolid land. The ſurface of this land, inhabited by man, and covered with plants and animals, is made by nature to decay, in diſſolving from that hard and compact ſtate in which it is found below the ſoil; and the ſoil itſelf is neceſſarily waſhed away by the continual circulation of the water running from the ſummits of the mountains towards the general receptacle of that fluid; thus the heights of our land are levelled with the ſhores; our fertile plains are formed from the ruins of the mountains; and the moveable materials, after previous migration, are carried forwards to the unfathomable regions of the ocean. As the vegetable ſoil is thus conſtantly removed from the ſurface of the land, whatever may be the ſupply which it receives from the diſſolution of the ſolid earth, the land gradually tends to deſtruction, which, in a courſe of ages, is inevitable. In order to counteract this deſtructibility, our author ſuggeſts, that in the conſtitution of this world there may be a reproductive operation, by which a ruined conſtitution may be again repaired, and a duration and ſtability procured to the machine, conſidered as a world ſuſtaining plants and animals. Although, according to Dr. Hutton, the Moſaic account places the commencement of the exiſtence of man upon the earth at no great diſtance; and we have no document in natural hiſtory which attributes a high antiquity to the human race; yet this is not the caſe with regard to the inferior ſpecies of animals, particularly thoſe which inhabit the ocean and its ſhores. Accordingly we find alſo in the relics of ſea animals that are diſcovered in the ſolid body of our earth evidences of an earlier exiſtence than that to which the Moſaic hiſtory ſeems to trace the origin of our earth. We are thus led to repreſent our author's ſentiments, with regard to the formation of the terreſtrial globe. The ſolid parts of the globe, he ſays, are, in general, compoſed of ſand, of gravel, of argillaceous and calcareous ſtrata; or of the various compoſitions of theſe, with other ſubſtances. Sand is ſeparated and ſized by ſtreams and currents; gravel is formed by

by the mutual attrition of ſtones agitated in water; and marley or argillaceous ſtrata have been collected, by ſubſiding in water with which thoſe earthy ſubſtances had been floated. Hence he is led to infer, that ſo far as the earth is formed of theſe materials, the ſolid body would appear to have been the production of water, winds, and tides. But that which renders the original of our land clear and certain, in his opinion, is the immenſe quantity of calcareous bodies, which had belonged to animals, and the intimate connection of theſe maſſes of animal production with the other ſtrata of the land. Accordingly he proceeds to prove, that all thoſe calcareous bodies, from the collection of which the ſtrata were formed, have belonged to the ſea, and were produced by it. For which purpoſe he alleges, that we find the traces of marine animals in the moſt ſolid parts of the earth; and, therefore, theſe ſolid parts muſt have been formed after the ocean was inhabited by thoſe animals, which belong to that fluid medium. Before he inveſtigates the natural hiſtory of theſe ſolid parts, and the manner in which they were formed, he undertakes to ſhew that all the maſſes of marble and limeſtone are compoſed of the calcareous matter of marine bodies. To this purpoſe, he obſerves, that there are few maſſes of marble or limeſtone in which we may not find ſome of thoſe objects, which indicate the marine origin of the maſs. Beſides, in theſe calcareous ſtrata, which are evidently of marine origin, there are many parts that are of a ſparry ſtructure, or, in other words, the original texture of theſe beds, in ſuch places, has been diſſolved, and a new ſtructure has been aſſumed, which is peculiar to a certain ſtate of the calcareous earth. This change is produced by cryſtallization, in conſequence of a previous ſtate of fluidity, which has ſo diſperſed the concreting parts, as to allow them to aſſume a regular ſhape and ſtructure proper to that ſubſtance. Moreover, in all the regions of the earth there are huge maſſes of calcareous matter, in that cryſtalline form or ſparry ſtate, in which, perhaps, no veſtige can be formed of any organized body, nor any indication that ſuch calcareous matter had belonged to animals: but, as in other maſſes, this ſparry ſtructure, or cryſtalline ſtate, is evidently aſſumed by the marine calcareous ſubſtances, in operations which are natural to the globe, and which are neceſſary to the conſolidation of the ſtrata, it does not appear that the ſparry maſſes, in which no figured body is formed, have been originally different from other maſſes, which being only cryſtallized in part, and in part ſtill retaining their original form, bear ample evidence of their marine origin. From this kind of reaſoning he concludes, that all the ſtrata of the earth, both thoſe conſiſting of hard calcareous maſſes, and others ſuperincumbent upon theſe, have had their origin at the bottom of the ſea, by the collection of ſand and gravel, of ſhells, of coralline and cruſtaceous bodies, and of earths and clays, variouſly mixed, or ſeparated and accumulated. There is, however, a part of the ſolid earth which is excluded from the reſult of this reaſoning, and this part conſiſts of certain mountains and maſſes of granite, which are thought to be older in their formation, and are very rarely found ſuperincumbent on ſtrata, which muſt be acknowledged as the productions of the ſea. We thus obtain ſolid land, the greater part of which, if not the whole, was originally compoſed at the bottom of the ſea; but this, our author ſays, is not the world which we inhabit; and therefore the queſtion is, how ſuch continents as we have upon the globe could be elevated above the level of the ſea. This queſtion he proceeds to reſolve, by ſhewing, firſt, how this change could not be effected, and then, by ſtating the mode in which he conceives the ſtrata of the globe formed at the bottom of the ſea were conſolidated. In this operation the general agents are fire and water. Rejecting, after a minute examination of its effect on various ſubſtances, and in different circumſtances, the agency of water, he adopts that of fuſion by heat, and examines its effect on the ſiliceous and calcareous ſtrata, which are the prevailing ſubſtances on the globe, all the reſt being, in compariſon of theſe, as nothing; for unleſs they be the bituminous or coal ſtrata, there is hardly any other which does not neceſſarily contain more or leſs of one or other of theſe two ſubſtances. If, therefore, it can be ſhewn, that both of theſe two general ſtrata have been conſolidated by the ſimple fuſion of their ſubſtance, no doubt will remain with regard to the nature of that operation, which has been carried on at great depths of the earth, inacceſſible to human obſervation. Our author, therefore, proceeds to prove, that theſe ſtrata have been conſolidated by ſimple fuſion, and that this operation is univerſal, in relation to the ſtrata of the earth, as having produced the various degrees of ſolidity or hardneſs in theſe bodies. Having adduced arguments and facts in proof of the firſt poſition, Dr. Hutton exemplifies the ſecond, in the caſe of chalk, which is naturally a ſoft calcareous earth, but which may be alſo found conſolidated in every different degree. Through the middle of the iſle of Wight there runs a ridge of hills of indurated chalk. This ridge runs from the iſle of Wight directly weſt into Dorſetſhire, and paſſes by Corſ-caſtle towards Dorcheſter, or beyond that place. The ſea has broken through this ridge at the weſt end of the iſle of Wight, where columns of the indurated chalk remain, called the Needles: the ſame appearance being found upon the oppoſite ſhore in Dorſetſhire. In this field of chalk, we find every gradation of that ſoft earthy ſubſtance to the moſt conſolidated body of this indurated ridge, which is not ſolid marble, but which has loſt its chalky property, and has acquired a kind of ſtony hardneſs. This cretaceous ſubſtance may be found in its moſt indurated and conſolidated ſtate in the north of Ireland, not far from the Giants' Cauſeway. This body, which was once a maſs of chalk, is now a ſolid marble. Then, if it be by means of fuſion that the ſtrata of the earth have been, in many places, conſolidated, we muſt conclude, that all the degrees of conſolidation, which are indefinite, have been brought about by the ſame means. The author afterwards ſhews, that granite, which forms a part of the ſtructure of the earth, is conſolidated by means of fuſion, and in no other mode. The author proceeds to argue, that if ſtrata have been conſolidated by means of heat, acting in ſuch a manner as to ſoften their ſubſtance, then, in cooling, they muſt have formed rents or ſeparations of their ſubſtance, by the unequal degrees of contraction, which the contiguous ſtrata may have ſuffered. There is no appearance more diſtinct, than that of the perpendicular fiſſures in ſtrata. They are generally known to workmen by the terms of veins, or backs and cutters; and there is no conſiderable ſtratum without them. If it be by means of heat and fuſion that ſtrata have been conſolidated, then, in proportion to the degree of conſolidation they have undergone from their original ſtate, they ſhould, *ceteris paribus*, abound more with ſeparations in their maſs; and this concluſion is fully juſtified by appearances.

The author concludes upon the whole, from chemical principles, capable of demonſtration, that all the ſolid ſtrata of the globe have been condenſed by means of heat, and hardened from a ſtate of fuſion. The propoſition alſo admits, he ſays, of proof upon principles which are purely mechanical.

Our author's next object is to ſhew by what operation maſſes of looſe materials, collected at the bottom of the ſea, were

were raiſed above its ſurface, and transformed into ſolid land. The power of heat for the expanſion of bodies is, ſo far as we know, unlimited; but by the expanſion of bodies placed under the ſtrata at the bottom of the ſea, the elevation of theſe ſtrata may be effected; and therefore the queſtion to be reſolved is, how far have we reaſon to conclude, that this power of expanſion has been employed in the production of this earth above the level of the ſea? The examination of natural appearances will ſerve to evince the elevation of ſtrata by the power of heat above the level of the ſea. The ſtrata formed at the bottom of the ocean are neceſſarily horizontal, or nearly ſo, and continuous in their horizontal direction or extent: If, therefore, theſe ſtrata are cemented by the heat of fuſion, and elevated by an expanſive power acting from below, we may expect to find every ſpecies of fracture, diſlocation, and contortion, in theſe bodies, and every degree of departure from a horizontal towards a vertical poſition. The ſtrata of the globe are, accordingly, found in every poſſible poſition: from horizontal, they are often found vertical: from continuous, broken and ſeparated in every poſſible direction: and from a plane, bent and doubled. They could not have been thus originally formed; and the power that has produced this change cannot have been inferior to that which might have been required for their elevation from the place in which they had been formed. Natural appearances confirm this reaſoning; and the inference is, that the land on which we dwell has been elevated from a lower ſituation by the ſame agent, which had been employed in conſolidating the ſtrata, in giving them ſtability, and preparing them for the purpoſe of the living world. This agent is matter actuated by extreme heat, and expanded with amazing force. It is alſo a power of the ſame nature that has been employed in forming, by fracture and diſlocation, mineral veins. By tracing the effects of volcanoes, and by a variety of other inveſtigations, which we cannot purſue, our author deduces this general concluſion, that all the continents and iſlands of this globe have been raiſed by means of fire above the ſurface of the ocean; and, therefore, that almoſt the whole of what we ſee on this earth, was originally formed at the bottom of the ſea. From the conſideration of the materials which compoſe the preſent land, Dr. Hutton thinks there is reaſon to conclude, that during the time this land was forming, by the collection of its materials at the bottom of the ſea, there had been a former land containing materials ſimilar to thoſe which we find at preſent in examining the earth. We may alſo conclude, he ſays, that there had been operations ſimilar to thoſe which we now find natural to the globe, and neceſſarily exerted in the actual formation of gravel, ſand, and clay: and, moreover, that there had been in the ocean a ſyſtem of animated beings, which propagated their ſpecies, and which have thus continued their reſpective race to this day. In order to be convinced of this truth, we have merely to examine the ſtrata of our earth, in which we find the remains of animals; of every genus now exiſting in the ſea, and probably every ſpecies, and perhaps ſome ſpecies with which we are not now acquainted. There had been alſo, our author ſuppoſes, a world of plants as well as an ocean repleniſhed with living animals.

Having aſcertained the ſtate of a former earth, in which plants and animals had lived, as well as the gradual production of the preſent earth compoſed from the materials of a former world, it muſt be evident, as Dr. Hutton ſuppoſes, that here are two operations, which are neceſſarily conſecutive. The formation of the preſent earth neceſſarily involves the deſtruction of continents in the ancient world; and by purſuing in our minds the natural operations of a former earth, we clearly ſee the origin of that land, by the fertility of which, we, and all the animated bodies of the ſea, are fed. It is, in like manner, that, contemplating the preſent operations of the globe, we may perceive the actual exiſtence of thoſe productive cauſes, which are now laying the foundation of land in the unfathomable regions of the ſea, and which will, in time, give birth to future continents.

Upon our author's principles of decay and renovation, there may have been an indefinite ſucceſſion of worlds in paſt time, and there may be a ſimilar ſucceſſion in future time. The ſame proceſs, or ſeries of operations, may be repeated without end, and may have taken place for ages paſt. He obſerves, indeed, that our earth is compoſed of the materials, not of the earth which immediately preceded the preſent, but of the earth, which we may conſider as the third in aſcending backwards, and which had exiſted before the land that was above the ſurface of the ſea, while our preſent land was beneath the water of the ocean; ſo that we have three diſtinct ſucceſſive periods of exiſtence, and each of theſe, in our meaſurement of time, having an indefinite duration. The reſult of our author's inquiry, as he expreſsly ſays, is that, in the ſucceſſion of worlds, "we find no veſtige of a beginning,—no proſpect of an end." The principles of this theory have been clearly explained, and elegantly illuſtrated by profeſſor Playfair, who has alſo ſucceſsfully combated the charge of impiety, which Dr. Hutton's opponents endeavoured to attach to his opinions. In connection with this ſyſtem, we ſhould have introduced ſome remarks on volcanoes from ſir William Hamilton, and others; but having extended this article far beyond our cuſtomary limits, we muſt refer to Volcano.

Another theory, which is now held by many in high eſtimation, is called the "Neptunian," or "Wernerean," from profeſſor Werner of Freybourg, one of the moſt diſtinguiſhed mineralogiſts of the preſent day, and a zealous ſupporter of this theory. He profeſſes to baniſh every thing hypothetical, and to deduce, from accurate obſervation, ſuch concluſions as ſeem to be unavoidable. He ſets out, however, in conformity to moſt other theoriſts, with conjecture, and ſtates, that the earth, to a conſiderable depth, has been once in a ſtate of fluidity, produced, not by fire, as the Huttonians ſuppoſe, but by aqueous ſolution. The outlines of the ſyſtem, founded on this principle, are as follow: 1. The ſuperficial parts of the earth, to a certain depth, muſt have been originally in a ſoft or liquid ſtate, which may be inferred from its preſent ſpheroidal ſhape, and from a variety of geological obſervations. 2. That, at the time of the creation, and for many centuries after, the interior and more central parts contained immenſe empty caverns; and, conſequently, conſiſted of materials ſufficiently ſolid to reſiſt the preſſure of the enormous maſs of ſuperincumbent liquid ſubſtance. 3. The materials of which the ſtrata of the earth are compoſed, were at one period diſſolved, or ſuſpended in water; and from this fluid they had ſucceſſively conſolidated in various combinations, partly by cryſtallization, and partly by mechanical depoſition:—granite, as the baſis on which the greateſt number of ſtrata reſt, having been firſt formed, and the other primitive ſtrata in due order, by precipitations chiefly chemical. 4. From the period of the formation of theſe ſtrata, the water, which covered the earth, began to decreaſe in height, by retiring gradually into cavities in the internal parts of the earth; and, during this proceſs, other precipitations were effected, and the intermediate ſtrata, or ſtrata of tranſition, were formed, of which ſiliceous ſchiſtus and tranſition are the principal. 5. When the water was ſtill abating, the mechanical action of its maſs on the ſtrata already formed, occaſioned in them a partial diſintegration;

disintegration; the materials from this source, together with the remaining part of the matter originally dissolved, by their precipitation and consolidation, formed the secondary strata, which are generally arranged in horizontal beds, and abundant in organic remains. 6 During the gradual consolidation of these strata, rents and cavities opened, into which the water, holding various substances in solution, retired; hence, the formation of mineral veins. 7. Volcanic fires and alluvions have produced some inconsiderable and partial changes on the surface of the earth. See Playfair's System of Geography, vol. i. See DELUGE, FOSSILS, SHELLS, STRATA, and VOLCANO

EARTH, in *Agriculture* and *Gardening*. See SOIL, LAND, &c.

EARTH, *Untried*, the soil, or earth, which is six or seven inches deep, where neither spade nor plough has reached. This is greatly recommended by Mr. Lawrence, for amendments and improvements, both in the fruit and kitchen garden. He assures us, from his own experience, that no kind of compost, made with art, exceeds it; and adds, that if the choicest fruit-trees be planted herein, they presently discover an uncommon healthfulness and vigour; and that, if any tender sort of annuals be discreetly sown in this earth, made fine by sifting, their looks, colour, &c. soon discover that they like the soil. Melons and cucumbers need no other compost but this untried earth; and asparagus itself will prosper, at least, as well in this untried earth, if laid a foot and a half deep, as with all the usual expence of dung; though for the tenderer flowers, and exotics, this earth is not found to have any extraordinary excellencies. For annual plants, produced from seed, a coat of this untried earth, two inches deep, may suffice: on other occasions, a greater depth is required.

EARTH, in *Chemistry* and *Philosophy*. The ancient naturalists imagined, that all material substances were ultimately resolvable into four simple bodies, air, fire, water, and earth, which on this account were called the four elements. The empyreum, or external sphere of the visible world, in which the sun and the other stars perform their revolutions, was supposed to be the peculiar seat of fire: the region, interposed between the earth and the empyreum, was called the atmosphere, the superior part of which, (or the æther,) was considered as the peculiar residence of the element of air, while the lower portion, in which the clouds float, was regarded as the natural situation of the element of water. The earth, the lowest and innermost of these spheres, was supposed to be the great reservoir of elementary earth. The natural characters of the supposed elements were imagined to be analogous to the above hypothetical distribution of them. Thus fire was considered as the active principle of the universe, the source of animal and vegetable life, the great cause of change and renovation. Earth, on the contrary, was regarded as the principle of fixity, hardness, and solidity; as that to which the persistency of the various forms of animated and inanimate beings was owing. The opinions of the ancient naturalists were received with respect and submission by the early chemists, whose researches they directed, and from whom they derived, in return, the support of experimental arguments. In proof of the first it may be stated, that the universal method of analysis adopted by the old chemists was, the exposure of the substance operated on to different degrees of heat, from which circumstance, indeed, they were familiarly known by the appellation of *Philosophers by fire*. Of the nature of the experiments by which the above-mentioned properties of earth were supposed to be demonstrated, the following may serve as a specimen. If a vegetable or animal is exposed to the action of an open fire, those of its component parts that are volatilizable or combustible, are resolved into flame and vapour, and air, and there remains behind a white, dry, fixed, pulverulent, earthy matter, to which, as the only permanent part of the subject of experiment, its form was attributed.

As chemical processes came to be multiplied, it was found convenient to classify the earths; whence arose the distinction of metallic earths, or calces. (which were thought to be ultimately resolvable into one general metallic or *mercurial* earth,) alkaline earths, and earths proper, that is, such as were neither alkaline nor metalizable. The metallic earths were found to differ remarkably from the rest by their superior specific gravity, till the discovery of barytes took place; the high specific gravity of which occasioned many attempts, but wholly without success, to reduce it to the metallic state. This, however, was not considered as absolutely conclusive of the non-metallic nature of barytes, and in the opinion of many, was fully counterbalanced by the positive argument of its great weight. When Lavoisier published his theory, he stated, as an analogical inference, the probability that the earths would one day be proved to be metalic oxyds; and soon after, the actual metallization of barytes and some of the other earths was announced by M. M. Ruprecht and Tondi. On the repetition, however, of their experiments by Klaproth and Savaresi, the supposed discovery was clearly proved to be an entire mistake; the metallic globules which were produced in the experiments alluded to being only phosphuret of iron, and derived from the crucible in which the fusions were performed.

Of late years the hypothesis of the metallic nature of the earths was entirely abandoned, and the only innovation on the old arrangement was, the detaching of the alkaline earths, barytes, strontian, lime, and magnesia, and placing them with the other alkalies; and leaving silex, zircon, alumine, glucine, and yttria, to form the class of earths proper, characterised by infusibility in fire, insolubility in water, the absence of acid or alkaline properties, and irreducibility to the metallic state.

The recent splendid discoveries of professor Davy on electro-chemical agency, have, however, disclosed a multitude of highly important facts, of which. one of the most interesting is, that not only the earths, but the alkalies themselves, are compounds of peculiar metallic bases with oxygen, in consequence of which the class of earths, heretofore distinguished by negative properties, is done away. See ELECTRICITY and METALS.

EARTH, *Animal*, is phosphat of lime, of which the hard parts of the warm blooded animals are principally composed, and which remains behind after the dissipation by combustion of the other ingredients.

EARTH *of Dew*, an earth much valued by many former chemical experimenters, and prepared in the following manner: a large quantity of dew is to be collected, and set in a wooden vessel, in a cool shady place, covered with a canvas, to keep out dust and flies, there will in three weeks, and sometimes longer, come out a putrefaction in the liquor. During the time of this putrefaction, certain films are daily formed on the surface of the liquor, and these falling down to the bottom, one after the other, form, by degrees, a sediment of a sort of mud. This is to be thrown away, and the dew, when separated from it, is to be filtered clear, and evaporated to a dryness, the remainder is a greyish earth, which is the true earth of dew: this is very light and friable, and is of a foliated structure in the mass, looking like so many leaves of brown paper, spread very thin and even over one another. Phil. Transf. N° 3.

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This earth, expoſed to a ſmart fire, loſes its foliated texture, and runs into a maſs, reſembling a mixture of ſalt and brimſtone melted together, but it is not at all inflammable. This, ground on a levigating ſtone, tinges the water to a purpliſh colour. A pound of this earth, properly treated by calcination and elixiviation, will yield an ounce of a pure and white ſalt, ſomewhat reſembling nitre. The chemiſts have been at great pains to procure this earth, but they do not ſeem yet to have made any very important uſe of it; and in all probability it is no other than that common ſpar which we know to be contained in all water, and which encruſts the ſides of our tea-kettles, and other veſſels, in which water is often boiled. We know, by manifold inſtances, that ſpar is rariſiable into vapour with water, and therefore it would be a greater wonder if the dew were found not to contain it, than that it does.

EARTH, in *Geography*, denotes the terraqueous globe, which we inhabit, conſiſting of land and water; the ſurface of which is diverſified by countries and ſeas of various boundaries and dimenſions. On the earth, in this view of it, are deſcribed ſeveral circles, which either properly belong to the earth itſelf, or which are transferred to it from the viſible heavens. Theſe circles are the *Equator*, *Ecliptic*, *Tropics*, *Polar circles*, *Meridians*. *Horizon*, *Parallels*, &c. which ſee reſpectively. See alſo GLOBE. In order to eſtimate the proportion of the land to the water on the ſurface of the earth, ſo far as diſcoveries had been extended in his time, Dr. Long took off the paper from a terreſtrial globe, and, ſeparating the land from the ſea, weighed the parts reſpectively; and in this way he found the proportion of the land to the ſea to be as 124 to 349. This concluſion, which after all muſt be very vague and unſatisfactory, would have been more accurate, if the land were ſeparated from the ſea before the paper was paſted on the globe. The paper of modern globes, including all the modern diſcoveries, would afford a more juſt inference. The ſeas and unknown parts of the earth, independent of ſome late diſcovered iſlands and countries, are ſaid, in conſequence of a meaſurement of ſome of the beſt maps, to contain 160,522,026 ſquare miles; the inhabited parts, 38,990,569; Europe, 4,456,065; Aſia, 10,768,823; Africa, 9,654,807; America, 14,110,874; in all, 199,512,595, being the number of ſquare miles on the whole ſurface of our globe. In conſequence of recent diſcoveries, it has been concluded that more than two-thirds of the ſurface of the terreſtrial globe are covered with water. (See OCEAN and SEA.) For an account of the land on the ſurface of the earth, ſee EUROPE, AFRICA, AMERICA, and ASIA. See alſo AUSTRALASIA, NOTASIA, and POLYNESIA, &c. &c. &c.

EARTH, *Japan*. See CATECHU.

EARTH, *Black*. See BLACK.

EARTH, *Fuller's*, in *Mineralogy*. See FULLER'S *Earth*.

EARTH, *Green*. See GREEN *Earth*.

EARTH, *Lemnian*. See BOLE.

EARTH, *Livonian*. See LIVONICA *Terra*.

EARTH *of Malta*. See MELITENSIS *Terra*.

EARTHS *of Mineral Waters*. All mineral waters contain earth of ſome kind, though very different in quantity and in nature. Theſe are found, in different waters, of very different colours and appearances, ſome white, ſome grey, ſome yelloviſh, ſome reddiſh, and ſome brown. They are alſo as different in their qualities as in their form; ſome of them are ſoluble in acids, others are not ſo; ſome fuſible in the fire; others not; and ſome retain their natural colour, after burning; others change it in the fire. By this we learn, that ſome are marley, others argillaceous, others ochreous, and ſome ſandy; others there are which are produced by the concretion of certain juices, ſaline or ſulphureous, and others not ſo. Some are ſimply mineral, others are metallic. And as many of theſe are very different from any of the known earths, even in their pure and ſeparate ſtate, they are yet much leſs diſtinguiſhable when mixed one with another, as they very frequently are in the waters of even our common ſprings, much more ſo in the mineral medicinal ones.

The ſimple infuſions of certain ſulphureous mineral earths may remarkably alter the waters of wells and fountains, without having any thing of thoſe earths remaining, after their diſtillation; in the ſame manner as nothing is ſeparable, by art, from certain liquors, rendered emetic by antimony. The hot mineral waters may contract ſome alteration from the ſulphureous and bituminous matters which they meet with in their courſe; for theſe ſubſtances all contain ſubtile ſalts, which hot water may take up, and carry away with it. See *Mineral* WATERS.

EARTH *of Nocera*. See NOCERIANA *Terra*.

EARTH *of Portugal*. See PORTUGALLICA *Terra*.

EARTH, *Samian*. See BOLE.

EARTH, *Sealed*. See BOLE.

EARTH, *Soap*. See SOAP *Earth*.

EARTH, *Yellow*. See YELLOW *Earth*.

EARTH-*Bags*, *Sacks à Terre*, in *Fortification*. See SACKS *of Earth*, and SAND-*Bags*.

EARTH-*Banks*, in *Huſbandry*, &c. are a very common fence about London, and in ſeveral other parts of England. Where ſtones are not to be had cheap, theſe are to be preferred to all other fences, both for ſoundneſs and duration.

The beſt manner of making them is this: dig up ſome turf in a graſſy place, a ſpit deep, or nearly to the breadth of the ſpade, and about four or five inches thick; lay theſe turfs with the graſs outward, even by a line on one ſide, and on the backſide of theſe lay another row of turf, having a foot ſpace of ſolid ground on the outſide, to prevent the bank from ſlipping in, if it ſhould be any way faulty. On the outſide of this make a ditch, or elſe let the ſides be lowered both ways with a ſlope two feet deep, and there will be no paſture loſt by the fence, becauſe it will bear graſs on both ſides.

The earth that is dug out of the ditches, or from the ſlopes, muſt be thrown in between the two rows of turf, till the middle is made level with the reſt. Then lay on two more rows of turf in the ſame manner, and with more of the earth fill up, and make level as before. Let this method be continued till the bank is raiſed four feet high, or more if neceſſary, only obſerving, that the higher it is to be carried, the wider the foundation muſt be made. As the bank is carried up, the ſides muſt not be raiſed perpendicular, but ſloping inward both ways, ſo that at the top it may be about two feet and a half wide. This ſort of fence, when made with leſs care, and faced with clay, is left naked, and ſerves very well in ſome places; but when it is thus managed with the turf, the joinings of the ſeveral pieces are hid in a little time, by the growth of the graſſy part of the turf on each ſide; and it makes a beautiful fence, of as green and pleaſant a colour as the reſt of the field.

The great improvement upon this plan, is the planting quickſets, or young white-thorn plants, in the middle of the top of the bank. The earth on each ſide of theſe may be raiſed up with a ſort of wall, and the rain that falls wholly preſerved for the plants. This plenty of water, and depth of fine earth, make the young plants grow quicker and more vigorouſly than in any other way; and the moſt beautiful of all hedges is formed in this manner. When this ſort of hedge is young, there muſt be placed on each ſide of it a ſhort dry hedge, of about a foot high, to keep the ſheep from

from cropping the young plants, but this may be taken away after a little time.

There is one caution necessary in regard to the making of these banks, which is, that they must never be made in a very dry season, because if much rain should follow, the earth of the bank would swell and burst out, or spoil the shape of the bank; but if this should happen, it is easily enough repaired. This beautiful fence may be made at a smaller price than those unaccustomed to these things may imagine. In good digging ground, where men work for fourteen pence a day, it may be made and planted with quick for two shillings a pole. It may be made proper for the keeping in of deer, only by the small addition of planting, at every eight or ten feet distance, a posl a little slanting, with a mortise in it: let this stand about two feet above the bank, and into the mortises all along, put a rail made of a bough of any tree, no deer will ever go over this, nor can they creep under it, as they often do when a pale tumbles down. The quick, on the top of this bank, may be kept clipped, and will grow very thick, and afford the best shelter for cattle of any fence in use with us. Mortimer's Husbandry.

EARTH-*Board*, that part of a plough which turns over the earth.

EARTH-*Flax*. See *Plume*-ALLUM.

EARTH-*Nut*, in *Botany*. See ARACHIS.

EARTH-*Nut Pea*. See LATHYRUS.

EARTH-*Pitch*. See BITUMEN.

EARTH-*Pucerons*, in *Natural History*, a name given by authors to a species of puceron very singular in its place of abode. In the month of March, if the turf be raised in several places in any dry pasture, there will be found, under some parts of it, clusters of ants, and, on a further search, it will be usually found, that these animals are gathered about some pucerons of a peculiar species. These are large, and of a greyish colour, and are usually found in the midst of the clusters of ants. See PUCERON.

The common abode of the several other species of pucerons is on the young branches or leaves of trees; as their only food is the sap or juice of vegetables, probably these earth kinds draw out those juices from the roots of the grasses and other plants, in the same manner that the others do from the other parts. The ants that conduct us to these, are also our guides where to find the greater part of the others; and the reason of this is, that as these creatures feed on the saccharine juices of plants, they are evacuated from their bodies in a liquid form, very little altered from their original state; and the ants, who love such food, find it ready prepared for them, in the excrements which these little animals are continually voiding. Reaumur.

EARTHED SUGAR. See SUGAR.

EARTHEN FLOORS. See FLOOR.

EARTHEN *Ware*. See POTTERY.

EARTHING, in the general sense. See INTERMENT.

EARTHING, in *Agriculture* and *Gardening*, denotes the covering of vines, celery, and other shrubs and plants with earth.

EARTHQUAKE, in *Natural History*, is a sudden concussion of some part or other of the earth, generally accompanied with unusual noises, and productive of various effects, such as the emission of flames, water, vapours, &c.; and agitating the ground in various degrees, from the slightest shocks to the most tremendous convulsions, and the overthrow of buildings, towns, rocks, mountains, and very extensive tracts of land.

It has been justly observed, that of all the phenomena of nature, none is so apt to impress the human mind with terror as an earthquake. Its unlimited, its sudden, its dreadful effects leave no certain remedy, or no refuge to the terrified individuals. Seneca, speaking of it, says, "A tempestate nos vindicant portus: nimborum vim effusam, et sine fine cadentes aquas, tecta propellunt: fugientes non sequitur incendium: adversus tonitrua et minas cœli, subterraneæ domus, et defossi in altum specus remedia sunt. Nullum malum sine effugio est. Hoc malum latissimè patet, inevitabile avidum, publicè noxium. Non enim domos solum, aut familias, aut urbes singulas hausit, sed gentes totas, regionesque subvertit; et modo ruinis operit, modo in altum voraginem condit." Quest. Nat. lib. vi.

There is no country upon this globe, whether continent or island, which is not more or less subject to earthquakes. Even the sea is affected by them. And the histories of all times record an immense series of earthquakes, which has hardly left a month, a week, or perhaps a single day, unmarked by their devastations in the annals of the world. But though history speaks of the frequency, of the variety, and of the destruction, of earthquakes; yet no certain information respecting their origin has been transmitted to us from the experience of our predecessors, whose knowledge of the subject seems not to have amounted merely to conjectures and vague hypotheses. In short, we know nothing certain respecting the cause or causes which produce the earthquakes; neither are we acquainted with any certain indications of their going to take place, nor with any mode of averting them. Yet these are the objects to which the industry of philosophers must be attentively directed; and for the attainment of which, all the facts that have been more authentically recorded should be carefully collected, compared, and reflected upon. In conformity to this, we shall, in the first place, state such accounts of particular earthquakes as are more likely to convey a competent idea of their variety, their powers, their extent, &c.; principally dwelling upon those, which, in consequence of their being of a more recent date, have been more circumstantially described by eye-witnesses, some of whom are still living. We shall afterwards examine the hypotheses that have been offered in explanation of the phenomena; and shall endeavour to place the philosophical part of the subject under a concise and comprehensive form.

Several ancient authors, as Seneca, Strabo, Callisthenes, Pausanias, Pliny, Thucydides, &c. mention a variety of stupendous effects produced by earthquakes, either preceding or during their life-time; such as the separation of mountains, the appearance and disappearance of islands, the destruction of a great many cities, some of which were swallowed up, together with their inhabitants, so effectually as not to leave even a vestige of their former existence.

In the 17th year of the Christian era, under the reign of the emperor Tiberius, twelve cities of Asia Minor were destroyed in one night:—a dreadful disaster, the memory of which, or rather of the towns that were raised in lieu of those that were destroyed, is attested by a medal, still extant, of the above-mentioned emperor, on the legend of which we find, "Civitatibus Asiæ Restitutis." (Strabo. lib. xii. Tacitus Ann. lib. ii.) Eusebius adds Ephesus also to the above-mentioned twelve cities, which raises their number to thirteen. A remarkable circumstance attending the destruction of these towns is particularly noticed by Dr. Stukeley, as peculiarly favourable to his hypothesis, of which we shall speak hereafter. The circumstance is, that these thirteen cities must have occupied a circuit of about 300 miles in diameter; and though the cities themselves were completely destroyed, yet neither the mountains were reversed, nor the springs and fountains broken, nor was the course of the rivers

rivers altered. In ſhort, there was no kind of alteration produced in the ſurface of the country, which indeed remains the ſame to this day.

In the 63d year of the Chriſtian era, another violent earthquake took place in the neighbourhood of the mount Veſuvius, which was attended with extenſive deſtruction. And about 16 years after this, various other earthquakes were felt near the ſame place, which preceded that famous eruption of Veſuvius, in which the elder Pliny loſt his life.

Under the reign of the emperor Gallienus, the greateſt part of the country which forms the preſent Italy was ſhaken by earthquakes during ſeveral days. They were preceded and accompanied by horrid ſounds beneath the ſurface of the earth, and with reports like thunder. Various fiſſures of the earth, which were repeatedly opened and cloſed in a great many places, ſwallowed up a vaſt number of human beings.

In the ſecond year of the reign of Valentinian and Valens, on the morning of the 21ſt of July, A. D. 365, (Gibbon ſays, from the account of Ammianus,) the greateſt part of the Roman world was ſhaken by a violent earthquake. The impreſſion was communicated to the waters. The ſhores of the Mediterranean were left dry, by the ſudden retreat of the ſea; great quantities of fiſh were caught with the hand, and large veſſels were ſtranded on the mud. But the tide ſoon returned, with the weight of an immenſe and irreſiſtible deluge, which was ſeverely felt on the coaſts of Sicily, of Dalmatia, of Greece, and of Egypt. Large boats were tranſported, and lodged on the roofs of houſes, or at the diſtance of two miles from the ſhore; the people, with their habitations, were ſwept away by the waters; and the city of Alexandria annually commemorated the fatal day, on which 50,000 perſons loſt their lives in the inundation.

In the ſixth century, during the reign of Juſtinian in the Eaſt, which laſted 38 years, earthquakes (as it appears from the hiſtories of Procopius, Agathias, John Malala, and Theophanes) were peculiarly frequent, and remarkably deſtructive. Gibbon, in his account of thoſe times, accompanies his conciſe narrative with ſeveral obſervations of a moral or philoſophical nature, which render the paſſage peculiarly intereſting. "Without," he ſays, "aſſigning the cauſe, hiſtory will diſtinguiſh the periods in which theſe calamitous events have been rare or frequent, and will obſerve, that this fever of the earth raged with uncommon violence during the reign of Juſtinian. Each year is marked by the repetition of earthquakes, of ſuch duration, that Conſtantinople has been ſhaken above forty days; of ſuch extent, that the ſhock has been communicated to the whole ſurface of the globe, or at leaſt of the Roman empire. An impulſive or vibratory motion was felt; enormous chaſms were opened; huge and heavy bodies were diſcharged into the air; the ſea alternately advanced and retreated beyond its ordinary bounds; and a mountain was torn from Libanus, and caſt into the waves, where it protected as a mole the new harbour of Botrys, in Phœnicia. Two hundred and fifty thouſand perſons are ſaid to have periſhed in the earthquake of Antioch, on the 20th of May, 526, whoſe domeſtic multitudes were ſwelled by the conflux of ſtrangers to the feſtival of the Aſcenſion. The loſs of Berytus, on the 9th of July, 551, was of ſmaller account, but of much greater value. That city, on the coaſt of Phœnicia, was illuſtrated by the ſtudy of the civil law, which opened the ſureſt road to wealth and dignity: the ſchools of Berytus were filled with the riſing ſpirits of the age; and many a youth was loſt in the earthquake, who might have lived to be the ſcourge or the guardian of his country. In theſe diſaſters, the architect becomes the enemy of mankind. The hut of a ſavage, or the tent of an Arab, may be thrown down without injury to the inhabitant; and the Peruvians had reaſon to deride the folly of their Spaniſh conquerors, who with ſo much coſt and labour erected their own ſepulchres. The rich marbles of a patrician are daſhed upon his own head; a whole people is buried under the ruins of public and private edifices; and the conflagration is kindled and propagated by the innumerable fires, which are neceſſary for the ſubſiſtence and manufactures of a great city. Inſtead of the mutual ſympathy, which might comfort and aſſiſt the diſtreſſed, they dreadfully experience the vices and paſſions which are releaſed from the fear of puniſhment: the tottering houſes are pillaged by intrepid avarice; revenge embraces the moment, and ſelects the victim; and the earth often ſwallows the aſſaſſin or the raviſher, in the conſummation of their crimes."

One of the moſt remarkable events in the hiſtory of earthquakes occurred in the year 1538, on the coaſt of Puzzuoli, (the ancient Puteoli,) in the kingdom of Naples, and is particularly recorded by many hiſtorians, ſome of whom were eye-witneſſes of the phenomenon. Simon Porzio, Capaccio, Da Toledo, Summonte, in his "Hiſtory of the Kingdom of Naples," and others, relate that from the year 1537, until the month of September, 1538, ſhocks of earthquake were frequently felt along the coaſt of Puzzuoli; but, during the 27th and the 28th of that month, the ſhocks became much more violent, and followed each other ſo cloſely, as hardly to admit an interval of a few minutes. The ſea retired ſeveral yards from the accuſtomed ſhore. But on the 29th of the above-mentioned month, at about two hours after the ſetting of the ſun, a moſt tremendous ſhock took place, which at once annihilated the lake Lucrinus; a town, with its inhabitants, was ſwallowed up by the earth, which opened itſelf in various places, and emitted flames, with ſand and red-hot ſtones. That extent of ground, which lay between the Avernian lake and a hill called mount Barbaro, began to riſe, and, with the acceſſion of the ignited matter, formed, in a ſingle night, a new hill, which is actually exiſting under the name of Monte Nuovo; and its perpendicular height from the level of the ſea is, according to a late meaſurement, equal to 1127 Engliſh feet. The habitations of the neighbourhood were completely demoliſhed, ſo that, 24 hours after, no veſtige of their exiſtence could be perceived.

Meaco, in Japan, experienced a deſtructive earthquake in 1595. It was again deſtroyed by a like calamity, which continued three hours, in September, 1596; and it was alſo deſtroyed in 1738.

In the year 1638, a terrible earthquake happened in Calabria, the ſpot which ſeems to be particularly devoted to ſuch dreadful calamities; and is deſcribed in the following manner by Kircher, who was an eye witneſs of it. "On the 24th of March, he ſays, "we launched in a ſmall boat from the harbour of Meſſina, in Sicily, and arrived the ſame day at the promontory of Pelorus. Our deſtination was for the city of Euphemia, in Calabria, but on account of the weather, we were obliged to remain three days at Pelorus. At length, wearied with the delay, we reſolved to proſecute our voyage; and although the ſea ſeemed more than uſually agitated, yet we ventured forward. The gulf of Charybdis, which we approached, ſeemed whirled round in ſuch a manner as to form a vaſt hollow, verging to a point in the centre. Proceeding onward, and turning my eyes to mount Etna, I ſaw it caſt forth large volumes of ſmoke, of mountainous ſize, which entirely covered the iſland, and blotted out even the ſhores from my view. This, together with the dreadful noiſe, and the ſulphureous ſtench, which

which was ſtrongly perceived, filled me with apprehenſions that ſome more dreadful calamity was impending. The ſea itſelf ſeemed to wear a very unuſual appearance; thoſe who have ſeen a lake in a violent ſhower of rain all covered over with bubbles, will have ſome idea of its agitations. My ſurpriſe was ſtill increaſed by the calmneſs and ſerenity of the weather; not a breeze, not a cloud appeared, which might be ſuppoſed to put all nature thus into motion. I therefore warned my companion, that an earthquake was approaching; and, after ſome time, making for the ſhore with all poſſible diligence, we landed at Tropea. But we had ſcarce arrived at the Jeſuits' college in that city, when our ears were ſtunned with an horrid ſound, reſembling that of an infinite number of chariots driven fiercely forward, the wheels rattling and the thongs cracking. Soon after this, a moſt dreadful earthquake enſued; ſo that the whole track upon which we ſtood ſeemed to vibrate, as if we were in the ſcale of a balance that continued waving. This motion, however, ſoon grew more violent; and being no longer able to keep my legs, I was thrown proſtrate upon the ground. After ſome time, finding that I remained unhurt amidſt the general concuſſion, I reſolved to venture for ſafety, and running as faſt as I could, reached the ſhore. I did not ſearch long here before I found the boat from which I had landed, and my companion alſo. Leaving this ſeat of deſolation, we proſecuted our voyage along the coaſt; and the next day, came to Rochetta, where we landed, although the earth ſtill continued in violent agitations. But we were ſcarcely arrived at our inn, when we were once more obliged to return to our boat; and in about half an hour we ſaw the greateſt part of the town, and the inn at which we had ſet up, daſhed to the ground, and burying all its inhabitants beneath its ruins. Proceeding onward in our little veſſel, we at length landed at Lopizium, a caſtle midway between Tropea and Euphemia, the city to which we were bound. Here, wherever I turned my eyes, nothing but ſcenes of ruin and horror appeared: towns and caſtles levelled to the ground; ſtromboli, though at ſixty miles diſtance, belching forth flames in an unuſual manner, and with a noiſe which I could diſtinctly hear. But my attention was quickly turned from more remote to contiguous danger. The rumbling ſound of an approaching earthquake, which, by this time we were grown acquainted with, alarmed us for the conſequences. It ſeemed every moment to grow louder, and to come nearer. The place on which we ſtood now began to ſhake moſt dreadfully; ſo that, being unable to ſtand, my companion and I caught hold of whatever ſhrub grew neareſt to us, and ſupported ourſelves in that manner. After ſome time, the violent paroxyſm ceaſing, we again ſtood up, in order to proſecute our voyage to Euphemia, which lay within ſight. In the mean time, while we were preparing for this purpoſe, I turned my eyes towards the city; but could only ſee a frightful dark cloud, that ſeemed to reſt upon the place. This the more ſurpriſed us, as the weather was ſo very ſerene. We waited, therefore, till the cloud was paſſed away: then turning to look for the city, it was totally ſunk; and nothing but a diſmal and putrid lake was to be ſeen where it ſtood."

The iſland of Jamaica is ſo very ſubject to earthquakes, that, as Dr. Sloane relates, its inhabitants expect one at leaſt every year. Among theſe earthquakes, Dr. Sloane deſcribes one of ſo deſtructive a nature, as perhaps to equal the ſevereſt of ſuch calamities. This earthquake took place in the year 1692. In two minutes time the ſhock deſtroyed and drowned nine-tenths of the town of Port Royal, at that time the capital of the iſland. (Phil. Tranſ. n. 209.) The houſes ſunk 30 or 40 fathoms deep. The earth opening, ſwallowed up people; and they roſe in other ſtreets; ſome in the middle of the harbour; and yet many were ſaved, though there were 2000 people loſt, and 1000 acres of land ſunk. All the houſes were thrown down throughout the iſland. One Hopkins had his plantation removed half a mile from its place. Of all the wells, from one fathom to ſix or ſeven, the water flew out at top with a vehement motion. While the houſes on one ſide of the ſtreet were ſwallowed up, on the other they were thrown on heaps; and the ſand in the ſtreet roſe like waves in the ſea, lifting up every body that ſtood on it, and immediately dropping down into pits: and at the ſame inſtant a flood of water breaking in, rolled them over and over; ſome catching hold of beams, rafters, &c. Ships and ſloops in the harbour were overſet and loſt; the Swan frigate, particularly, was thrown over by the motion of the ſea, and the ſinking of the wharf, and was driven over the tops of many houſes. It was attended with a hollow rumbling noiſe, like that of thunder. In leſs than a minute, three quarters of the houſes, and the ground they ſtood on, with the inhabitants, were all ſunk quite under water; and the little part left behind was no better than a heap of rubbiſh. The ſhake was ſo violent, that it threw people down on their knees or their faces as they were running about for ſhelter. The ground heaved and ſwelled like a rolling ſea; and ſeveral houſes, ſtill ſtanding, were ſhuffled and moved ſome yards out of their places. A whole ſtreet is ſaid to be twice as broad now as before; and in many places, the earth would crack, and open and ſhut, quick and faſt: of which openings, two or three hundred might be ſeen at a time; in ſome whereof, the people were ſwallowed up; others, the earth cloſing, were caught by the middle, and preſſed to death; as to others, the heads only appeared. The larger openings ſwallowed up houſes; and out of ſome would iſſue whole rivers of water, ſpouted up a great height into the air, and threatening a deluge to that part the earthquake ſpared. The whole was attended with ſtenches and offenſive ſmells, the noiſe of falling mountains at a diſtance, &c. and the ſky in a minute's time was turned dull and reddiſh like a glowing oven. Yet, as great a ſufferer as Port Royal was, more houſes were left ſtanding therein than on the whole iſland beſide. Scarce a planting-houſe or ſugar-work was left ſtanding in all Jamaica. A great part of them was ſwallowed up, houſes, people, trees, and all at once; in lieu of which, afterwards, appeared great pools of water, which, when dried up, left nothing but ſand, without any mark that ever tree or plant had been thereon. Above twelve miles from the ſea, the earth gaped, and ſpouted out with a prodigious force vaſt quantities of water into the air; yet the greateſt violences were among the mountains and rocks; and it is a general opinion, that the nearer the mountains the greater was the ſhake, and that the cauſe thereof lay there. Moſt of the rivers were ſtopped up for 24 hours, by the falling of the mountains, till ſwelling up, they made themſelves new tracts and channels, tearing up in their paſſage trees, &c. After the great ſhake, many of thoſe people who eſcaped got on board ſhips in the harbour, where many continued above two months; the ſhakes all that time being ſo violent, and coming ſo thick, ſometimes two or three in an hour, accompanied with frightful noiſes, like a ruſtling wind, or a hollow rumbling thunder, with brimſtone blaſts, that they durſt not come aſhore. The conſequence of the earthquake was a general ſickneſs, from the noiſome vapours belched forth, which ſwept away above 3000 perſons of thoſe who were left.

In the year 1693, the iſland of Sicily experienced a moſt tremendous earthquake, whoſe ſhocks were ſeverely felt as far

far as Naples on one ſide, and Malta on the other. The deſtruction occaſioned by this earthquake was immenſe; fifty four cities and towns, together with an immenſe number of villages, were either totally deſtroyed or in great meaſure damaged: and among them was counted the famous Catania, once the reſidence of monarchs, and adorned by elegant buildings, a univerſity, &c. Father Serrovita, who was riding in ſight of it, obſerved from the diſtance of a few miles, that a denſe black cloud hung over that city. Ætna at the ſame time iſſued vaſt volumes of flame; the ſea was wonderfully agitated, and a roaring noiſe proceeded from it; the birds were terrified, the animals in the fields roared and trembled; the ground ſhook violently; all ſeemed to threaten deſtruction. In the middle of this horrid ſcene, an exploſion, with a ſhock of enormous magnitude took place, which levelled Catania with the ground, and a cloud of duſt, which roſe in the air, indicated the fatal ſpot. Out of 18,900 inhabitants of that once famous city, 900 are ſaid to have ſurvived that lamentable event. But Sicily and the kingdom of Naples have experienced ſo many earthquakes, that their dates alone would form a conſiderable liſt. Among theſe, the earthquakes of the year 1783 are remarkable, not only for their duration, and for the variety of their deſtructive effects, but likewiſe for their having been carefully examined and particularly deſcribed by competent obſervers. Of thoſe, however, we ſhall ſpeak hereafter.

In the years 1737 and 1738, violent earthquakes happened at Kamtſchatka, which ruined the habitations of the natives. And about the ſame time, the volcanoes of the neighbourhood made formidable eruptions; for that country abounds in volcanoes, ſome of which are extinct, whilſt others are ſtill burning. Pekin ſuffered a terrible earthquake in the year 1739.

In South America, and eſpecially in the vicinity of volcanoes, the earthquakes are frequent and generally violent. In 1746 Callao and Lima were almoſt totally deſtroyed. But the laſt mentioned town is ſo very ſubject to earthquakes, that ſince the eſtabliſhment of the Spaniards in that country, various ſuch diſaſters have taken place. In 1746 at Quito, in Peru, not leſs than 200 ſhocks of earthquake were counted in 24 hours; and within about one year 451 ſuch ſhocks were felt. In July 1773 San Jago of Guatimala was ſo effectually deſtroyed by a terrible earthquake, that not a ſingle building was left ſtanding in it.

Great Britain, and France, though upon the whole no very great ſufferers, have not, however, been exempt from earthquakes. In France, indeed, the various extinct volcanoes it contains indicate, that in a remote period that country muſt have frequently experienced ſuch calamities; and, in fact, ſeveral occurrences of the kind are actually recorded.

The laſt ſhocks of earthquake felt in London took place on the 8th of February, and on the 8th of March, 1749. But they only affrighted the inhabitants. In the year following, on the 30th of September, an earthquake affected various parts of England. The centre of the ſhock ſeems to have been about Daventry, in Northamptonſhire. A few other ſlight ſhocks have alſo been felt in various parts of England and Wales ſince that time.

Mr. Henry, in the Phil. Tranſ. for 1778, deſcribes the earthquake which was felt at Mancheſter in 1777. It extended 140 miles; the bells tolled twice: it was obſerved that moſt noiſe was heard in the neighbourhood of conductors of electricity; and ſome ſhocks were felt.

The year 1755 was rendered memorable by the dreadful earthquake of Liſbon, the effects of which were more or leſs ſeverely felt by almoſt the whole of Europe. Of this alſo we ſhall take particular notice hereafter.

In 1759, during the months of October and November, ſeveral violent earthquakes happened in Syria. Damaſcus, and another large city of Syria, were entirely demoliſhed; and it was reckoned that 6000 human beings in the former, and nearly all the inhabitants of the latter, were buried under the ruins. Tripoli of Syria, together with ſeveral other towns, villages, &c. alſo ſuffered conſiderably at the ſame time.

During the year 1767, frequent earthquakes were felt in Germany, in Switzerland, and other circumjacent places. In 1769, Bagdad was almoſt totally deſtroyed by an earthquake. In June, 1770, the iſland of St. Domingo ſuffered a tremendous earthquake, which was attended with the opening of a volcano. In September, 1774, at Altdorf, in Switzerland, a great number of edifices were deſtroyed by ſeveral ſtrong ſhocks of earthquake. In 1775, Ternate, among the Molucca iſlands, and Iceland, ſuffered violent earthquakes, which were accompanied with eruptions of their volcanoes. In 1778, Manheim, and Smyrna, the former in April, and the latter in July, ſuffered greatly in conſequence of earthquakes. In ſhort, there is no part of the habitable world, which is not more or leſs ſubject to the deſtructive action of earthquakes. Nor are the iſlands more exempt from ſuch diſaſters. On the contrary, it appears, upon the whole, that earthquakes are more frequent and more deſtructive among them than upon continents. In fact, the Caribbee iſlands, the Azores, the Moluccas, the Philippine iſlands, &c. are peculiarly ſubject to earthquakes.

A full hiſtory of earthquakes, as far as may be collected from the annals of the various countries of the earth, would prove a diſguſting monotony, alike deſtitute of amuſement and of inſtruction; unleſs, indeed, every particular account contained an accurate deſcription of ſome ſingular phenomenon, which might be likely to throw light upon a ſubject which is equally obſcure and important. But the accounts of ſuch events, eſpecially during a remote period, are moſtly contaminated by exaggerations and uncertainties, ſo that they can afford but little aſſiſtance to the mind of a ſpeculative philoſopher. The foregoing accounts have been ſelected as the moſt ſtriking inſtances of the kind, and as being ſufficient to convey an adequate idea of the force, the extent, the variety, and the duration of earthquakes. But we have reſerved the account of two remarkable caſes for our particular examination, *viz.* the earthquake of Liſbon in 1755, and thoſe of Calabria in 1783. The wonderful effects produced by theſe earthquakes are, perhaps, not exceeded by thoſe of any other convulſion of the kind. They were alſo particularly noticed by a variety of intelligent and creditable perſons, who have recorded, with ſufficient concurrence of teſtimony, all the principal phenomena that preceded, accompanied, and followed them, ſo as to afford ample ſcope for conjecture and for hypotheſes, reſpecting the origin, the nature, and the probable method of averting, ſo great a ſcourge of the human ſpecies.

The great earthquake of Liſbon, the capital of Portugal, took place on the 1ſt of November, 1755, but its effects were felt at an immenſe diſtance from Liſbon. Previous to it ſeveral peculiarities of the weather were remarked, which are as follows. In the year 1750 Liſbon experienced a ſlight, but ſenſible tremor of the earth, and ſimilar very ſlight tremors were frequently perceived in the courſe of the four following years, which proved ſo very dry, that ſeveral ſprings and fountains, uſually abundant, failed entirely. The wind moſtly blew from the north, or the north-eaſt. The next year, *viz.* the year 1755, was very wet and rainy; the

the ſummer was unuſually cool; and during the 40 days which immediately preceded the earthquake, the weather was clear, but not remarkably ſo. On the day immediately preceding that of the earthquake, a remarkable gloomineſs prevailed in the atmoſphere, and the ſun was obſcured. At laſt, on the morning of the fatal day, November the 1ſt, a thick fog aroſe early in the morning, but this was ſoon diſſipated by the heat of the ſun. There was no wind, nor the leaſt agitation of the ſea; the weather was remarkably warm. In the midſt of this univerſal ſtilluefs, at 35 minutes after nine in the morning, a ſubterranean rumbling noiſe was heard, and ſoon after a tremendous earthquake ſhook the whole city, throwing ſeveral of its buildings to the ground. The ſhocks were at firſt ſhort and quick; but they ſoon changed into another kind of vibration, which toſſed the houſes from ſide to ſide with ſo much violence, as to deſtroy by far the greateſt part of the city, killing, at the ſame time, a multitude of its inhabitants. The whole deſtructive ſcene laſted about ſix minutes, and not leſs than 60,000 perſons are ſaid to have periſhed in it. The effects in the river Tagus were equally remarkable. At the commencement of the earthquake, thoſe who were in boats at about a mile from the city perceived a noiſe, as if their boats were running aground, though they were in deep water, and at the ſame time they ſaw the houſes fall on both ſides of the river. The veſſels of all ſizes were driven from their moorings, and were violently toſſed about, repeatedly appearing to ſtrike, or actually ſtriking the ground; for in many places the bed of the river roſe above its ſurface. It is remarkable that a new quay, with ſeveral hundreds of perſons upon it, ſunk to an unfathomable depth, and not one of the dead bodies ever floated to the ſurface. At firſt, the bar was laid dry from ſhore to ſhore; but ſoon after the ſea rolling in like a mountain, inſtantly roſe to the height of about 50 feet near Belem caſtle. Another ſhock happened at about noon of the ſame day, and during this the walls of the few houſes that remained ſtanding were ſeen to open, about a foot from top to bottom, and then to cloſe again, without hardly leaving a mark of the fiſſure. Such were the diſaſters of Liſbon on that memorable day; we ſhall now gradually proceed to ſtate the effects of the ſame earthquake at other places.

At Colares, about 20 miles from Liſbon, and two miles from the ſea, on the laſt day of October, the weather was clear, and uncommonly warm. About four o'clock in the afternoon there aroſe a fog, unuſual at that time of the year, which came from the ſea, and ſpread itſelf over the vallies. Soon after the wind changing to the eaſt, the fog returned to the ſea, collecting itſelf and becoming very thick. As the fog retired, the ſea roſe with a prodigious roaring. The 1ſt of November the day broke with a ſerene ſky, the wind continued at eaſt; but about nine o'clock the ſun began to grow dim, and about half an hour after was heard a rumbling noiſe, like that of chariots, which increaſed to ſuch a degree, that it became equal to the exploſion of the largeſt cannon. Immediately a ſhock of an earthquake was felt, which was quickly ſucceeded by a ſecond, and a third; and at the ſame time ſeveral light flames of fire iſſued from the mountains, reſembling the kindling of charcoal. In theſe three ſhocks the walls of the buildings moved from eaſt to weſt. In another ſituation, from whence the ſea coaſt could be diſcovered, there iſſued from one of the hills, called the Fojo, a great quantity of ſmoke, very thick, but not very black. This ſtill increaſed with the fourth ſhock, and afterwards continued to iſſue in a greater or leſs degree. Juſt as the ſubterraneous rumblings were heard, the ſmoke was obſerved to burſt forth at the Fojo; and the quantity of ſmoke was always proportioned to the noiſe. On viſiting the place from whence the ſmoke was ſeen to ariſe, no ſigns of fire could be perceived near it.

At Oporto, near the mouth of the river Douro, the earthquake began about 40 minutes paſt nine. The ſky was very ſerene, when a dreadful hollow noiſe, like thunder, or the rattling of coaches at a diſtance, was heard, and almoſt at the ſame inſtant the earth began to ſhake. In about a minute or two the river roſe and fell five or ſix feet, and continued to do ſo for four hours. It ran up at firſt with ſo much violence, that it broke a ſhip's hawſer. In ſome parts the river opened, and ſeemed to discharge vaſt quantities of air; and the agitation in the ſea was ſo great about a league beyond the bar, that air was ſuppoſed to have been diſcharged there alſo.

St. Ubes, a ſea-port town about 20 miles ſouth of Liſbon, was entirely ſwallowed up by the repeated ſhocks and the vaſt ſurf of the ſea. Huge pieces of rock were detached at the ſame time from the promontory at the weſt end of the town, which conſiſts of a chain of mountains containing fine jaſper of different colours.

The ſame earthquake was felt all over Spain, except in Catalonia, Arragon, and Valencia. At Ayamonte, near where the Guadiana falls into the bay of Cadiz, a little before ten o'clock on the 1ſt of November, the earthquake was felt, having been immediately preceded by a hollow ruſhing noiſe. Here the ſhocks continued for fourteen or fifteen minutes, damaged almoſt all the buildings, throwing down ſome, and leaving others irreparably ſhattered. In little more than half an hour after, the ſea and river, with all the canals, overflowed their banks with great violence, laying under water all the coaſts of the iſlands adjacent to the city and its neighbourhood, and flowing into the very ſtreets. The water came on in vaſt black mountains, white with foam at the top, and demoliſhed more than one half of a tower at the bar named De Canala. In the adjacent ſtrands every thing was irrecoverably loſt; for all that was overflowed ſunk, and the beach became a ſea, without the leaſt reſemblance of what it was before. Many perſons periſhed; for although they got aboard ſome veſſels, yet part of theſe foundered; and others being forced out to ſea, the unhappy paſſengers were ſo terrified, that they threw themſelves overboard. The day was ſerene, and not a breath of wind ſtirring.

At Cadiz, ſome minutes after nine in the morning, the earthquake began, and laſted about five minutes. The water of the ciſterns under ground waſhed backwards and forwards, ſo that a great froth aroſe. At ten minutes after eleven a wave was ſeen coming from the ſea, at eight miles diſtance, at leaſt 60 feet higher than uſual. It daſhed againſt the weſt part of the town, which is very rocky. Though theſe rocks broke a good deal of its force, it came at laſt upon the city walls, beat in the breaſt work, and carried pieces of the building, of eight or ten ton weight, to the diſtance of 40 or 50 yards. When the wave was gone, ſome parts that are deep at low water were left quite dry; for the water returned with the ſame violence with which it came. At half an hour after eleven came a ſecond wave, and after that four other remarkable ones; the firſt at ten minutes before twelve; the ſecond half an hour before one; the third ten minutes after one; and the fourth ten minutes before two. Similar waves, but ſmaller, and gradually leſſening, continued with uncertain intervals till the evening.

At Gibraltar, the earthquake was not felt till after ten. It began with a tremulous motion of the earth, which laſted about half a minute. Then followed a violent ſhock; after that, a trembling of the earth for five or ſix ſeconds; then another ſhock, not ſo violent as the firſt, which went off gradually

gradually as it began. The whole lasted about two minutes. Some of the guns on the battery were seen to rise, others to sink, the earth having an undulating motion. Most people were seized with giddiness and sickness, and some fell down; others were stupefied, and many that were walking or riding, felt no motion in the earth, but turned sick. The sea rose six feet every fifteen minutes; and then fell so low, that boats and all the small craft near the shore were left aground, as were also numbers of small fish. The flux and reflux lasted till next morning, having decreased gradually from two in the afternoon.

At Madrid the earthquake came on at the same time as at Gibraltar, and lasted about six minutes. At first every body thought they were seized with a swimming in their heads; and afterwards, that the houses were falling. It was not felt in coaches, nor by those who walked on foot, except very slightly; and no accident happened, except that two lads were killed by the fall of a stone-cross from the porch of a church.

Malaga felt a violent shock; the bells rung in the steeples, the water of a well overflowed, and as suddenly retired.

Saint Lucar, at the mouth of the Guadalquivir, was violently shocked, and the sea broke in and did a great deal of mischief.

At Seville several houses were shaken down; the famous tower of the cathedral, called "La Giralda," opened in the four sides; and the waters were so violently agitated, that all the vessels in the river were driven ashore.

In Africa, the earthquake was felt almost as severely as it had been in Europe. Great part of the town of Algiers was destroyed. At Arzilla, in the kingdom of Fez, about ten in the morning, the sea suddenly rose with such impetuosity, that it lifted up a vessel in the bay, and dropped it with such force on the land, that it was broken to pieces; and a boat was found two musket-shot within land from the sea. At Fez and Mequinez, a great many houses fell, and a multitude of people were buried in the ruins.

At Morocco, many people lost their lives by the falling down of a great number of houses: and about eight leagues from the city, the earth opened and swallowed up a village with all the inhabitants, who were known by the name of the "Sons of Besumba," to the number of about 8000 or 10,000 persons, together with all their cattle, &c. and soon after, the earth closed again in the same manner as before.

At Salle, a great deal of damage was done. Near a third part of the houses was overthrown; the waters rushed into the city with great rapidity, and left behind them great quantities of fish.

At Tangier, the earthquake began at ten in the morning, and lasted 10 or 12 minutes. The sea came up to the walls, which was not known to have ever happened before; and went down immediately with the same rapidity with which it arose, leaving a great quantity of fish behind it. These commotions were repeated 18 times, and lasted till six in the evening.

At Tetuan, the earthquake began at the same time it did at Tangier, but lasted only seven or eight minutes. There were three shocks, so extremely violent, that it was feared the whole city would be destroyed.

In the city of Funchal, in the island of Madeira, a shock of the earthquake was first perceived at 38 minutes past nine in the morning. It was preceded by a rumbling noise in the air, like that of empty carriages passing hastily over a stone pavement. The observer felt the floor immediately to move with a tremulous motion, vibrating very quickly. The shock continued more than a minute; during which time the vibrations, though continual, were weakened and increased in force twice very sensibly. The increase, after the first remission of the shock, was the most intense. The noise in the air accompanied the shock during the whole of its continuance, and lasted some seconds after the motion of the earth had ceased; dying away like a peal of distant thunder rolling through the air. At three quarters past eleven, the sea, which was quite calm, (it being a fine day, and no wind stirring,) retired suddenly some paces; then rising with a great swell without the least noise, and as suddenly advancing, overflowed the shore, and entered the city. It rose 15 feet perpendicular above the high-water mark, although the tide, which flows there seven feet, was then at half ebb.

The water immediately receded, and after having fluctuated four or five times between high and low water mark, it subsided, and the sea remained calm as before. In the northern part of the island the inundation was more violent, the sea there retiring above 100 paces at first, and, suddenly returning, overflowed the shore, forcing open doors, breaking down the walls of several magazines and store-houses, leaving great quantities of fish ashore, and in the streets of the village of Machico. All this was the effect of one rising of the sea, for it never afterwards flowed high enough to reach the high-water mark. It continued, however, to fluctuate here much longer before it subsided than at Funchal; and in some places farther to the westward, it was hardly, if at all, perceptible.

The shocks of this earthquake were also felt in a great many other places, much more distant from Portugal, but in general very slightly. They were felt in several provinces of Sweden, in Italy, and especially at Milan; in England at Earsy Court, Berks; at Eyam-bridge, Derbyshire, where the shocks were pretty smart; in France, as at Bayonne, Bourdeaux, and Lyons, &c. But the effects of this earthquake in distant places, were observed to affect the waters of seas, lakes, rivers, springs, wells, &c. in a most extraordinary manner; and such phenomena took place principally in Norway, Sweden, Germany, Holland, Corsica, Switzerland, Antigua, Barbadoes, Great Britain, Ireland, &c.

In some of those places the waters turned muddy, and were strangely agitated, in others, they overflowed the banks with violence and then retired; unusual tides came on at different places, a bubbling hissing or roaring was perceived in some lakes, and so forth: but we must be more particular in describing some of those effects, which were observed in England, Scotland, and Ireland.

At Barborough in Derbyshire, between 11 and 12 in the morning, a surprising and frightful noise was heard near a large body of water called "Pibley Dam," a large swell of water came in a current from the south, and rose two feet on the north side of the lake. It then subsided, returned again, and so on, gradually decreasing in its motion until it ceased entirely. A similar noise, with agitation, and overflowing of the water of a canal, was observed at about half an hour after ten in the morning, at Busbridge in Surrey; a similar agitation was observed in a pond at Cobham in Surrey. At Dunstall in Suffolk, the water of a pond rose gradually for several minutes in the form of a pyramid, and fell down like a water-spout. Other ponds in the neighbourhood had a smooth flux and reflux from one end to the other. Near Durham, about half an hour after ten, a rushing noise was heard to issue from a pond, and its water was seen to rise and to descend alternately, without any fluctuating motion, and continued this rising and falling during six or seven minutes, making four or five such vibrations in a minute. At Earsy Court, Berks, about 11 o'clock, after a violent trembling of the earth, a motion of the water of a fish-pond was observed from the south to the north end of

the pond, leaving the bottom at the fouth end altogether dry for about fix feet. It then returned, and flowed at the fouth end, rifing three feet up the flope bank; and immediately after returned to the north bank, rifing there alfo about three feet. In the time between the flux and reflux, the water fwelled up in the middle of the pond, collected in a ridge about 20 inches higher than the level on each fide, and boiled like a pot. This agitation from fouth to north lafted about four minutes. At Eaton bridge, Kent, the water of a pond was feen to open in the middle, fo that a poft could be feen a good way down, almoft to the bottom. The water in the mean time dafhed over a bank two feet high, and perpendicular to the pond. This was repeated feveral times with a great noife. At Shireburn caftle, Oxfordfhire, at a little after ten in the morning, a ftrange motion was obferved in the water of a moat which furrounds the houfe. Though there was not the leaft wind, the water was obferved to flow at one corner, and to retire again fucceffively and regularly. Every flood began gently; its velocity increafed by degrees, and at laft it rufhed in with great impetuofity, till it had attained its full height. After a little time it ebbed in a fimilar manner, &c. At every flux, the whole body of water feemed to be violently thrown againft the bank, but neither during the time of the flux nor that of the reflux, did there appear the leaft wringle of a wave on the other parts of the moat.

The like movement was obferved at the oppofite corner of the moat; but it was remarked with furprife, that the water flowed at both corners, which ftood diagonally oppofite to each other, at the fame time, and alfo ebbed at the fame time in both places.

At White Rock, Glamorganfhire, at about two hours ebb of the tide, and near three quarters after fix in the evening, a vaft quantity of water rufhed up with a prodigious noife; floated two large veffels, broke their moorings, drove them acrofs the river, and had like to have overfet them.

The whole rife and fall of this extraordinary body of water did not laft above 10 minutes, nor was it felt in any other part of the river, fo that it feemed to have gufhed out of the earth at that place.

At Loch Lomond in Scotland, at about half an hour after nine in the morning, the water, without the leaft apparent caufe, rofe againft its banks with great rapidity, then fubfided far below the ufual level. It rofe again, and fo forth.

The greateft perpendicular height of this fwell was two feet, and four inches. A remarkable phenomenon attended the earthquake in this lake, which was, that a large ftone, lying at fome diftance from fhore, but in fuch fhallow water that it could eafily be feen, was forced out of its place in the lake upon dry land, leaving a deep furrow in the ground, all along the way in which it had moved. At Loch Nefs, at about half an hour after nine, a great agitation was obferved in the water of the river Oich.

At Kinfale, in Ireland, between two and three in the afternoon, the weather being calm, and the tide near full, a large body of water fuddenly rufhed into the harbour with fuch rapidity, that it broke the cables of two floops, and it whirled round feveral veffels. At one place it overflowed, and poured into the market place. It then fubfided, and again rofe, continuing this motion for about 10 minutes. But between fix and feven in the evening, the water rofe again, though not with fo great violence as before, and it continued to ebb and flow alternately till three in the morning.

At fea, the fhocks of this earthquake were felt moft violently. Off St. Lucar, the captain of the Nancy frigate felt his fhip fo violently fhaken, that he thought he had ftruck the ground; but on heaving the lead, found he was in a great depth of water. Captain Clark from Denia, in N. lat. 36° 24′, between nine and ten in the morning, had his fhip fhaken and ftrained as if fhe had ftruck upon a rock, fo that the feams of the deck opened, and the compafs was overturned in the binacle. The mafter of a veffel, bound to the American iflands, being in N. lat. 25°. W. long. 40°, and writing in his cabin, heard a violent noife, as he imagined, in the fteerage, and while he was afking the caufe of it, the fhip was put into a ftrange agitation, and feemed as if fhe had been fuddenly jerked up and fufpended by a rope faftened to the maft-head. He immediately ftarted up with great terror and aftonifhment; and looking out at the cabin-window, faw land, as he took it to be, at the diftance of about a mile. But coming upon the deck the land was no more to be feen, but he perceived a violent current crofs the fhip's way to the leeward. In about a minute, this current returned with great impetuofity, and at a league's diftance he faw three craggy pointed rocks throwing up water of various colours refembling fire. This phenomenon, in about two minutes, ended in a black cloud, which afcended very heavily. After it had rifen above the horizon, no rocks were to be feen; though the cloud, ftill afcending, was long vifible, the weather being extremely clear. Between nine and ten in the morning, another fhip, 40 leagues weft of St. Vincent, was fo ftrongly agitated, that the anchors, which were lafhed, bounced up, and the men were thrown a foot and a half perpendicularly up from the deck. Immediately after this, the fhip funk in the water as low as the main chains. The lead fhewed a great depth of water, and the line was tinged of a yellow colour, and fmelled of fulphur. The fhock lafted about ten minutes, but fmaller ones were felt during about 24 hours after the firft.

Thus we have ftated the moft material particulars which were obferved on the firft of November 1755, during an earthquake remarkable for its deftructive effects, for its extent, and for the fingularity of the phenomena with which it was accompanied. Many other particulars might have been added which were obferved in fome of the above-mentioned places as well as in others; but we have thought proper to omit them, confidering that they are neither of much confequence, nor effentially different from fome of thofe which have been already mentioned. See Phil. Tranf. vol. xlvi. and xlix.

The earthquakes of Calabria are of a more recent date, but of a duration vaftly greater than the preceding. In fact, it was a repetition of fhocks more or lefs violent and deftructive, which continued to afflict that country from the beginning of the year 1783 to the end of the year 1786. The moft violent fhocks, however, and the greateft deftruction, took place during February and March of the firft of thofe years. The moft authentic account of thefe earthquakes was written by the chevalier Vivenzio, phyfician to their Sicilian majefties. This intelligent gentleman publifhed his firft account in the year 1783, immediately after the moft deftructive fhocks; and his documents were derived from the accounts which were regularly tranfmitted to the court of Naples, from the various parts of Calabria and Sicily, which places were the actual fufferers of the misfortunes. But in the year 1788, when the fhocks had entirely ceafed, and when the former accounts had received due corrections and enlargements, the fame gentleman publifhed a fecond edition, much amended and improved, with the addition of elegant plates. The title of the book is "Iftoria de Tremuoti Avvenuti nella provincia della Calabria Ulteriore, e nella Città di Meffina, nell' anno 1783, &c. Di Giovanni Vivenzio, Cavaliere," &c. Amongft other improvements,

provements, this second edition contains a most singular and accurate journal of the earthquakes, kept by a learned physician of Monteleone, in Calabria, named Dr. Domenico Pignataro, who resided upon that devoted spot all the time. This journal expresses the time, the strength, the direction, and the effects of each shock, and is accompanied with an accurate statement of the concomitant phenomena of the atmosphere, such as the strength and direction of the wind, rain, temperature, &c.

Besides the above, several other partial accounts were also published about that time; and sir William Hamilton, then English minister at the court of Naples, also transmitted his accounts, which contain several curious observations. From all these documents we have extracted the following account, which, considering the variety and the importance of the facts, we have endeavoured to render as concise as it was in our power.

The southern part of the kingdom of Naples consists of two provinces of the same name, viz. the Hither Calabria, and the Further Calabria, or Calabria Citra, and Calabria Ultra, the latter of which is separated from the island of Sicily by the channel or faro of Messina. This province extends from latitude 37° 45' to 39° 12' N., it is separated from the other Calabria principally by the mountains called Sile, and by the mountains of Nicastro; and is itself divided nearly from north to south by a ridge of mountains called the Appennines, among which there are Monte Dijo, Monte Sacro, and Monte Caulone, extending westward to the Tyrrhene sea. It was in the vicinity of these mountains that the earthquake in general exerted its greatest force. Catanzaro is the principal city or capital of the province.

With respect to weather, temperature, &c. of the year 1782, preceding that of the earthquake, it was observed in that province, that the summer proved remarkably hot and dry, the autumn was peculiarly rainy and cold; but the beginning of the winter was rather mild. The winds mostly predominant were, the S.E., the S., and the S.W. On the 28th of October a violent hurricane arose, and blew along the coast of Catanzaro, the heights of Tiriolo, and as far as the plains of Crifalco, rooting up trees, cutting and destroying whatever happened to be in its way. The violent rains of October and November filled the cisterns, wells, ponds, and rivers, to an unusual degree, which occasioned a great deal of damage throughout the province, and on the 10th of December upwards of a hundred persons lost their lives in consequence of the violent overflow of a torrent.

In the course of the night of the 1st of January, 1783, a slight shock of an earthquake was felt; and it was said by some, that two other slight shocks were also felt during two other nights of the same month. This, however, is uncertain. During the first two days of February, the weather was either clear, though not perfectly so, or covered with broken clouds: the wind blew either from the south-east, or from the west. The sun appeared somewhat inflamed. The morning of the 5th commenced with nearly the same appearances, but a haziness came on gradually. On the shores of Bovino and Pizzo the fishermen were obliged to relinquish their occupations, and to land, for though there was no wind, yet the sea at some distance appeared to be in an extraordinary state of ferment and ebullition. On the eastern coast, near cape Rizzuto, the sea being unusually agitated, overflowed the shores, and at that time some assert that they felt a slight tremor of the earth. From about ten until very near twelve o'clock at noon, some rain fell in different parts of the province; but at Monteleone it rained abundantly. The wind was S.S.E. In this state of the atmosphere, at about a quarter before one in the afternoon, a rumbling subterranean noise, like a succession of thunders was in about two seconds succeeded by a dreadful earthquake. At first the soil began to shake gently, but the vibrations soon became violent in the direction of S.S.W. and N.N.E. some of them, however, were extremely strong and irregular, then they decreased nearly in the same manner as they had commenced, and the whole lasted about two minutes. The water of the sea was instantly put in agitation; at first it retired from the shore, and it flowed soon after, and this was repeated three times successively. This earthquake shock, fractured, or entirely demolished, several buildings on the northern part of the island of Sicily, as well as all over the province of Calabria. The ground was thrown up or sunk in several places, changing the face of the country, and interrupting the course of rivers, the overflowing of which occasioned incredible damage. At the same time the fires, which were naturally kindled among the houses and villages that were destroyed, contributed to the distress of the natives. Some of these fires continued to burn two or three days, and even longer. The inhabitants of Monteleone saw a dense fog rise from the sea, and those who happened to be involved in it, perceived a disagreeable strong smell, as if it came from the rubbish of the buildings that were destroyed. Water was seen to spring out of the ground in a great many places, and these, as well as the waters of rivers, &c. became muddy, and mostly emitted a sulphureous or phosphoric smell. Large fissures were found open in the ground, and in other places the ground was elevated much above its usual level; and thus the most delicious plantations, gardens, pasture lands, &c. instantly became a frightful desert.

The greatest force of the earthquake seems to have been exerted in the very centre of the province, viz. in the vicinity, or on the western side of Aspromonte, Monte Sacro, and Monte Caulone. And from that place the greatest force seems to have proceeded in the direction of W.S.W.

The space which came within the action of this earthquake was reckoned to measure 50 miles by 30; for whatever was comprehended within it, was altered and destroyed in a dreadful manner. At Messina, in Sicily, the houses on or near the level of the sea suffered most. The Lipari islands likewise suffered their share of the disasters. The utmost boundaries at which the shock was felt, seemed to be Otranto in the kingdom of Naples, and Palermo in Sicily. A vast number of people perished under the ruins of their habitations, many were left lame and helpless, and those who survived were so terrified as hardly to know what to do. Besides the above great convulsion, four more such dreadful commotions took place, of which we shall speak presently; but in the course of the same day, the memorable 5th of February 1783, and within four hours of the great commotion, not less than 14 other shocks were felt, but their force and duration was not to be compared to the great one. Indeed, during the whole year 1783, from February forward, very few days passed without one or two or more of those shocks of various strength and duration, taking place. They became gradually less frequent in the following years, 1784, 1785, and 1786, with which the journal terminates.

We must now resume the account of the four other extraordinary commotions which followed that of the 5th of February. The next, or second great earthquake, took place at about midnight, between the 6th and 7th of the same February. It was accompanied by a dreadful rumbling noise, it lasted about one minute and an half, but it commenced and ended with the same uniform violence. About the same time the sea in many places rose several feet above its usual level, and produced great damage by its inundation. This second great earthquake, as may be easily imagined, added

considerably to the scene of destruction and distress; but without repeating the same disagreeable expressions of horror, we shall proceed to state the periods of the other great commotions, and shall then add a summary of the principal facts which may demand our more particular attention.

The third great earthquake took place in the afternoon of the 7th of the same February. It lasted about two minutes and a half. The rumbling noise and the commotion commenced at the same moment. The shocks were of various sorts, such as horizontal or vertical pulsations, whirling, waving, &c.

The fourth tremendous earthquake happened very early in the morning of the 1st of March following. This also was accompanied with great subterranean noise; it lasted about a minute and 35 seconds; it was tremendously violent throughout its whole duration. The shocks were at first undulating, but after a very short intermission they changed into a sort of whirling motion.

The fifth and last great earthquake took place on the evening of the 28th of the same month of March, at about an hour and a quarter after sun setting. It lasted about two minutes. Its shocks were of various sorts, the last of which proved the most violent.

In the journal, the shocks, much inferior to the abovementioned five extraordinary convulsions, are distinguished into four degrees of force; the first being the weakest, and the fourth the strongest. And from the statement of the whole journal, it appears that during the year 1783, the unfortunate inhabitants of Calabria felt 501 shocks of the first degree, 236 of the second degree, 175 of the third, and 32 of the fourth degree, besides the five great commotions; in all 949 earthquakes.

During the year 1784, there happened 98 shocks of the first degree, 34 of the second, 16 of the third, and three of the fourth degree. In all 151 shocks. Their number gradually diminished in the following years, so that it needs not be particularly stated.

Those dreadful and repeated commotions, shook, altered, and destroyed the whole face of the country. Sir William Hamilton observes, that if the city of Oppido, where the earthquake exerted its greatest force, be taken as a centre, and round that centre a circle be described with a radius of 22 miles, this will comprehend all the towns, villages, farms, &c. that were utterly destroyed, where the greatest mortality happened, and where the surface of the country suffered the greatest alteration. But if you describe the circle with a radius of 72 miles, this, then, will comprehend the whole country that had any mark of having been affected by the earthquake. The greatest alteration of the country took place on the western side of the mountains which have been mentioned above, *viz.* Monte Sacro, Monte Caulone, &c. Many openings and cracks were made in those places; some hills were lowered, others were entirely levelled with the adjoining ground; some were split asunder; deep vallies were filled up; pieces of ground, with trees standing, were transported from one place to another, even with men upon them, who often remained unhurt. But the interruption of the rivers, in consequence of the fall of hills, and the alterations of the ground, caused an unappreciable damage. As it appeared from the survey made by professional persons, sent on purpose by the government of Naples, not less than 215 lakes, and some of them very extensive, were formed by the above-mentioned interruptions.

From the authentic statements which were transmitted to the government, it appears that 182 towns and villages were entirely destroyed, 92 were partly destroyed, but rendered entirely uninhabitable, and many others suffered in a less degree.

From the statement of the population previous to, and subsequent to the earthquakes, it appears, that in the whole country that suffered, the whole population before the earthquakes, comprehending men, women, and children, amounted to 439,776 human beings; out of which number 29,451 died under the ruins, and 5709 died of diseases contracted in consequence of the earthquakes. It is now necessary to add some of those remarkable occurrences which took place at different times during the above-mentioned earthquakes. It was observed, previous to most of the shocks, that the clouds, when any existed, dispersed in the atmosphere, generally collected together, and remained stationary, suspended, as it were, upon some particular spot. It is said that horses and other animals, by their moanings, dejection, or uneasiness, frequently indicated the approach of an earthquake; and it was particularly observed, that geese were soonest and most alarmed at the approach of a shock. Vivenzio relates that a physician of Cosenza, named Dr. Niccola Zupo, being impressed with the idea that electricity is the cause of earthquakes, stuck into the ground an iron rod of about 12 feet in length, and that at the time of many a shock, he observed electric fire proceed from the pointed extremity of the rod which projected above the ground.

Mount Ætna, in Sicily, and the volcano of Stromboli, had smoked less than usual before the earthquakes; but they both exhibited appearances of an eruption during the earthquakes.

Sir William Hamilton, long before the termination of the earthquakes, had the curiosity to go and examine the place with his own eyes. As he was going towards Rosano, and before he arrived at that place, he passed over a swampy plain, in many parts of which he was shewn small hollows in the earth, of the shape of an inverted cone. They were covered with sand, as was the soil near them. He was informed that during the earthquake of the 5th of February, a fountain of water, mixed with sand, had been driven up from each of those spots to a considerable height. This phenomenon, he thought, might be easily explained by supposing the first impulse of the earthquake to have come from the bottom upwards, which all the inhabitants of the plain attested to be the fact; the surface of the plain suddenly rising, the rivers, which are not deep, would naturally disappear, and the plain returning with violence to its former level, the rivers must naturally have returned and overflowed, as the sudden depression of the boggy ground would as naturally force out the water that lay hid under their surface. It was observed in the other parts, where the same phenomenon had been exhibited, that the ground was always low and rushy.

The surprizing case of the two tenements which had exchanged situation was fully ascertained by sir William Hamilton, who relates that they were situated in a valley surrounded by high grounds; and the surface of the earth, which was removed, had probably been undermined by little rivulets which come from the mountains, and were then plainly discernible on the bare spot which the tenements had quitted. Their course down the valley was sufficiently rapid to prove that it had not been a perfect level. The earthquake, he supposes, had opened some depositories of rain water in the clay-hills, which surrounded the valley; which water, mixed with the loose soil, taking its course suddenly through the undermined surface, lifting it with the large olive, mulberry trees, and a thatched cottage, floated

floated the whole piece of ground, with all its vegetation about a mile down the valley, where it then ſtood with moſt of the trees erect. Theſe two tenements were about a mile long and half a mile broad.

The deſtruction in ſome places, and the miſery that enſued, exceed deſcription. The force of the earthquake of the 5th of February was ſo great at the town of Poliſtene, that all the inhabitants were buried, alive or dead, under the ruins of their houſes, in an inſtant, and out of 6000, 2100 are ſaid to have loſt their lives on that day. At Caſal Nuovo, the princeſs Gerace Grimaldi, with 4000 of her ſubjects, periſhed on the ſame day by the exploſion; for ſuch it appears to have been. Some, who had been dug alive out of the ruins, ſaid, that they had felt their houſes fairly lifted up, without the leaſt previous notice. An inhabitant of Caſal Nuovo was at that moment on a hill overlooking the plain, when, feeling the ſhock, and turning round, inſtead of the town he ſaw only a thick cloud of white duſt, like ſmoke, the natural effect of the cruſhing of the buildings and the mortar flying off. That town was ſo effectually demoliſhed, that no veſtige of houſe or ſtreet remained, but all lay in one confuſed heap of ruins. Of the ſeveral perſons that were dug out alive, ſome were quite unhurt; and it is ſingular, that ſome perſons were buried by one ſhock, and liberated by another ſhock. Theſe facts, however extraordinary they may appear, were well authenticated; and a prieſt eſpecially, who related his own adventure to ſir William Hamilton, having been buried in the ruins of his own houſe by the firſt ſhock, was blown out of it by the ſecond, which immediately followed the firſt.

Another well-atteſted fact took place in the vicinity of Oppido. A man, who was ploughing his field with a pair of oxen, was tranſported with his field and team clear from one ſide of a ravine to the other, and neither he nor his oxen were hurt.

We ſhall cloſe this account of the Calabrian earthquake, with the narration of the misfortune which overwhelmed the inhabitants of Scilla; and which may be conſidered as one of the greateſt diſaſters occaſioned by thoſe convulſions. The city of Scilla was ſituated on the declivity of a mountain, the foot of which was waſhed by the Tyrrhene ſea. The prince of Scilla having remarked, that during the firſt great ſhock of the 5th of February, part of the rock near Scilla had been detached into the ſea, and fearing that the rock of Scilla, on which his town and caſtle were ſituated, might alſo be precipitated down, prepared ſome boats, together with ſeveral of his dependents and adherents, accommodated, as well as they could, in thoſe boats, and retired to a little beach, ſituated at the foot of the hill. The ſecond great earthquake, which happened about midnight, having detached the greateſt part of a mountain much higher than that of Scilla, called Monaſina; that enormous maſs of ſolid matter fell into the ſea, and occaſioned a great wave. But Vivenzio's account ſays, that it was part of another hill, called Campallà, that fell ſome time after the above, and which might meaſure about a ſquare mile and a half, and that about half a minute after this fall, two mountainous waves, accompanied by a horrid roaring, proceeded towards the ſhore to the altitude of about 30 feet, and ſwept away whatever happened to be in their way. The water retired, and came again; repeating this motion three times within about two minutes; and during this ſhort period an immenſe deſtruction was occaſioned by the impetuoſity of the water. Barges, tends, men, and all were daſhed againſt the houſes, and waſhed away into the ſea. The prince, or count of Sinopoli, with his adherents, and a vaſt number of other perſons, loſt their lives. A few, however, had the good fortune of being ſaved, and among thoſe, the ſingular adventure of a girl is related, who was driven by the water into the branches of a mulberry tree, ſituated about 30 ſteps from the ſhore, where her hair and clothes being entangled amongſt the branches of the tree, detained her, at the height of about 30 feet from the ground. The formidable effects of the above-mentioned waves were alſo felt on the coaſt of Sicily, where ſeveral perſons were killed.

A careful examination of the accounts of earthquakes, that have been recorded by ancient as well as modern authors, has enabled philoſophers to form certain general rules or deductions, which we ſhall now ſtate, but concerning which, we muſt obſerve, that none of them muſt be conſidered as being exactly certain. They are only approximations to the truth, and may be conſidered as rules becauſe they agree with, or are indicated by the majority of facts, and of courſe they are ſubject to various exceptions.

1. Thoſe countries which are within the tropics, or not very far from them, are more ſubject to earthquakes than thoſe which are nearer to the poles, or have a high latitude; excepting, however, thoſe countries in which volcanoes exiſt, as Iceland and other places; for in the vicinity of volcanoes, earthquakes have generally been more frequent.

2. When a volcano has continued an unuſual length of time without making an eruption, then an earthquake is more likely to happen in the neighbourhood of it, than after a copious eruption.

3. Earthquakes are moſtly preceded by the fall of copious rains after a long drought; and ſuch was evidently the caſe with the earthquake of Liſbon, as well as with thoſe of Calabria.

4. Several other unuſual phenomena have often preceded earthquakes, and ſuch are ſtrong northern lights, abundance of what are commonly called ſhooting ſtars, fire-balls, which are more commonly known under the name of meteors; a peculiar thickneſs, or rather a want of perfect tranſparency in the atmoſphere, and a ſimilar dullneſs or a fiery redneſs in the aſpect of the ſun.

5. The ſea alſo is generally affected in an unuſual manner previous to an earthquake happening upon the adjoining land. It either ſwells up to an unuſual height, or bubbles up, and emits a peculiar roaring noiſe. The waters likewiſe of ſprings, wells, ponds, and rivers, frequently grow muddy previouſly to an earthquake, or give other indications of it, ſuch as to become ſuddenly more abundant, or more ſcanty, to yield unpleaſant ſmells, &c. It has been often obſerved, that the waters of ponds, rivers, ſeas, &c. have given indications of an earthquake having taken place at an immenſe diſtance, when no ſhock or tremor of the earth, or other unuſual phenomenon, could be perceived in the neighbourhood of thoſe waters.

6. At the time of an earthquake the air is generally calm and ſerene, though ſeldom very pellucid; but afterwards becomes generally obſcure and cloudy.

7. A noiſe of various kind, *viz.* either a continued rumbling, or ſomething like the rattling of carriages, or like the exploſions of heavy cannon, is the general forerunner of an earthquake; but ſometimes the ſhock and noiſe commence at the ſame time.

8. The nature and direction of the ſhocks vary much, and moſtly they ſucceed each other in a very ſhort time. The earth ſometimes trembles, at other times it moves ſomewhat like the waves of the ſea. The ſhock frequently begins with a perpendicular heave; then changes into a vibratory

bratory motion backwards and forwards, or in a whirling ſort of movement.

9. A ſingle ſhock is of ſhort duration, ſcarcely ever exceeding a minute; but they frequently ſucceed each other, at ſhort intervals, for a conſiderable length of time.

10. At the time of an earthquake, fiſſures, cracks, or chaſms, are frequently opened in the earth, which are of various ſhapes and ſizes; and are either ſhut up immediately, or they are left open. In great earthquakes, thoſe openings of the earth frequently ſwallow up human beings, and other animals. And there are various inſtances on record of their having ſwallowed up even whole towns. Sometimes a ſulphureous, or phoſphoric ſmell, ſmoke, and flames, but more commonly waters, iſſue out of thoſe openings.

11. Flame and ſmoke have alſo been emitted from the earth, when no openings were viſible in it; and it is ſaid, that flame and ſmoke have iſſued, likewiſe, from the water of the ſea at the time of an earthquake.

12. The effects of an earthquake are felt by ſhips at ſea, and often in a very great degree. An unuſual motion of the water is moſtly obſerved, which is either like a prodigious ſwell, or like a current ſetting in a certain direction, or ſomewhat like a whirling movement. The ſhips are affected with a ſudden ſtroke, as if they had run a-ground, or ſtruck upon a rock; and ſometimes they are affected in a more hurtful manner, as we have mentioned above, during the earthquake of Liſbon.

13. Earthquakes are not confined to any particular diſtrict, or within any preſcribable limits. Some of their effects have frequently been obſerved at an immenſe diſtance from the actual ſcene of action. And if attentive obſervations were made, and proper machines were uſed, there is no doubt but that their effects would manifeſt themſelves at a much more ſurpriſing diſtance.

The idea of meaſuring the vibrations of an earthquake, or of conſtructing a machine capable of indicating the motion of the earth, when affected by a moderate ſhock, has occurred to ſeveral perſons. A Mr. Wark propoſed to uſe a veſſel partly filled with water, and having its inſide ſurface above the level of the water, covered with powder of any light ſort; for, if a veſſel, ſo prepared, be kept on the ground, or upon any thing that is firmly fixed to the ground, the powder will remain unwaſhed from the inſide of it as long as the earth remains unſhaken; but if the earth, and of courſe the veſſel, happens to be moved out of its uſual ſituation by any ſhock of an earthquake, then the water, by waſhing off ſome of the powder, from one ſide or the other of the veſſel, would give an indication of that motion. (Roz. I. 376.) That the above-mentioned effect would take place, there can be no doubt; but the ſhortneſs of the radius of vibration (for a very large veſſel could not be conveniently uſed for ſuch a purpoſe.) will not render ſenſible any very ſmall movements of the earth.

A watch-maker of the city of Naples, during the earthquakes of Calabria, in the year 1783, made a much better contrivance for the ſame purpoſe, which is as follows: By connecting three oblong pieces of wood, he formed a ſtrong triangular frame, which he fixed ſtraight up, in a very ſteady room, and ſcrewed one ſide of it faſt to the floor. From the upper angle of this triangular frame, a pendulum proceeded, which was about eight feet in length, and conſiſted of a rod, nicely ſuſpended, and having a bob, or leaden ball, of a conſiderable weight, faſtened to its lower extremity. Juſt under the ball there was a black lead pencil, which, by means of a delicate ſpring, was made to reſt gently upon a ſheet of paper, which was fixed horizontally under the pencil. It will be eaſily comprehended that, if the floor of the room, wherein this machine was fixed, happened to be moved out of its uſual level, the pendulum muſt neceſſarily move relatively to the frame, and, of courſe, the pencil muſt mark a black ſtroke upon the ſheet of paper. The length and direction of this ſtroke would obviouſly indicate which way, and how much the floor was moved from its uſual ſituation. This machine was uſed at Naples during the latter part of the earthquakes of Calabria, and its inventor had the ſatisfaction to obſerve ſeveral marks made by the pencil upon the paper, at the time that the ſhocks of the earthquake took place in Calabria (as it was proved by comparing the times with the information which was afterwards received from Calabria,) at the ſame time that no perſon in Naples was at all ſenſible of any ſhock. It is evident, that ſuch a machine cannot indicate any perpendicular riſing, or ſinking of the ground.

The reader will eaſily believe, that a natural phenomenon of ſuch magnitude, and of ſuch conſequence as an earthquake, has at all times excited the ſpeculation of philoſophers, reſpecting its nature and its origin. Though few experiments have been inſtituted with that view, yet a vaſt number of hypotheſes have been offered, which run through all the intermediate ſteps, from the moſt evident abſurdity to a degree of high probability. Almoſt all the ancient writers who ſpeak of earthquakes offer ſome theory, or conjecture. But, as at that time, when the branches of natural philoſophy were in their very infancy, in proportion to what they are at preſent, thoſe theories, or conjectures, were hardly any thing more than random gueſſes; yet, it is to be remarked, that ſome of them coincide, in a great degree, with the two beſt modern theories, which reſt upon the innumerable facts and diſcoveries that have been produced by the two or three laſt prolific centuries.

It was imagined by Anaxagoras, that vaſt caverns, or vaults, exiſted within the body of the earth, and that earthquakes were produced by ſubterraneous clouds, confined within thoſe cavities, which, burſting into lightning, ſhook thoſe vaults, and occaſioned the ſhocks. Another hypotheſis was, that the above-mentioned vaults, being undermined, or weakened by ſubterranean fires, at laſt fell in, with whatever lay upon them. Epicurus, and other Peripatetics, aſcribed the earthquakes to the ignition of inflammable exhalations.

One of the moſt prevailing opinions, not only among the ancients, but alſo amongſt the more modern, and even amongſt ſome of the preſent philoſophers, is, that the rarefaction of water is the cauſe of volcanoes; but it is curious to obſerve how this hypotheſis has been differently modified at different times, and by different philoſophers.

The very early philoſophical writers were contented to ſay that water, reduced into ſteam by the heat of ſubterraneous fires, was the cauſe of earthquakes. Gaſſendus, Kircher, Schottus, Varenius, Des Cartes, &c. ſuppoſed that there are numerous large cavities within the body of the earth, which communicate with one another. Some of theſe cavities contain water; whilſt others contain vapour, or exhalations, ariſing from inflammable matter, ſuch as bitumen, ſulphur, &c. They then imagined that theſe exhalations were ſubject to inflammation, either from the effect of fermentation, or otherwiſe, and by their flow, or by their violent combuſtion, occaſioned the different kinds of earthquakes. Fabri ſimply and judiciouſly ſuppoſed that water, when prodigiouſly rarefied by heat, might ſometimes be the cauſe of earthquakes. Dr. Woodward ſuppoſes, that the ſubterranean heat, or fire, which is continually elevating water out of the abyſs, which, according to him, occupies the centre of the earth, to furniſh rain, dew, ſprings, and rivers,

rivers; may be ſtopped in ſome particular part. When this obſtruction happens, the heat cauſes a great ſwelling and commotion in the waters of the abyſs; and, at the ſame time, making the like effort againſt the ſuperincumbent earth, that agitation and concuſſion of it are occaſioned, which we call an earthquake. Mr. Amontons, of the French Academy of Sciences, offered the following hypotheſis. According to the received philoſophical principles, which ſuppoſe the atmoſphere to be about 45 miles high, and that the denſity of the air increaſes in proportion to the abſolute height of the ſuperincumbent column of aerial fluid, it is ſhewn, that, at the depth of 43,528 fathoms below the ſurface of the earth, air is but one-fourth lighter than mercury. Now, this depth of 43,528 fathoms is only a 74th part of the ſemi-diameter of the earth; and the vaſt ſphere beyond this depth, in diameter 6,451,538 fathoms, may probably be only filled with air; which will be here greatly condenſed, and much heavier than the heaviest bodies we know of in nature. But it is found, by experiment, that the more air is compreſſed, the more does the ſame degree of heat increaſe its ſpring, and the more capable does it render it of a violent effect; and that, for inſtance, the degree of heat of boiling water increaſes the ſpring of the air above what it has in its natural ſtate, in our climate, by a quantity equal to a third of the weight wherewith it is preſſed. Whence, we may conclude, that a degree of heat which, on the ſurface of the earth, will only have a moderate effect, may be capable of a very violent one below. And, as we are aſſured, that there are in nature degrees of heat much more conſiderable than that of boiling water, it is very poſſible there may be ſome, whoſe violence, further aſſiſted by the exceedingly great weight of the air, may be more than ſufficient to break and overturn this ſolid orb of 43,528 fathoms; whoſe weight, compared to that of the included air, would be but a trifle.

This reaſoning, though very ſpecious, will not bear a careful and particular examination.

Dr. Stukeley ſeems to have been the firſt perſon who advanced that earthquakes were probably cauſed by electricity. The two earthquakes which were felt in London during the months of February and March 1749, together with that which happened in Northamptonſhire on the 30th of September 1750, ſuggeſted this inquiry, upon which the doctor beſtowed a good deal of attention, and he communicated his reaſoning and his obſervations to the Royal Society in two papers, which are contained in the Phil. Tranſ. vol. xlvi. A ſummary of theſe papers is as follows.

That earthquakes are not owing to ſubterraneous winds, fires, vapours, or any thing that occaſions an explosion, and heaves up the ground, Dr. Stukeley thought might eaſily be concluded from a variety of circumſtances. In the firſt place, he thought there was no evidence of any remarkable cavernous ſtructure of the earth; but that, on the contrary, there is rather reaſon to preſume, that it is, in a great meaſure, ſolid, ſo as to leave little room for internal changes and fermentations within its ſubſtance; nor do coal pits, he ſays, when on fire, ever produce any thing reſembling an earthquake.

In the ſecond earthquake at London, there was no ſuch thing as fire, vapour, ſmoke, ſmell, or any eruption of any kind obſerved, though the ſhock affected a circuit of 30 miles in diameter. This conſideration alone, of the extent of ſurface ſhaken by an earthquake, he thought, was ſufficient to overthrow the ſuppoſition of its being owing to the expanſion of any ſubterraneous vapour.

For it could not poſſibly be imagined, that ſo immenſe a force, as could act upon that compaſs of ground inſtantaneously, ſhould never break the ſurface of it, ſo as to be diſcoverable to the ſight or ſmell; when ſmall fire balls, burſting in the air, have inſtantly propagated a ſulphureous ſmell all around them, to the diſtance of ſeveral miles.

Beſides, the operation of this great fermentation, and production of elaſtic vapours, &c. ought to be many days in continuance, and not inſtantaneous; and the evaporation of ſuch a quantity of inflammable matter would require a long time.

He thought that if vapours and ſubterraneous fermentations, exploſions, and eruptions, were the cauſe of earthquakes, they would abſolutely ruin the whole ſyſtem of ſprings and fountains wherever they had once been, which is quite contrary to fact, even where they have been frequently repeated. Mentioning the great earthquake which happened A. D. 17; when no leſs than 13 great cities of Aſia Minor were deſtroyed in one night, and which may be reckoned to have ſhaken a maſs of earth 300 miles in diameter, he aſks, how can we poſſibly conceive the action of any ſubterraneous vapours to produce ſuch an effect ſo inſtantaneouſly? How came it to paſs that the whole country of Aſia Minor was not at the ſame time deſtroyed, its mountains reverſed, &c.? Whereas, nothing ſuffered but the cities.

To make the hypotheſis of ſubterraneous vapours being the cauſe of earthquakes the more improbable, he obſerves, that any ſubterraneous power, ſufficient to move a ſurface of earth thirty miles in diameter, muſt be lodged at leaſt 15 or 20 miles below the ſurface of the earth, and, therefore, muſt move an inverted cone of ſolid earth, whoſe baſis is 30 miles in diameter, and axis 15 or 20 miles; an effect which, he ſays, no natural power could produce.

Upon the ſame principle, the ſubterraneous cauſe of the earthquake in Aſia Minor muſt have moved a cone of earth of 300 miles baſe, and 200 in the axis; which, he ſays, all the gun-powder which has ever been made ſince the invention of it, would not have been able to ſtir, much leſs any vapours, which could be ſuppoſed to be generated ſo far below the ſurface.

It is not upon the principles of any ſubterraneous exploſion that we can in the leaſt account for the manner in which ſhips, far from any land, are affected during an earthquake; which ſeems as if they ſtruck upon a rock, or as if ſomething thumped againſt their bottoms. Even the fiſhes are affected by an earthquake. The ſtroke, therefore, muſt be occaſioned by ſomething that could communicate motion with unſpeakably greater velocity than any heaving of the earth under the ſea, by the elaſticity of generated vapours. This could only produce a gradual ſwell, and could never give ſuch an impulſe to the water, as would make it feel like a ſtone.

Comparing all theſe circumſtances, Dr. Stukeley ſays, he had always thought, that an earthquake was an electrical ſhock, of the ſame nature with thoſe which are now become familiar in electrical experiments. And this hypotheſis, he thought, was confirmed by the phenomena preceding and attending earthquakes, particularly thoſe which happened in London and other parts of England. The weather, for five or ſix months before the firſt of theſe earthquakes, had been dry and warm to an extraordinary degree, the wind generally ſouth and ſouth-weſt, and that without rain, ſo that the earth muſt have been in a ſtate of electricity ready for that particular vibration in which electrification conſiſts. On this account, he obſerves, that the northern regions of the world are but little ſubject to earthquakes in comparison with the ſouthern, where the warmth and dryneſs of the air, ſo neceſſary to electricity, are common.

All the flat country of Lincolnſhire, before the earthquake

in September, though underneath it is a watery bog; yet, through the whole preceding ſummer and autumn (as they can have no natural ſprings in ſuch a level) had the drought ſo great on the ſurface of the earth, that the inhabitants were obliged to drive their cattle ſeveral miles to water. This, he ſays, ſhews how fit the dry ſurface was for an electrical vibration; and alſo, which is of great importance, that earthquakes reach but very little below the ſurface of the earth.

Before the earthquake at London, all vegetables had been uncommonly forward, and electricity is well known to quicken vegetation. As the weather had been uncommonly mild previous to the earthquake, it is more likely that the forward ſtate of vegetation was owing to that circumſtance, rather than to the interference of electricity, which Dr. Ingenhouſz found, by a variety of experiments, not to forward vegetation, as it had been believed.

Dr. Stukeley continues to remark, that the aurora borealis had been very frequent about the ſame time, and had been twice repeated juſt before the earthquake, of ſuch colours as had never been ſeen before. It had alſo removed to the ſouth, contrary to what is common in England; ſo that ſome Italians, and people from other places where earthquakes are frequent, obſerving theſe lights, and the peculiar temperature of the air, did actually foretell the earthquake. For a fortnight before the earthquake in September, the weather was ſerene, mild, and calm; and one evening, there was a deep red aurora borealis, covering the cope of heaven, very terrible to behold. The whole year had been remarkable for fire-balls, thunder, lightning, and coruſcations, almoſt throughout England. And all theſe meteors are ſuppoſed to be cauſed by the electrical ſtate of the atmoſphere.

In theſe previous circumſtances of the ſtate of the earth and air, nothing, he ſays, is wanting to produce the wonderful effect of an earthquake, but the touch of ſome non-electric body, which muſt neceſſarily be had *ab extra*, from the region of the air, or atmoſphere. Hence, he infers, that if a non-electic cloud diſcharges its contents upon any part of the earth in that highly electrical ſtate, an earthquake muſt neceſſarily enſue. It has been obſerved, that the noiſe which commonly attends earthquakes, generally precedes the ſhock: whereas it muſt have been quite the contrary if the concuſſion had depended upon a ſubterraneous eruption. This noiſe attending earthquakes, the doctor thought, could not be accounted for, but upon the principles of electricity. He alſo thought that the flames and ſulphureous ſmells which are frequently obſerved during earthquakes, are more eaſily accounted for, upon the ſuppoſition of their being electrical phenomena. The impreſſion made by an earthquake upon land and water, to the greateſt diſtances, is inſtantaneous, which could only be effected by electricity.

The little damage, the Dr. ſays, generally done by earthquakes, is an argument of their being occaſioned by a ſingle vibration, or tremulous motion of the ſurface of the earth by an electrical ſnap. This vibration impreſſed on the water, meeting with the ſolid bottoms of ſhips and lighters, occaſions that thump which is ſaid to be felt by them. That earthquakes are electrical phenomena, he thinks, is made further evident, from their chiefly affecting the ſea-coaſt, places along rivers, and eminences. Laſtly, the doctor adds, as a farther argument in favour of his hypotheſis, that pains in the back, rheumatic, hyſteric, and nervous caſes; head-aches, colics, &c. were felt by many people of weak conſtitutions for a day or two after the earthquake; juſt as they would after electrification, and, to ſome, theſe diſorders proved fatal.

In what manner the earth and atmoſphere are put into that electrical and vibratory ſtate, which prepares them to give or receive that ſnap and ſhock which we call an earthquake, and whence it is that this electric matter comes, the doctor does not pretend to ſay, but thinks it as difficult to account for as magnetiſm, gravitation, muſcular motion, and many other ſecrets in nature.

Willing to throw as much light as poſſible upon the important and obſcure ſubject of earthquakes, we have endeavoured to extract the moſt important part of Dr. Stukeley's ingenious papers, which, ſince their publication in the Phil. Tranſ. have acquired many adherents; yet it is eaſy to perceive, that he writes like a man who has long employed his ſerious thoughts upon a favourite ſubject; which naturally caſts a veil over the merits of other ſubjects that may ſtand in oppoſition to the former. The doctor moſtly derived his concluſions from the phenomena which attended the ſlight earthquakes of 1749 at London. Had he lived to examine the ſubſequent earthquakes of Liſbon and of Calabria, it is moſt likely that he would at leaſt have altered ſome of his arguments. He is miſtaken when he ſays, that the force of ſteam cannot poſſibly equal that of gun-powder. He alſo lays too much ſtreſs upon various effects which might be attributed to other cauſes as well as to the agency of electricity; and at laſt, his not being able to account for the accumulation of an enormous quantity of electricity in the earth or in the atmoſphere, forms the greateſt defect of his theory.

The ſimilarity between the effects of electricity and ſome of the phenomena that attend earthquakes, has ſtruck a great many perſons, but when one examines the particulars a little beyond the bare ſimilarity of certain phenomena, there appears to be very little reaſon for concluding that electricity is the cauſe of earthquakes. The chevalier Vivenzio, in his account of the earthquakes of Calabria in 1783, expreſſes his perfect conviction of their being electrical phenomena; but his hypotheſis of the accumulation of electric fluid under certain ſtrata of non-conducting matter, and of the force which it muſt exert againſt thoſe ſtrata, is too vague to demand any particular examination. This author is not only perſuaded that electricity is the cauſe of earthquakes, but he alſo propoſes a remedy againſt their effects. In ſhort, he propoſes to fix metallic rods into the ground, as deep as it may be practicable, through which the electric fluid may paſs from the earth into the atmoſphere, and *vice verſâ*. Theſe rods, he ſays, ſhould project ſome feet above the ſurface of the earth, and both extremities of each metallic rod, *viz.* that which is within, and that which is above the ground, ſhould terminate into a number of points, or pointed branches, ſomewhat like a bruſh. And if another ſet of ſuch pointed branches was placed about the middle of each rod, it would be ſtill better.

Whoever is acquainted with the practical part of electricity, muſt know how difficult it is to confine the electric fluid, eſpecially when it is much condenſed, or in large quantities. The beſt poſſible inſulation, formed by the interpoſition of dry glaſs and reſins, will hardly prevent the diſſipation of that ſubtile fluid, which will endeavour to fly off into the air, or to any other body which may happen to be within its reach. How difficult it is then to conceive, that an immenſe quantity of that fluid (for ſurely immenſe muſt that quantity be which can produce an earthquake) can be accumulated in any part of the earth, without its immediately ruſhing to the other parts of it; or, in ſhort, that it may be accumulated at all in any part of it more than in another. It is undoubtedly true, that the earth contains various non-conducting bodies; but the manner in which they

they are found to exist is such as to prevent the possibility of forming a perfect non-conducting stratum of any considerable extent: for they either exist in separate pieces, or they are intermixed with water and a variety of other bodies, so that the whole compound is far from being a non-conductor of electricity. And we may venture to add, that as far as human art has been able to descend below the surface of the earth, it is not possible to cut off from any part of it a cubic lump of 15 or 20 feet, which might be considered as a perfect non-conductor of electricity. In the atmosphere, or in the clouds, as far as we know, no very extraordinary quantity of electricity can be accumulated, beyond what may constitute a thunder-storm; for though the *aurora borea*, shooting stars, as they are commonly called, and other meteors, have been supposed to be electrical phenomena, yet there is no certain evidence of their being actually so.

Such, in brief, are the observations which may be advanced respecting the supposed accumulation of electric fluid, either within the earth or in the atmosphere. If, then, we proceed to examine the effects, we shall undoubtedly find, that some of those which are produced by earthquakes may be conveniently explained upon the supposition of their being electrical phenomena; and the principal of these is the effect produced upon vessels at sea. But several others cannot be satisfactorily reconciled to it: for instance, in the earthquakes of Calabria, in 1783, small shocks, strong shocks, and extraordinary commotions, followed one another at short intervals of time, without any order or regularity. Now it is difficult to comprehend how the electric fluid, which produced those shocks, could be let out of its confinement in a manner so irregular: for if a small quantity of it, which produced a slight shock, could find an exit, why a larger quantity of it (which can much more easily cut its way through any obstacle) could not come out at the same time? and yet, not long after, this large quantity comes out of its confinement, and produces a great earthquake.

Slight flames, supposed to have been electric fire, have been frequently seen at the time of earthquakes: but, in the first place, these flames may have been nothing more than the combustion of hydrogen gas, dislodged from under the earth, and inflamed at the time of an earthquake; and, secondly, they may be allowed to be electric fire, without the least necessity of admitting that earthquakes are produced by electricity: for, at the time of an earthquake, the conversion of a certain quantity of water into vapour, or of vapour into water, generally and evidently takes place; and whenever this is the case, electricity must be generated, because vapour contains much more electric fluid than water, or the same quantity of water contains less of the electric fluid in that state, than in a state of vapour: therefore, when water is converted into vapour, a quantity of electric fluid is absorbed, and, of course, negative electricity is manifested;—when vapour is converted into water, a quantity of electric fluid is deposited, and, of course, positive electricity is manifested.

The communication of the shock of an earthquake to places far distant from each other, at the same or nearly at the same instant of time, has also been alleged as a proof of their being produced by electricity. But surely when a stroke of any kind, and of sufficient strength, is given to any part of an extended solid, the commotion is communicated to the most distant parts of it, if not instantaneously, at least in an exceedingly small portion of time. The least scratch of a pin, at one end of the longest beam that can be produced, is instantly heard at the other end, by a person who puts his ear in contact with the beam.

The last hypothesis which remains to be mentioned is, that earthquakes are produced by the sudden expansion of water into vapour; and this indeed coincides with the opinions of various ancient authors: but it is rendered much more probable by the facts which, of late years, have been ascertained respecting the expansibility of steam. The principal facts are as follow. Water, raised to the temperature of 212° of Fahrenheit's thermometer, in an ordinary state of the atmosphere, is converted into steam, viz. an elastic fluid, the bulk of which is not much less than 1800 times the bulk of the water from which it originated; and in that state, its elasticity enables it to support the pressure of the atmosphere. If its temperature be increased by about 30° more, so as to amount in all to about 242°, then its elastic force will be doubled; by the addition of 30° more of heat, its elasticity will be quadrupled; and so on: nor is it known how far this increase of elasticity may be extended, by increasing the temperature. Therefore, if water happens to fall upon any thing, which can instantly communicate a very high degree of heat to it, the elasticity of the vapour, which is thereby produced, may be equal to any force we may have any idea of. The only thing requisite is the ignited substance, which is to furnish a sufficient quantity of heat; and for this purpose, large quantities of melted metals are the fittest, especially those which require a very high temperature for their fusion; metallic substances being very good conductors of heat, so that when water falls upon any part of the melted matter, the caloric rushes to that spot from every part of the mass, and instantly converts the water into steam, possessed of a prodigious elastic force. Now the application of these facts to the production of earthquakes is extremely easy, as will appear from the following observations of Dr. Thomas Young. We must not, however, omit to acknowledge that there are certain circumstances, which indicate a connection between the state of the atmosphere and the approach of an earthquake, and which do not seem to admit of an explanation upon this hypothesis.

"The shocks of earthquakes," Dr. Young says, "and the eruptions of volcanoes, are, in all probability, modifications of the effects of one common cause: the same countries are liable to both of them; and where the agitation produced by an earthquake extends farther than there is any reason to suspect a subterraneous commotion, it is probably propagated through the earth nearly in the same manner as a noise is conveyed through the air. Volcanoes are found in almost all parts of the world, but most commonly in the neighbourhood of the sea, and especially in small islands; for instance, in Italy, Sicily, Iceland, Japan, the Caribbees, the Cape Verd islands, the Canaries, and the Azores. There are also numerous volcanoes in Mexico and Peru, especially Pichincha and Cotopaxi. The subterraneous fires, which are continually kept up in an open volcano, depend perhaps in general on sulphureous combinations and decompositions, like the heating of a heap of wet pyrites, or the union of sulphur and iron-filings; but, in other cases, they may perhaps approach more nearly to the nature of common fires. A mountain of coal has been burning in Siberia for almost a century, and must probably have undermined, in some degree, the neighbouring country. The immediate cause of an eruption appears to be very frequently an admission of water from the sea, or from subterraneous reservoirs. It has often happened that boiling water has been discharged, in great quantities from a volcano; and the force of steam is perhaps more adequate to the production of violent explosions, than any other power in nature. The consequence of such an admission of water into an immense collection of ignited materials, may in some measure be

be underſtood, from the accidents which occaſionally happen in founderies: thus, a whole furnace of melted iron was lately diſſipated into the air, in Colebrook Dale, by the effect of a flood, which ſuddenly overflowed it."

We ſhall now conclude this article with the account of an idea of a preſervative againſt the effects of earthquakes, which has been not only believed, but actually put in practice by various perſons at different times. The idea is, that deep wells, by giving vent to the effluvia, whatever they be, that produce earthquakes, will guard cities, buildings, &c. againſt their effects; or rather that they will prevent the ſhocks of earthquake. And this effect, provided it be true, ſeems to be much in favour of the laſt-mentioned hypotheſis, namely, that earthquakes are occaſioned by the great expanſion or elaſticity of aqueous vapour. We do not mean to vouch for the truth of it, but we ſhall briefly mention our authorities. Pliny ſays, "In terræ motibus eſt remedium, quale, et crebri ſpecus præbent: conceptum enim ſpiritum exhalant: quod in certis notatur oppidis, quæ minus quatiuntur, crebris ad cluviem cuniculis cavata. Multoque ſunt tutiora in iiſdem illis, quæ pendent; ſicut Neapoli in Italia intelligitur———Deſinunt autem tremores, cum ventus emerſit." Hiſt. Nat. l. ii. cap. 82. In the city of Naples, there is a pyramid erected before a church, dedicated to St. Januarius, under which (Celano, in his firſt volume of the deſcription of that city, ſays that) there is a deep well, which has ſeveral openings about the baſe of that pyramid, and which was made expreſsly for the purpoſe of ſaving it from the effects of earthquakes. Toaldo, the diſtinguiſhed aſtronomer, is much inclined to believe that idea, and he adduces ſeveral inſtances in corroboration of it. (See his Saggio Meteorologico, printed at Podova, in 1770.) This author, among other inſtances, ſays, that the city of Udine, capital of the Friuli, has four very deep wells, and other excavations, made at a very remote period; for they are even mentioned by Palladio: and ancient tradition ſays, that they were made at a time when that province ſuffered frequent earthquakes; and that the expedient ſeems to have been attended with the deſired effect. The ancient city of Nola, in the kingdom of Naples, was never known to have been damaged by earthquakes; and this city contains both within and without its boundaries a great number of wells. It is much to be wiſhed, that ſuch caſes may be inquired into, and properly examined, wherever they may be thought likely to occur.

EARTHQUAKE, *Artificial.* There are two experiments, frequently deſcribed by chemical and philoſophical writers, to which they have given the name of artificial earthquakes: one of them is furniſhed by the ſcience of chemiſtry, the other by that of electricity. The former, which, by the bye, may with more propriety be called an *artificial volcano*, is prepared in the following manner: Take about twenty pounds weight of iron-filings, and an equal quantity of pounded ſulphur, or of flowers of ſulphur; mix theſe two articles with as much water as will enable you to work them into a maſs like a pretty ſtiff paſte; and in that ſtate bury it into the ground, about a foot or two below the ſurface. This paſte, being a ſort of artificial pyrites in a moiſt ſtate, will ferment and will generate heat ſufficient to ſet it actually on fire; ſo that, ſome hours after the laying down of the above-mentioned paſte, the earth over it will be ſeen to crack, and fire will come out of it.

By means of electricity, the artificial earthquake may be performed various ways; but the following is perhaps the beſt. Place the extremities of two wires upon the ſurface of a thick and flat piece of glaſs; ſo that they may ſtand in one direction, and about one inch diſtant from each other. Lay a little cylinder of ivory (about three-fourths of an inch in diameter, and an inch or two high) upon that part of the ſurface of the glaſs which lies between the extremities of the two wires. Upon the upper part of the ivory cylinder, place a little board about five or ſix inches ſquare; and upon this, which may repreſent the ground of a town, diſpoſe, in any manner you pleaſe, little repreſentations of houſes, made either of paper, or cork, or wood, &c. Things being thus prepared, connect one of the above-mentioned wires with the outſide of a pretty large Leyden phial, fully charged with electricity, and connect the other wire with the knob of the ſame phial: in doing which, the charge or ſhock will paſs over the flat piece of glaſs, and under the ivory cylinder, from the extremity of one wire to the other. This ſhock hardly ever fails to break the glaſs, and to ſhake the ivory cylinder, with the board that ſtands over it, ſo as to throw down the little repreſentations of houſes, &c.; and thus it will give a faint repreſentation of an earthquake. This experiment may be performed very commodiouſly, by uſing an electrical inſtrument, called the *univerſal diſcharger*; for a deſcription of which, ſee the article ELECTRICAL *Apparatus.*

EARTHWORM, in *Zoology.* See LUMBRICUS.

Earthworms are by ſome eſteemed of great virtue in medicine, and are ſaid to be diuretic, diaphoretic, and anodyne; as alſo diſcutient, emollient, and openers of obſtructions; and have been preſcribed in apoplexies, ſpaſms, and all nervous affections, and in the jaundice, dropſies, and colics. See WORM *Tincture.*

EASE, in the *Sea Language*, ſignifies as much as ſlacken, or let go ſlacker.

Thus they ſay, eaſe the bowline, eaſe the ſheet; that is, let them go ſlacker.

EASE *the Ship*, is the command given by the pilot to the ſteerſman, to put the helm cloſe to the lee ſide; or hard-a-lee, when the ſhip is expected to pitch or plunge her fore-part deep in the water while cloſe hauled.

EASE, *Chapel of.* See CHAPEL.

EASEL, the frame uſed by painters to ſupport the tablet, or frame of canvas, upon which they are painting.

The eaſel in common uſe is too well known, and too ſimple, to need a figure: it is only a triangular frame, which ſtands on its baſe, and is ſupported in an inclined poſition by a leg behind; the ſides of the triangle are perforated with holes to receive pegs, which ſupport the tablet; and by placing the pegs in other holes, the canvas can be placed higher or lower on the frame. Mr. Middleton of St. Martin's Lane, London, has contrived an eaſel, repreſented in *fig.* 1. *Plate* XII. *Miſcellany*, of which A A is a rectangular frame of mahogany, having grooves for a frame, *a a*, to ſlide up and down in; and a ſmall ſpring-latch at the underſide of the frame, *a a*, fixes the frame at any height the painter chuſes, by locking into any of the holes made in the middle rail of the frame A A. The canvas is reſted upon a ſmall box, *b*, at the lower part of the frame *a a*; and the box alſo ſerves as a ſhelf to contain ſpare pencils, &c. B is a leg to ſupport the frame A A, which is ſhut up cloſe to the frame, when the eaſel is not in uſe.

EASEL-*Pieces*, among *Painters*, ſuch ſmaller pieces, either portraits or landſcapes, which are painted on the eaſel.

They are thus called to diſtinguiſh them from larger pictures drawn on walls, cielings, &c.

EASEMENT, in *Law*, a ſervice or convenience which one neighbour has of another by charter or preſcription, without profit; as a way through his ground, a ſink, or the like. (Kitch. 105) A perſon may preſcribe to an eaſement in the freehold of another, as belonging to ſome ancient houſe, or land, &c. And a way over the land of another,

other, a gate-way, water-courſe, or waſhing-place on another's ground, may be claimed by preſcription as eaſements. But a multitude of perſons cannot preſcribe; though for an eaſement they may plead cuſtom. Cro. Jac. 170. 3 Leon. 254. 3 Mod. 394.

In the civil law, eaſements are called *ſervitus prædii.*

EASINGWOLD, in *Geography*, a market-town in the wapentake of Bulmer, in the North Riding of Yorkſhire, England, is about 11 miles from York, and 206 from London. According to the late official report to parliament, in 1801, this town contained 269 houſes, and 1467 inhabitants. Here are a weekly market on Fridays, and two annual fairs.

EASK, a lake of Ireland, in the county of Donegal; 4 miles N.E. of Donegal.

EAST, in *Coſmography*, one of the cardinal points of the horizon; being the point wherein the prime vertical interſects that quarter of the horizon in which the ſun riſes when in the equinoctial.

The word eaſt is Saxon. In Italy, and throughout the Mediterranean, the eaſt-wind is called the *levante*:—In Greek, ανατολη and απηλιωτης, becauſe it comes from the ſide of the ſun, απ' ηλιου:—in Latin, *eurus*.

To find the eaſt and weſt line, points, &c. ſee MERIDIAN-*Line*, and DEGREE.

EAST-*Wind*, is that which blows from the eaſt point. See WIND.

EAST-*Dials*. See DIAL.

EAST-*India Companies*. See COMPANY.

EAST-*India Silk*. See SILK.

EAST, *Mooring for*. See MOORING.

EASTANALLEE, in *Geography*, the N.E. head branch of Alabama river, in Georgia, North America, on which ſtands the town of Eaſtanallee.

EAST ANDOVER, a town of America, in York county, and ſtate of Maine, 90 miles N.W. of Portland, containing 175 inhabitants.

EAST BAY, an arm of lake Champlain, projecting eaſtward from its ſouth point.

EAST BETHLEHEM, a townſhip of America, in the county of Waſhington and ſtate of Pennſylvania, having 1461 inhabitants.

EASTBOURNE, a pariſh in the hundred of Eaſtbourne, and rape of Pevenſey, in the county of Suſſex, England, is one of thoſe places that has obtained ſome degree of celebrity, in conſequence of being frequented in the ſummer months, for bathing. It is ſituated in a valley, nearly ſurrounded by hills, which are moſtly appropriated to ſheep-walks. The country is very ſimilar to parts of Saliſbury-plain; and, like that, conſiſts of a ſubſtratum of chalk and flint, with a thin ſtratum of mould, which produces a fine ſweet herbage for ſheep. The village is about one mile from the ſea, near which is the hamlet of Southbourne, where are ſeveral modern houſes built and fitted up for viſitors. In the pariſh is a free-ſchool for 15 boys, a ſmall theatre, and barracks for horſe and foot ſoldiers. In the church, which has ſome claim to antiquity, are ſeveral fine monuments. Lord George Cavendiſh has a handſome ſeat here. At a place called Holywell is a ſpring of chalybeate water, which is ſaid to poſſeſs ſimilar qualities to the Briſtol waters. On this coaſt the cliffs are very lofty in places, particularly that promontory called *Beachy-head*, which is noted by mariners as a place of danger. Here are many caverns in the cliffs, which are much frequented by ſmugglers. See a Guide to Eaſtbourne.

EAST CAMP, a village of New York, in the county of Columbia, on the eaſt bank of the Hudſon, 7 miles above Red Hook; 13 miles N. of New York.

EAST CAPE, the eaſternmoſt point of the continent of Aſia, and the dominions of Ruſſia. N. lat. 66° 15′. W. long. 169° 32′.

EAST CAPE, the eaſternmoſt land of the coaſt of New Zealand. S. lat. 37° 42′ 30″. W. long. 181°. The cape is high, and has white cliffs.

EAST CHESTER, a townſhip of America, in the ſtate of New York and county of Weſt Cheſter, on Long iſland Sound, about 8 miles S.W. of Rye, and 17 N.E. of New York, containing 738 inhabitants.

EASTER, in *Chronology* and *Eccleſiaſtical Hiſtory*, a feaſt of the church, held in memory of our Saviour's reſurrection.

The Greeks and Latins call it Πασχα, *paſcha*, originally a Hebrew word, ſignifying *paſſage*, applied to the feaſt of the Paſſover, which is held among the Jews much about the ſame time. In Engliſh it is called Eaſter, from *Eaſtre*, a goddeſs worſhipped with peculiar ceremony in the month of April.

The obſervation of this feſtival is as ancient as the time of the Apoſtles; for it is certain that the Chriſtians of the ſecond century celebrated anniverſary feſtivals in commemoration of the death and reſurrection of Chriſt, and of the effuſion of the Holy Ghoſt upon the apoſtles. The day which was obſerved as the anniverſary of Chriſt's death was called the paſchal day, becauſe it was conſidered as the ſame with that on which the Jews celebrated their Paſſover. But towards the cloſe of this century, a diſpute commenced about the particular time in which this feaſt was to be kept. The Aſiatic churches kept it on the 14th day of the firſt Jewiſh month, and three days after commemorated the reſurrection of the Redeemer, pleading on behalf of this practice the authority of the apoſtles, Philip and John, and the example of Chriſt, who held his paſchal feaſt on the ſame day that the Jews celebrated their paſſover. The weſtern churches celebrated their paſchal feaſt on the night that preceded the anniverſary of Chriſt's reſurrection, and thus connected the commemoration of his death with that of his reſurrection; and they pleaded the authority of the apoſtles Peter and Paul. One principal inconvenience attending the Aſiatic method was, that this great feſtival was commonly held on other days of the week than the *firſt*, or Sunday, which was the day of Chriſt's reſurrection. Hence very vehement contentions aroſe between the Aſiatic and Weſtern Chriſtians. About the middle of the ſecond century, during the reign of Antoninus Pius, the venerable Polycarp came to Rome, to confer with Anicet, biſhop of that ſee, upon this matter; but the conference, though conducted with great decency and moderation, was ineffectual for terminating the diſputes. Polycarp and Anicet, however, agreed in opinion, that the controverſy ought not to diſſolve the bonds of charity. Towards the cloſe of this century, Victor, biſhop of Rome, attempted to force the Aſiatic churches, by the pretended authority of his laws and decrees, to follow the rule which was obſerved by the weſtern churches: they refuſed to ſubmit, and were excommunicated by Victor. However, in conſequence of the mild interpoſition of Irenæus, biſhop of Lyons, the diſputants retained their own cuſtoms till the fourth century, when the council of Nice aboliſhed that of the Aſiatics, and rendered the time of the celebration of Eaſter the ſame through all the Chriſtian churches.

Eaſter is one of the moſt conſiderable feſtivals in the Chriſtian calendar; being that which regulates and determines the time of all the other moveable feaſts.

The rule for the celebration of Eaſter, fixed by the council

council of Nice, in the year 325, is that it be held on the Sunday which falls next after the full moon following the 21st of March; *i. e.* the Sunday which falls next after the first full moon after the vernal equinox.

The reason of which decree was, that the Christians might avoid celebrating their Easter at the same time with the Jewish passover, which, according to the institution of Moses, was held the very day of the full moon.

To find Easter agreeably to this rule, the method that obtained throughout the church, from the time of Dionysius Exignus to that of the reformation of the calendar under pope Gregory, and which still obtains in countries where the Gregorian correction is not admitted, is, by means of the golden numbers, duly distributed throughout the Julian calendar. See *Metonic* CYCLE.

To find Easter by the golden number, see NUMBER *of Direction*, and *Metonic* CYCLE.

In the new or Gregorian computation, in lieu of golden numbers, the time of Easter is found by means of epacts contrived for that purpose. See EPACT, and *Metonic* CYCLE.

Having the dominical letter and the epact, Easter-day may be found by the two following rules: 1. For finding Easter limit, or the day of the paschal full moon from March the first inclusive; add 6 to the epact; and if this sum exceeds 30, 30 must be taken from it; the remainder subtracted from 50 will give the limit, which is never to exceed 49, nor fall short of 21. 2. From the limit and dominical letter, Easter-day may be found, by adding 4 to the number of the dominical letter, subtracting the sum from the limit, and the remainder from the next higher number, which is exactly divisible by 7; add the last remainder to the limit, and the sum will give the number of days from the 1st of March to Easter-day, both inclusive. Thus for the year 1809, the epact is 14, and the dominical letter A: $6 + 14 = 20 : 50 - 20 = 30$ paschal limit; $30 - 5$ the sum of 4 and the dominical letter, $= 25$; and $28 - 25 = 3$, which added to 30, the limit, gives 33, or the number of days from March the 1st inclusive to Easter-day, or 2d of April.

The following table renders the finding of Easter in the Gregorian year from the year 1700 to the year 1900 very easy.

Epacts.	Paschal full Moons.		Epacts.	Paschal full Moons.	
X.	13 April,	E.	IX.	4 April,	C.
XI.	2 April,	A.	XX.	24 March,	F.
XXII.	22 March,	D.	I.	12 April,	D.
III.	10 April,	B.	XII.	1 April,	G.
XIV.	30 March,	E.	XXIII.	21 March,	C.
XXV.	18 April,	C.	IV.	9 April,	A
VI.	7 April,	F.	XV.	29 March,	D
XVII.	27 March,	B.	XXVI.	17 April,	B.
XVIII.	15 April,	G	VII.	6 April,	E.
			XVIII.	26 March,	A

Now, to find Easter for any given Gregorian year, seek the dominical letter and the Gregorian epact, as shewn under EPACT and *Metonic* CYCLE. Find the epact in the table, and note the paschal full moon, with the weekly letter corresponding to the same.

E. gr. the dominical letter of 1809 is A, and the epact XIV. consequently the paschal full moon falls on the 30th of March E, which is therefore Thursday, and Easter-day is the 2d of April, as before.

Though the Gregorian calendar be doubtless preferable to the Julian, yet it also has its defects. It cannot, for instance, keep the equinox fixed on the 21st of March, but it will sometimes fall on the 19th, and sometimes on the 23d.

Add, that the full moon happening on the 20th of March, might sometimes be paschal; yet it is not allowed as such in the Gregorian computation; as on the contrary, the full moon of the 22d of March may be allowed for paschal, which it is not. Scaiger and Calvisius have also proved other inaccuracies in this calendar. See CALENDAR. See an excellent paper on this subject by the earl of Macclesfield, in the Phil. Trans. vol xl. p. 417. See *Metonic* CYCLE, and EPACT.

EASTER, in *Geography*, an island in the South Pacific ocean, commonly supposed to be *Davis's land*, from its having being visited by Capt. Davis in 1686, but touched at by Roggewin in April 1722, is situated in S. lat. 27° 5′ 30″, and W. long 109° 46′ 20″. The French editor of La Perouse's voyage is of opinion that Davis's land does not exist: but that there are islands in the 27th degree of S. latitude, about 200 leagues from Copiapo, which are the islands of St. Felix and St. Ambrose, laid down erroneously in all the maps; and that these islands are the pretended land of Davis. Easter is about ten or twelve leagues in circuit, having a hilly and stony surface, and an iron bound shore. The hills are so high that they may be seen at the distance of 15 or 16 leagues. Off the S. end are two rocky islets lying near the shore: the north and east points of the island rise directly from the sea to a considerable height; between them, on the S.E. side, the shore forms an open bay, in which Capt. Cook, who visited this island in March 1774, supposes that the Dutch anchored. He anchored on the west side of the island, three miles to the north of the south point, in a road which is very good with easterly winds, but dangerous with those that are westerly, as the other on the S.E. side must be with easterly winds. This bay, called "Cook's bay," is easily known, says La Perouse; for after doubling the two rocks off the S. point of the island, and running along shore at the distance of a mile, a small creek may be perceived, which is the most certain landmark. When this creek bears E. by S. and the two rocks just mentioned are shut in with the point, there is anchorage in twenty fathoms water over a bottom of sand, at three quarters of a mile from the shore. Nothing, however, but necessity, says Cook, will induce any one to touch at this isle, unless it can be done without going much out of the way, in which case it may be done with advantage, as the people readily part with such refreshments as they have, and at an easy rate. Generally speaking, this island affords no safe anchorage, no wood for fuel, nor any fresh water worth taking on board. Nature has been very sparing of her favours to this spot. As every thing must be raised by dint of labour, it cannot be supposed that the inhabitants plant much more than is sufficient for themselves, and as they are but few in number, they cannot have much to spare to supply the wants of strangers who may chance to visit them. La Perouse says, that scarcely a tenth part of the island is cultivated; and such is its fertility, that three days' labour is sufficient to produce the Indian subsistence for a year. The lands already cleared are in an oblong form, and very regular, without any inclosure: the rest of the island is covered with a very coarse grass, which extends to the summit of the mountains. The people seemed to have no implements of agriculture; and therefore it is probable, that when they have cleared the land, they make holes with stakes, and then plant their yams and potatoes. However, in the cultivation of the soil they manifest great intelligence,

intelligence, as they pull up the weeds, burn them in heaps, and thus fertilize the soil. The banana trees are planted in a strict line by a cord. The produce of the island is sweet potatoes, yams, tarawreddy root, plantain, and sugar canes, all of which are tolerably good, and the potatoes peculiarly excellent in their kind. They have some few gourds. Their tame fowls, such as cocks and hens, were few and small, but well tasted. They have also rats, which they eat: of land birds there are scarcely any, and their sea birds are few; these were men of war, tropic and egg birds, noddies, tern, &c. The coast did not seem to abound with fish. The soil is kept cool and moist by large stones, that lie loose upon the earth, and supply the place of the salutary shade, of which the inhabitants have deprived themselves by felling their trees. This practice, which has exposed their soil to be burnt up by the sun, and precluded the existence of floods, rivulets, or springs, must have taken place in very remote periods. The inhabitants did not seem to exceed 6 or 700 in number, and of these above two-thirds were males, according to Cook's account; but La Perouse, in 1785, estimates them at 2000: and the disproportion between the males and females not so considerable. Their population did not seem to be on the decline. In colour, features, and language, they bear such affinity to the people of the more western isles, that they are without doubt of the same origin. Their language, physiognomy, and manufactures, are the same with those of the other islanders of the South sea. They are generally of a slender race; so far from being giants, as one of the authors of Roggewin's voyage asserts, not one of them was seen who measured six feet. They are brisk and active, have good features, and not disagreeable countenances; are friendly and hospitable to strangers, but as much addicted to pilfering as any of their neighbours, nor do they seem to attach any disgrace to it. But they are well apprized of the injustice they commit, for they instantly fly to escape the punishment, which they evidently expect. The practice of tattooing or puncturing the skin is much used in this island, both by the men and women; but less by the latter than by the former. Their clothing is a piece or two of quilted cloth, about six feet by four, or a mat. One piece wrapped round their loins, and another over their shoulders, made a complete dress. But the men are generally naked, or wear nothing but a slip of cloth between their legs, fastened by each end to a cord or belt passing round their waist. Their cloth, like that of Otaheite, is made of the bark of the cloth-plant. Their hair is commonly black, worn long by the women, and sometimes tied up on the crown of the head; but the men wear their hair and beards cropped short. Their head-dress is a round fillet adorned with feathers; and both men and women have very large holes, or rather slits in their ears, extended to the length of nearly three inches. Their ear ornaments are the white down of feathers, and rings made of some elastic substance and rolled round like a watch spring. The women offer their favours to those who are disposed to purchase them by presents; and the men urge the acceptance of them, and while the women lavish their caresses, they take away the hats and the handkerchiefs of those who comply. All seemed to be accomplices in these thefts, and as soon as they were committed, ran away like a covey of birds. Some of them dragged girls thirteen or fourteen years of age, solely with the hope of receiving the reward of panders; but their repugnance evinced, that in them the laws of the country were violated. Although these islanders seem to be harmless and friendly, they are not destitute of offensive weapons, such as short wooden clubs and spears; the latter of which are crooked sticks about six feet long, armed at one end with pieces of flint. Their houses are low miserable huts, constructed by setting sticks upright in the ground, at six or eight feet distance, then bending them towards each other, and tying them together at the top. The building is so contrived as to be highest and broadest in the middle, and lower and narrower towards each end. To these sticks are affixed others in a horizontal direction, and the whole is thatched over with leaves of sugar-cane. The door way is in the middle of one side, formed like a porch, and so low and narrow as just to admit the entrance of a man crawling upon all fours. The largest of these huts seen by Capt. Cook was about 60 feet long, eight or nine feet high in the middle, and three or four at each end; its breadth being nearly equal to its height. But La Perouse measured a house, constructed since Cook's visit, which was 300 feet in length, 10 in breadth, and in the middle 10 in height. Its form was that of a canoe inverted; and it had no entrance except by creeping on the hands through two doors, both less than two feet high. This house was capable of containing 200 persons; and, together with two or three others not far distant, formed a village. Some dwellings are subterraneous, and are a kind of caverns or vaulted houses, constructed with stone. In these under-ground habitations, which are numerous in the interior part of the island, Capt. Cook and some of his officers imagine that the inhabitants conceal their women and children. They dress their victuals in the same manner as at Otaheite, with hot stones, in an oven or hole in the ground. The straw, or tops of sugar-canes, plantain-heads, &c. serve as fuel to heat the stones. In every district there is probably a chief, who superintends the plantations, of which Capt. Cook imagined he was the proprietor. The most probable conjectures concerning the government of these islanders are, that they compose but a single nation divided into as many districts as there are "morais;" for it was observed that their villages are built near these cœmeteries. The productions of the earth appear to be common to all the inhabitants of the same district; and as men offer their wives to strangers without the least delicacy or reserve, it must be supposed that they do not belong to any man in particular, and that as soon as children are weaned, they are delivered to other women, who in each district are charged with the management of them. The island abounds with several monuments and statues, of a gigantic size, which appear to be very ancient; and they are placed in a kind of morai, or burying-ground, which might be inferred from the number of bones that were near them. Instead of the colossal mausolea of pride and vanity, these islanders have substituted small heaps of stone in the shape of a pyramid, the upper stone of which is whitened with lime water. These little monuments are erected near the sea-shore; and an Indian clearly expressed to La Perouse and his companions the object to which these heaps of stones were appropriated, by laying himself down and afterwards lifting up his head towards heaven, which evidently expressed his belief in a future existence. However, they observed no trace of religious worship among them, and the gigantic statues are not regarded as idols by the present inhabitants, though they express a kind of veneration for them. They are placed on platforms of masonry, some of which are 30 or 40 feet long, 12 or 16 broad, and from 3 to 12 feet in height. They are faced with hewn stones of a very large size; and the workmanship is not inferior to the best plain piece of masonry we have in England. They use no sort of cement, and yet the joints are exceedingly close, and the stones mortised and tenanted into one another in a very artful manner. The side-walls are not perpendicular, but inclining a little inwards, like the breast-

works,

works, &c. that are built in Europe; and yet notwithstanding all the skill manifested in their construction, these curious structures are mouldering by the ravages of all-devouring time. The colossal statues, the largest of which is only fourteen feet six inches high, seven feet six inches broad across the shoulders, three feet thick in the belly, and six feet broad, and five feet thick at the base, rest upon platforms as their foundations. They are formed by a rude kind of sculpture out of a volcanic production, known among naturalists by the name of "lapillo," says La Perouse, a stone so light and friable, that some of Capt. Cook's officers thought it might be a factitious substance, composed of mortar indurated by the air. Although the workmanship is coarse, the features of the face are not ill formed, particularly the nose and chin; but the ears are long beyond proportion; and, as to the bodies, there is nothing like a human figure about them. In order to elevate them upon the platforms, and to place large cylindric stones upon their heads, Capt. Cook supposes that they raised the upper end by little and little, supporting it by stones as it was elevated, and building about it till it became erect; and thus a sort of mount or scaffolding would be formed, upon which they might roll the cylinder, and place it upon the head of the statue; and then the stones might be removed from about it. We may hence infer the ingenuity and perseverance of the islanders at the period in which they were constructed. Besides these monuments of antiquity, which were numerous, on or near the sea-coast, there were many smaller piles of stones along the coast, as we have already mentioned. These stones were lavas of different densities. The canoes of these people are of the same form with those of the Society islands; but they were mean in their structure, being built of many pieces of wood sewed together with small line. There were only about three or four of them observed on the island; about 18 or 20 feet long, head and stern carved or raised a little, very narrow, and fitted with out-riggers. They seemed capable of carrying no more than about four persons, and unfit for any distant navigation. As they have no trees on the island, they must have obtained the wood large enough for their purpose, either from that left here by the Spaniards, or from that drifted on the shore from some distant land. At the southernmost extremity of the island, M. de Langle and other companions of La Perouse found the crater of a volcano, whose size, depth, and regularity, excited their admiration. It resembled the frustum of a cone, whose upper and lower basis appeared more than two miles in circumference; the depth was at least 800 feet. At the bottom was a marsh, containing several considerable pools of fresh water, whose surface appeared to be above the level of the sea. This marsh was surrounded by the finest plantations of banana and mulberry trees. The grass on the sides of the cone, the marsh at the base, and the fertility of the adjacent lands, prove that the subterranean fires have been long extinguished. The inhabitants of this island, as we have reason to believe, were more numerous when the island was better wooded. If they had sufficient industry to build cisterns for preserving water, they would remedy one of the principal inconveniences of their situation, and might even prolong their lives; for M. de Langle informs us, that they did not see one man who appeared to be more than 65 years of age, as far as they were capable of judging. The ingenuity of these people may well surprise us, when we consider the meanness of their working-tools, which, like those of all the other islanders in this ocean, are made of stone, bone, shells, &c. They little value iron, or iron tools; and as presents, they preferred pieces of painted cloth, half an ell long, to nails, knives, and beads. But the chief object of their wishes was hats, which they greedily accepted or stole whenever they had an opportunity. Cook's 2d Voyage, vol. i. La Perouse's Voyage, vol. i.

EASTER *Term*. See TERM.

EASTERLING. See STERLING.

EASTERN. See ORIENTAL.

EASTERN *Amplitude, Church, Horizon, Ocean*. See the substantives.

EASTERN *District*, in *Geography*, a district of Upper Canada, constituted as such by the name of the district of Lunenburgh, in the province of Quebec, by lord Dorchester's proclamation, July 24, 1788, and taken principally from the west end of Montreal. It derives its present name from an act of the provincial legislature. It is bounded by the province of Lower Canada on the east; to the south by the river St. Lawrence; northerly by the Ottawa river; and westerly by a meridian line passing through the mouth of the Gananoque river in the township of Leeds.

EASTERN *Island*, an island on the E. side of Chesapeak bay, at the mouth of Chester river.

EASTERN *Precinct*, a precinct of America, in the state of New Jersey, and county of Somerset, which contained, in 1790, 2068 inhabitants, including 468 slaves.

EASTERN *River*, a settlement of America, in the state of Maine, and county of Hancock, containing, in 1790, 240 inhabitants.

EASTERTON, a village of America, in Dauphin county, Pennsylvania, on the E. side of Susquehannah river, 4 miles N. by W. of Harrisburg, and 111 N. by W. of Philadelphia.

EAST FLORIDA. See FLORIDA.

EAST GREENWICH. See GREENWICH.

EAST GRINSTEAD. See GRINSTEAD.

EAST HADDAM. See HADDAM.

EASTHAM, a post town of America, in the state of Massachusetts, and county of Barnstaple, 6 miles long and 2½ wide; seated on the peninsula of Cape Cod, between Orleans and Wellfleet; distant 94 miles from Boston. Since the forests have been cut down, a part of this township is become a desert of sand; and though it has thus sustained considerable damage as an arable district, the fertile lands are likely to be preserved by inclosures. The number of families is 122, including 659 inhabitants in 99 dwelling-houses, of which only seven are two stories high. At the distance of a mile, a light-house was erected on the high lands of Cape Cod in the year 1798. The town contains a meeting-house and two school-houses. The Nauset Indians formerly occupied this town and Orleans. N. lat. 41° 51′. W. long. 69° 56′.

EAST HAMPTON. See HAMPTON.

EAST HARTFORD. See HARTFORD.

EAST HAVEN. See HAVEN.

EAST ISLAND, an island so called by Cook, in 1769, that lies off EAST CAPE, on the coast of New Zealand. It is of a small circuit, high and round, and appears white and barren.

EAST KINGSTON. See KINGSTON.

EAST MAIN. See MAIN.

EAST MEATH. See MEATH.

EAST NESS, or EASTONNESS, a cape in the German ocean, on the east coast of England, between Southwold and Lowestoff.

EASTON, a post town of America, in the state of Pennsylvania, and capital of Northampton county, pleasantly situated at the mouth of the Lehigh, and on the W. side of Delaware river; containing about 150 dwelling houses, a church, court-house, register's office, and an academy, and

1045 inhabitants; 12 miles N.E. of Bethlehem, and 70 N. of Philadelphia.—Alſo, the chief and poſt-town of Talbot county, Maryland, formerly called Talbot court houſe, is ſeated on the E. ſide of Cheſapeak bay, near the forks of Treadhaven river; 12 miles from its junction with Choptank river. It has a handſome court-houſe and market-houſe, about 150 dwelling-houſes, and ſeveral ſtores for the ſupply of the adjacent country; 5 miles S. weſterly of Williamſburg, 37 S. of Cheſter town, and 118 S.W. of Philadelphia.—Alſo, a townſhip in Waſhington county, New York; containing 3069 inhabitants.

Easton, or *Eaſtown*, a poſt-town, important for its iron manufactures, ſituated in the county of Briſtol, and ſtate of Maſſachuſetts, near the head of Raynham river, ſix miles N.W. of Raynham, and 12 W. of Bridgewater, and containing 1550 inhabitants. The art of making ſteel was introduced here by captain Eliph. Leonard in 1786; which ſerves by its excellent quality for plough-ſhares, horſe-ſhoes, &c. that require hard ſteel: but for edge-tools, in general, it is inferior to that which is imported. The beſt mill-ſaws in the ſtate are manufactured here. The manufacture of linſeed oil began here in 1792; and from an annual ſtock of 3000 buſhels of ſeed, there have been annually produced near 5000 gallons of oil.

Easton's *Beach* and *Bay*, a beach and bay of America, which lie at the ſouthern end of Rhode iſland.

EASTOWN, a town of America, in the county of Waſhington, and ſtate of New York, ſeated on the eaſt bank of Hudſon river, and containing 3072 inhabitants.

EAST Point, the extreme eaſt point of the iſland of St. John, in the gulf of St. Lawrence.—Alſo, the N.E. extremity of New Holland. S. lat. 10° 42′.

East Port, a poſt-town of Waſhington county, in the ſtate of Maine. This townſhip forms the weſtern cape of Paſſamaquoddy bay, and the mouth of Kobbeſkook river; ſituated 888 miles N. E. from Waſhington.

East River, a river of America, in the ſtate of New York, forming a communication between North river and Long iſland, along the eaſtern ſide of New York iſland.

East River. See Quinepauge.

East Town, a town of America, in Cheſter county, and ſtate of Pennſylvania, containing 444 inhabitants.

East Whiteland, a townſhip of America, in Cheſter county, Pennſylvania, containing 642 inhabitants.

East Windsor. See Windsor.

EATON. See Eton.

Eaton, a townſhip of Lower Canada, E. of Aſcot, having 400 inhabitants. A ſouthern branch of St. Francis river runs through this town.—Alſo, a town of America, in the northern part of Strafford county, New Hampſhire, three miles N. of the Great Oſſipee lake, and about 56 N. by W. of Portſmouth; incorporated in 1766, and containing 381 inhabitants.

EATOOAS, in *Modern Hiſtory*, a name given at Otaheite to a claſs of enthuſiaſtic perſons, ſo called from a perſuaſion, that they are poſſeſſed with the ſpirit of the divinity. They appear as if they were bereaved of their ſenſes, and pretend to extraordinary gifts. During the paroxyſms of their fits they do not ſeem to know their moſt intimate acquaintance; and if any one of them happen to poſſeſs property, he will give away every moveable unleſs his friends put it out of his reach; and when he recovers, he will inquire for thoſe very things, which he had, juſt before, diſtributed, not ſeeming to have the leaſt remembrance of what he had done, while the fit was upon him. Cook's Third Voyage, vol. ii. p. 19.

EATUAS, in *Modern Mythology*, a name which the inhabitants of Otaheite in the South ſea give to an imaginary inferior race of deities; two of whom, they ſay, at ſome remote period of time, inhabited the earth, and were the parents of the firſt man. The term is derived from *eothe*, which ſignifies *finiſhed*. Theſe ſubordinate deities are very numerous, and are of both ſexes; the male are worſhipped by the men, and the female by the women, in ſeparate morais, and under the direction of diſtinct prieſts. There are alſo morais common to both. Hawkſw. Voyages, vol. ii. p. 239.

EAU Arquebusade. See Aqua *Vulneraria*.

Eau *de Luce*, is a kind of volatile liquid ſoap, of a ſtrong, penetrating ſmell. The following inſtructions will ſerve for making it: take four ounces of rectified ſpirit of wine, and in it diſſolve ten or twelve grains of white ſoap; filtrate this ſolution, then diſſolve in it a dram of rectified oil of amber, and filtrate again: mix as much of this ſolution with the ſtrongeſt volatile ſpirit of ſal ammoniac, in a cryſtal-glaſs bottle, as when ſufficiently ſhook, ſhall produce a beautiful milky-liquor. If upon its ſurface be formed a cream, ſome more of the oily ſpirit of wine ought to be added.

Eau *Rabel*. See Rabel.

EAVES, the margin or edge of the roof of a houſe, being the loweſt tiles, ſlate, or the like, which hang over the walls to throw off the waters to a diſtance from the wall.

Eaves-lath, a thick feather-edged board, generally nailed round the eaves of a houſe for the lowermoſt tiles, ſlate, or ſhingles to reſt upon.

Eaves *Droppers*, in *Law*, are perſons who liſten under walls or windows or the eaves of a houſe, to hearken after diſcourſe, and thereupon to frame ſlanderous and miſchievous tales. Theſe are a common nuiſance, and preſentable at the court leet, or indictable at the quarter ſeſſions, and puniſhable by fine, and finding ſureties for good behaviour. 1 Hawk. P. C. 132.

EAUZE, in Latin *Elufa*, in *Geography*, a very ancient town of France, in the department of the Gers, chief place of a canton, in the diſtrict of Condom, ſituated on the river Geliſe, near the ruins of the ancient Elufa, which was the chief city of Novempopulania; 21 miles S.W. of Condom, and 30 miles N.W. of Auch. It has a population of 3300 individuals. The canton contains 14 communes, and 9224 inhabitants, upon a territorial extent of 287 $\frac{1}{2}$ kilometres.

EBBING *and Flowing of the Sea*. See Tides.

EBDOMARY, Ebdomadarius, an officer anciently appointed weekly in cathedral churches, to ſupervize the regular performance of divine ſervice, and preſcribe the particular duties of each perſon attending in the choir, as to reading, ſinging, and praying. To this purpoſe, the ebdomary, at the beginning of his week, drew up in form, a bill, or writing, of the reſpective perſons, and their ſeveral offices, called *tabula*, and the perſons there entered were ſtyled *intabulati*.

EBDOME, Ἑβδόμη, in *Antiquity*, a feſtival kept on the ſeventh of every lunar month, in honour of Apollo, to whom all ſeventh days were ſacred, becauſe one of them was his birth-day; whence he was ſometimes called *Ebdomagenes*. For the ceremonies of this ſolemnity, ſee Pett. Archæol. Græc. lib. ii. cap. 20. tom. i. p. 385.

EBEDJESU, in *Biography*, a learned Syrian writer, of the ſect of the Neſtorians, was biſhop of Niſibis, called by the Syrians Soba, in the latter part of the 13th century, and died in the year 1318. Dr. Aſſeman firſt publiſhed an accurate edition of his catalogue of eccleſiaſtical writings at Rome, in 1725. Ebedjeſu having, in his catalogue, mentioned the writers of the Old Teſtament, proceeds to enumerate thoſe of the New, arranging the goſpels, the Acts of the Apoſtles, three Catholic epiſtles, and St. Paul's 14 epiſtles

epistles in the order which now obtains among us, and specifying the places and languages in which the several gospels of Matthew, Mark, Luke, and John, were written, agreeably to the common opinion of the Syrians in general. Accordingly, he says, that Matthew wrote his gospel in Hebrew, and published it in Palestine; that Mark preached in Latin at Rome; Luke taught and wrote at Alexandria, in the Greek tongue; and John wrote his gospel at Ephesus, in the same language. He mentions only three Catholic epistles, omitting the 2d of Peter, and 2d and 3d of John, and the epistle of Jude; conforming, in this respect, to the common sentiments of the Syrians. He likewise omits the book of Revelation; which book, and also the three Catholic epistles, are omitted in the ancient Syriac version. Dr. Lardner very justly remarks, that Ebedjesu should not have passed over in silence the four Catholic epistles, and the book of Revelation, whatever might have been the general opinion of the Syrians concerning them; because he could not be unacquainted with them. And if they were not equally respected with the other books of the New Testament, he might have so said. Lardner's Works, vol. iv. p. 442.

EBELEBEN, in *Geography*, a small town of the kingdom of Saxony, belonging to the prince of Schwarzburg Sondershausen, with a castle and a grammar school, remarkable for several learned professors, among others Paul Gölzen, known among historians by the name of Paulus Jovius.

EBELING, C. D. in *Biography*, of Hambro', well merits notice among German dilettanti, for his excellent taste, sound judgment, and extensive knowledge of the history of the musical art and its votaries; many excellent tracts and critiques have flowed from his pen, to which he never set his name. He was many years in strict friendship with the incomparable Emanuel Bach, whose superior genius and abilities he very early felt; and on the death of Telemann, he, perhaps, first taught the Hamburghers to appreciate his merit. His collection of music and musical curiosities, 30 years ago, surpassed that of any other private gentleman of that city. M. Ebeling was then in partnership with M. professor Busch, in the celebrated Academy of Commerce. He is author, among other works, of the "History of the American War," which has been much approved; but the present article extends no further than his skill, performance, and knowledge in music, faculties which he has, unhappily, long ceased to enjoy, except by memory, and reflection, from an almost total deafness.

EBELSTADT, or Ebeltoft, in *Geography*, a small town of Denmark, in the province of North Jutland, with a good harbour, on the gulf of the same name, on the east side of Jutland. In Latin, it is called *Ebeltoftia*, or *Pomagrium*. Ebeltoft is in the diocese, or general government, of Aarhuus, in the circle of Stiernholm.

EBENEZER, a town of America, being the capital of Effingham county, in the state of Georgia, seated on the S.W. bank of Savannah river; 25 miles N.N.W. of Savannah, and 860 S.W. of Philadelphia. It was settled in 1735, by Protestants, driven by persecution from Saltsburg, in the electorate of Bavaria; but is now declining, and reduced to less than 12 decaying houses.

EBENFELD, a town of Germany, in the duchy of Carniola; 3 miles S. of Stein.

EBENFURTH, a town of Germany, in the archduchy of Austria, seated on the Leyta, built by the knights Templars; 18 miles S. of Vienna.

EBENHAUSEN, a small town of Germany, in the former bishopric of Wurtzburg, which was secularised at the peace of Luneville, and given as an indemnity to the grand duke of Tuscany.

EBENOXYLUM, in *Botany*, from ἔβενος, *ebony*, the name of a valuable wood in Theophrastus, Pliny, &c. and ξύλον, *wood*. Loureir. Cochinch. 613. Class and order, *Diœcia Triandria*?

Gen. Ch. Male, *Cal.* none. *Cor.* Petals three, longish, acute, a little spreading, incurved. *Stam.* . . . Female. *Cal.* and *Cor.* as in the male. *Nectary* stellated. *Style* one, short. *Berry* small, ovate, smooth, of one cell. *Seeds* three, oblong, angular.

Eff. Ch. Male, Cal. none. Petals three. Female, Cal. none. Petals three. Nectary stellated. Style one. Berry with three seeds.

Sp. *Ebenoxylum verum*, Lour. A tall tree, with ascending branches. *Bark* rough, greenish-brown. *Wood* with a thick, heavy, white, uniform *alburnum*, and a very black, very heavy, and peculiarly uniform heart. *Leaves* scattered, stalked, lanceolate, broadish, entire, small, smooth, firm, shining, flat, of a brownish-green. *Flowers* white, on many-flowered terminal stalks. *Berry* reddish-yellow. Native of the vast woods of Cochinchina, about the 11th degree of north latitude, where Loureiro says he had often seen it, but not being then attentive to botany, he neglected to collect the flowers. The generic characters above given are, therefore, taken from Rumphius, who in his Herb. Amboin. part 4. t. 1, figures what he terms *Ebenus vulgaris*, and appears to be the plant of Loureiro. Whether it may be the same with any of the trees we have already mentioned under Diospyros, (which see,) and how far the above characters are faithful, we have not materials to determine.

EBENSFELD, in *Geography*, a town of Germany, in the duchy of Stiria; 6 miles W. of Pettau.

EBENTHEL, a town of Germany, in the duchy of Carinthia; 2 miles S.S.E. of Clagenfurt.

EBENUS, in *Botany*, Linn. Gen. 386. Schreb. 491. Class and order, *Diadelphia Decandria*. Nat. Ord. *Leguminosæ*, Juss. *Papilionaceæ*, Linn. E. *cretica*, Linn. Sp. Pl. 1076. Alpin. Exot. t. 278, the only species upon which this genus was founded by Linnæus, is reduced to *Anthyllis* by Jussieu, who is followed by La Marck, and by Willdenow, Sp. Pl. v. 3. 1019. The latter defines it "shrubby; leaves pinnate, or ternate, equal, villose; flowers spiked." It is a native of Crete; a slender elegant shrub, with silky leaves, and rose-coloured flowers. Prosper Alpinus conceived this to be one of the plants comprehended by Theophrastus under his ἔβενος, or *ebony*, as the wood is hard and black, and the shrub has an affinity to *Cytisus*. Hence, the above name was retained by Linnæus (see Diospyros and Ebenoxylum.) *Ebenus pinnata*, Ait. Hort. Kew. v. 3. 27. Desfont. in Act. de la Soc. d'Hist. Nat. de Paris, v. 1. t. 3, apparently of the same genus as the above, is *Anthyllis sericea*, Willd. 1014. This grows in Barbary and the Levant. Vahl makes it an *Hedysarum*. The stem is not shrubby, but herbaceous, and the root biennial.

EBERACH, in *Geography*, a small town of the kingdom of Bavaria, with a rich abbey, which was secularized at the peace of Luneville, and the revenues of which were made over to Bavaria.

EBERARDI, La Teresa, in *Biography*, one of the most elegantly simple and pleasing Italian singers of the second class, that we remember on our opera stage. She was here from the year 1760 to 1765, and performed the second woman's part in serious operas under the Mattei, and in the comic, under the Paganini, while Elisi was here. Whoever

Whoever heard her ſing Galuppi's Sicilian ſtrain, "La paſtoralla al Prato," in Il Filoſofo di Campagnæ, and "Sono Amante," in La Peſoatrice, will never forget her modeſt, unadorned, and unpretending manner of ſinging, which pleaſed, by mere purity of tone and natural ſweetneſs of expreſſion. And though her ſtyle and appointment were ſo inferior to the two great ſingers, with whom ſhe alternately appeared, ſhe was ſcarcely ever ſuffered to quit the ſtage, till ſhe had repeated her ſongs.

EBERBACH, in *Geography*, a ſmall town of the kingdom of Bavaria, ſituated on the Neckar; 2 miles W. of Moſsbach, and remarkable for its good wine.—Alſo, a ſmall town of France, in the department of the Lower Rhine; 9 miles of Haguenau, in the diſtrict of Straſbourg.

EBEREMORTH, or Eberemors, in our *Old Law*, the ſame as eberemurdrum, or eberemurder. See Aberemurder.

EBEREMURDRUM, or Aberemurdrum, in our *Old Writers*. See Aberemurder.

EBERMANSTADT, in *Geography*, a town of Germany, in the circle of Franconia, and biſhopric of Bamberg, ſeated on the Wiſent; 13 miles E.S.E. of Bamberg.

EBERN, a ſmall town of Germany, in the former biſhopric, now grand duchy of Würtzburg, ſituated on the river Baunach, and chief place of a diſtrict of the ſame name.

EBERSBURG, a ſmall town of the kingdom of Saxony, belonging to the counts of Stollberg, and remarkable for a very ancient tower, and the ruins of an old caſtle, and for a rich coal-mine, at a very little diſtance, near the village of Herrmanſacker.

EBERSTEIN, a ſmall town of Germany, in the grand duchy of Baden, near the Black foreſt, the diſtrict of which was formerly an earldom. It is five miles S.E. of Baden.

EBHER, a town of Perſia, in the province of Irak, ſeated on a river of the ſame name, in a fertile country, containing about 2500 houſes, and many moſques, caravanſeras, bazars, and other handſome buildings. The Turkiſh language is ſpoken in one part of the town, and the Perſian in the other. It is diſtant 40 miles W. from Caſbin.

EBIN, or Ybin, one of the ſmaller Philippine iſlands, in the Eaſt-Indian ſea.

EBINGEN, or Ekingen, a town of Germany, in the circle of Swabia, and duchy of Wurtemburg; 36 miles S. of Stutgardt, and 22 S. of Tubingen.

EBIONITES, in *Eccleſiaſtical Hiſtory*, the denomination of perſons who roſe in the church in the very firſt age of it, and formed themſelves into a ſect in the ſecond century, denying the divinity of Jeſus Chriſt.

Origen takes them to have been ſo called from the Hebrew word *ebion*, which, in that language, ſignifies *poor*; becauſe, ſays he, they were poor in ſenſe, and wanted underſtanding. Euſebius, with a view to the ſame etymology, is of opinion, they were thus called, as having poor thoughts of Jeſus Chriſt, taking him for no more than a mere man, born of Joſeph and Mary; and eſteeming the ritual ordinances of the law neceſſary to be obſerved by them. Others, he ſays, do not deny, that Jeſus was born of a virgin by the Holy Ghoſt. Nevertheleſs, they do not acknowledge his pre-exiſtence, as God the Word; and, like the others, they are fond of the external obſervances of the law of Moſes. They alſo reject Paul's epiſtles, and call him an apoſtate from the law.

It is more probable the Jews gave this appellation to the Chriſtians in general, out of contempt; becauſe, in the firſt times, there were few but poor people that embraced the Chriſtian religion. This opinion, Origen himſelf ſeems to give into, in his book againſt Celſus, where he ſays, that they called Ebionites, ſuch among the Jews as believed that Jeſus was truly the expected Meſſiah.

It might even be urged, with ſome probability, that the primitive Chriſtians aſſumed the name themſelves, in conformity to their profeſſion. It is certain, Epiphanius obſerves, they valued themſelves on being poor, in imitation of the apoſtles. The ſame Epiphanius, however, is of opinion, that there had been a man of the name *Ebion*, the chief and founder of the ſect of Ebionites, contemporary with the Nazarenes and Corinthians. He gives a long and exact account of the origin of the Ebionites, making them to have riſen after the deſtruction of Jeruſalem, when the firſt Chriſtians, called *Nazarenes*, went out of the ſame to live at Pella.

As to the origin of their name, many learned men are now of opinion, that there never was any man named Ebion, the leader of a ſect; but that the Ebionites were ſo called from their low opinion concerning the perſon of Chriſt, and their attachment to the external rites of the law of Moſes. To this opinion the judicious Dr. Lardner ſeems to incline. We cannot deny, ſays this candid writer, (vol. vii p. 21.) that there were ſome believers, who ſuppoſed Jeſus to have been born as other men; but he apprehends, that the number of them was very ſmall, nor does he recollect any Chriſtian writing, now extant, where that opinion is maintained. Although we allow that there were ſome, who rejected the apoſtle Paul, whilſt they received the other apoſtles, theſe he ſuppoſes to have been few in number. He adds, that he does not know any work of an ancient author, now remaining, who ſpeaks diſreſpectfully of him, excepting only the "Recognitions," or "Clementine Homilies."

The Ebionites are little elſe than a branch of Nazarenes; only that they are ſaid to have altered and corrupted, in many things, the purity of the faith held among thoſe firſt adherents to Chriſtianity. For this reaſon, Origen, as well as Euſebius, diſtinguiſhes two kinds of Ebionites, in his anſwer to Celſus: the one believed that Jeſus Chriſt was born of a virgin; and the others, that he was born after the manner of other men. The firſt were orthodox in every thing, except that to the Chriſtian doctrine they joined the ceremonies of the Jewiſh law, with the Jews, Samaritans, and Nazarenes, together with the traditions of the Phariſees. They differed from the Nazarenes, however, in ſeveral things, chiefly as to what regards the authority of the ſacred writings; for the Nazarenes received all for ſcripture contained in the Jewiſh canon; whereas the Ebionites are ſaid to have rejected all the prophets, and held the very names of David, Solomon, Iſaiah, Jeremiah, and Ezekiel, in abhorrence. They alſo rejected all St. Paul's Epiſtles, whom they treated with the utmoſt diſreſpect.

They received nothing of the Old Teſtament but the Pentateuch; which ſhould intimate them to have deſcended rather from the Samaritans than from the Jews. They agreed with the Nazarenes in uſing the Hebrew Goſpel of St. Matthew, otherwiſe called the Goſpel of the Twelve Apoſtles; but they are charged with having corrupted their copy in abundance of places; and particularly with having left out the genealogy of our Saviour, which was preſerved entire in that of the Nazarenes, and even in thoſe uſed by the Corinthians.

Irenæus, Euſebius, and Epiphanius, concur in ſaying, that the Ebionites received the goſpel of St. Matthew only. Epiphanius informs us, that the goſpel of the Ebionites began with the third chapter of Matthew, a little altered, and he ſays expreſsly, that it is defective and corrupted.

Some,

Some, however, have made this gospel canonical, and of greater value than our present Greek gospel of St. Matthew. See *Gospel of* St. Matthew and Nazarenes.

Beside the Hebrew gospel of St. Matthew, the Ebionites had adopted several other books, under the names of St. James, John, and the other apostles; they also made use of the travels of St. Peter, which are supposed to have been written by St. Clement, but had altered them so, that there was scarce any thing of truth left in them. They even made that saint tell a number of falsehoods, the better to authorize their own practices. See St. Epiphanius, who is very diffusive on the ancient heresy of the Ebionites, Hær. 30.

But his account deserves little credit, as, by his own confession, he has confounded the other sects with the Ebionites, and has charged them with errors, to which the first adherents to this sect were utter strangers.

Dr. Priestley, in his "History of Early Opinions concerning Jesus Christ, &c." (vol. iii.) zealously maintains the identity of the Ebionites and Nazarenes; and in opposition to those who assert, that they were subsequent to the destruction of Jerusalem by Titus, and to others who have fixed their origin so late as the desolation of Judea by Adrian, he endeavours to shew, that persons distinguished by these appellations were supposed to have existed in the time of the apostles. Irenæus, says this writer, who gives no other name to any Jewish Christians besides that of Ebionites, whom he always speaks of as denying the pre-existence and divinity of Christ, and likewise the miraculous conception, objects to the Gnostics, that they were of late date, but he says nothing of the Ebionites in that respect. Eusebius also says, that "the first heralds of our Saviour" (meaning the apostles) "called those Ebionites, which in the Hebrew language signifies poor; who, not denying the body of Christ, shewed their folly in denying his divinity."

Epiphanius makes the Ebionites contemporary with the Nazarenes; and he mentions the Ebionites as well as the Nazarenes among those who gave great alarm to the apostle John. Dr. Priestley further maintains, that there was no difference between these two sects; and that both of them were equally believers in the simple humanity of Christ. To this purpose he alleges the testimonies of Origen, Eusebius, and Jerom; but some have thought that the passages he produces do not decidedly warrant the inference which he deduces from them. (See the preceding part of this article, and the title Nazarenes.) In favour of the identity of the Ebionites and Nazarenes, this author observes, that the latter are not mentioned by name by any writer, who likewise speaks of the Ebionites, before Epiphanius, who was fond of multiplying heresies, though the people so called were certainly known before his time. The term Ebionites occurs, he says, only in Irenæus, Tertullian, Origen, and Eusebius. None of them make any mention of Nazarenes, though they must have been more considerable in the time of these writers than they were afterwards. It was not till the time of Epiphanius, that the term Nazarenes, by which the unbelieving Jews still continued to call the Christians among them, was applied to a sect different from that of the Ebionites. M. Le Clerc, and many other eminent critics of the last age, maintained the opinion, that the Ebionites and Nazarenes were the same people. Mr. Jones "On the Canon" (vol. i.) observes, that there was a very great agreement between these two ancient sects, but at the same time he intimates, that the Ebionites had made some addition to the old Nazarene system. Our author, after having remarked that the peculiar opinions of the Ebionites and Nazarenes are represented by the most respectable authorities as the very same, adds, that some have thought that the Nazarenes believed the miraculous conception, which the Ebionites denied; but that this opinion has no authority whatever among the ancients. Against this assertion, however, many objections might be urged. (See Nazarenes.)

Tertullian, it is observed, is the first Christian writer who expressly calls the Ebionites *heretics*. Although Irenæus professes his dislike of their doctrine, he never confounds them with the heretics. Justin Martyr makes no mention of them, but is supposed to include them under the general denomination of "Jewish Christians;" and it is asserted, on the authority of Jerom, that the Ebionites were anathematized *solely* on account of their adherence to the Jewish law, the yoke of which many of them were desirous of imposing on the Gentile Christians. Epiphanius, with great injustice, as it seems, charges the Ebionites with the peculiar doctrines of the Gnostics; whereas by the testimony of ancient writers, the heresy of the former was the very reverse of that of the latter.

The Ebionites, as we have already said, made use of no other gospel than that written in Hebrew, which was their own language, and this gospel is commonly said to be that of St Matthew, originally composed in their language, and for their use. Their copies of this gospel, however, began with the third chapter.

Epiphanius says, as we have already observed, that they also made use of the travels of Clement, with which they might be pleased, as it was an Unitarian work. But they made no use of the epistles of St. Paul, because they disapproved the slight, which he put upon the law of Moses, which they held in the greatest veneration. Epiphanius further says concerning the Ebionites, that they detest the prophets. However, from other accounts it appears, that they acknowledged the authority of all those books which we admit into the canon of the Old Testament. Symmachus was an Ebionite, and Theodotion, according to Jerom, was of the same sect, and as they both translated the other books of the Old Testament, as well as the Pentateuch, and without making any distinction between them, it is probable that they considered them as entitled to equal credit. To this purpose Irenæus expressly says, that the Ebionites expounded the prophecies too curiously.

EBISMA, in *Ancient Geography*, a town of Arabia Felix, in the country of the Adramites, according to Ptolemy.

EBLANA, a town of Hibernia, now *Dublin*.

EBODA, a town of Arabia Petræa, according to Ptolemy; but placed by Pliny in Arabia Felix.

EBOES, a name given in the West Indies to those negroes who are imported from those parts of Africa that are bounded westward by an extent of coast of about 300 leagues, called the bight of Benin. (See Benin.) These negroes are, with regard to their complexion, much yellower than those of the Gold Coast and Whidah. They appear of a sickly hue, and their eyes seem to be suffused with bile, even when they are in perfect health. The conformation of their face, in general, resembles that of the baboon. The great objection to these Eboes, as slaves, is their constitutional timidity and despondency of mind, which prevail to such a degree, that they often seek, in a voluntary death, a refuge from their own melancholy reflections. They therefore require mild and gentle treatment to reconcile them to their situation; and with this treatment their confidence may be gained, and they then manifest as great fidelity, affection, and gratitude, as can be expected from men in a state of slavery. The females are better labourers than the men, probably from their having been more hardly treated in Africa. It is said, however, that these Eboes are more savage than any nation of the Gold Coast; inasmuch as many

many of them, especially those of the Moro tribe, have been accustomed to the shocking practice of feeding on human flesh. As to their religious opinions and modes of worship, it is said, that, like the inhabitants of Whidah, they pay adoration to certain reptiles, of which the guana, a species of lizard, is in the highest estimation. They universally practise circumcision; and it is, moreover, affirmed, that they frequently offer up human sacrifices in their worship of the guana. Edwards's Hist. W. Indies, vol. ii.

EBOLICS, Ebolica. See Ecbolics.

EBONY *of Crete*, in *Botany*. See Ebenus.

Ebony *of the Alps*. See Cytisus.

Ebony, *False*. See Poinciana.

Ebony, *Mountain*. See Bauhinia.

Ebony-*Wood* is brought from the Indies, exceedingly hard and heavy, susceptible of a very fine polish, and on that account used in Mosaic and inlaid works, toys, &c.

There are divers kinds of ebony; the most usual among us are black, red, and green, all of them the product of the island of Madagascar, where the natives call them, indifferently, *hazon mainthi*, *q. d.* black wood. The island of St. Maurice, belonging to the Dutch, likewise furnishes part of the ebonies used in Europe.

Authors and travellers give very different accounts of the tree that yields the black ebony. By some of their descriptions, it should be a sort of palm-tree; by others, a cytisus, &c. M. Flacourt, who resided many years at Madagascar, as governor thereof, assures us, that it grows very high and big, its bark being black, and its leaves resembling those of our myrtle, of a deep, dusky, green colour.

Tavernier says, that the islanders always take care to bury their trees, when cut down, to make them the blacker, and to prevent their splitting, when wrought. F. Plumier mentions another black ebony tree, discovered by him at St. Domingo, which he calls "spartium portulacæ foliis aculeatum ebeni materiæ." Candia also bears a little shrub, known to the botanists under the name of *ebenus Cretica*, above described.

Pliny and Dioscorides say, the best ebony comes from Ethiopia, and the worst from India; but Theophrastus prefers that of India. Black ebony is much preferred to that of other colours. The best is a jet black, free of veins and rind, very massive, astringent, and of an acrid pungent taste. This is the diospyros ebenum, according to Dr. Roxburg's account, and is found in the woods of Ceylon. See Diospyros. Loureiro makes a distinct genus of it under the name of *Ebenoxylum*, which see. Its rind, infused in water, is said to purge pituita and cure venereal disorders; whence Mathiolus took guaiacum for a sort of ebony. It yields an agreeable perfume when laid on burning coals: when green, it readily takes fire, from the abundance of its fat. If rubbed against a stone it becomes brown. The Indians make statues of their gods, and sceptres for their princes, of this wood. It was first brought to Rome by Pompey, after he subdued Mithridates. It is now much less used among us than anciently; since the discovery of so many ways of giving other hard woods a black colour.

As to the green ebony, besides Madagascar and St. Maurice, it likewise grows in the Antilles, and especially in the isle of Tobago. The tree that yields it is very bushy; its leaves are smooth, and of a fine green colour. Beneath its bark is a white blea, about two inches thick; all beneath which, to the very heart, is a deep green, approaching towards a black, though sometimes streaked with yellow veins. Its use is not confined to Mosaic work; it is likewise good in dyeing, as yielding a fine green tincture.

As to red ebony, called also *grenadilla*, we know little of it more than the name.

The cabinet makers, inlayers, &c. make pear-tree, and other woods, pass for ebony, by giving them the black colour thereof. This some do by a few washes of a hot decoction of galls; and when dry, adding writing ink thereon, and polishing it with a stiff brush, and a little hot wax; and others heat or burn their wood black.

EBORA, in *Ancient Geography*, now *Evora*, a town of Spain, in the S. W. part of Lusitania. According to Bochart, its name, in the Eastern language, signifies abundance; which corresponds to *Cerealis*, derived from Ceres, an appellation given to it by Pliny.

EBRBUHARITES, a sect or order of religious, among the Mahometans; thus called from their founder Ebrbuhard, a disciple of Naschibendi.

The Ebrbuharites, notwithstanding the extraordinary sanctity they make profession of, with an absolute dereliction of all worldly things, are regarded, by the Mussulmans, as no better than heretics, because they do not esteem themselves obliged to go in pilgrimage to Mecca. To excuse themselves from this labour, they urge, that the purenesses of their souls, their sublime contemplations, ecstacies, &c. shew them Mecca and Mahomet's tomb, without stirring out of their cells.

EBREUIL, in *Geography*, a small town of France, in the department of the Allier, chief place of a canton, in the district of Gannat, with a population of 2200 individuals. The canton has an extent of 207 kilometres and a half, and contains 13,043 inhabitants, dispersed in 17 communes.

EBRICCATUM, a term used by Paracelsus to express the partial loss, or deprivation of reason, as it happens during drunkenness; but with the addition of the epithet *cælyste*, it signifies, with the same author, a much more exalted state, a sort of divine enthusiasm, or inspiration, such as the Sybils of old boasted of; and, among the moderns, the French prophets, and some other religious sects, have pretended to. Paracelsus himself pretended, at times, to be under some such influence; but his mad fits seemed to have very little of inspiration in them.

EBRIETAS. See Drunkenness.

EBRILLADE, in the *Manege*, a check of the bridle, which the horseman gives to the horse by a jerk of one rein, when he refuses to return. An ebrillade differs from a *saccade*, the latter being made with both reins at once, and the former only with one. Most people confound these two words under the general name of a check or jerk of the bridle, called in French *coup de bride*. It is a chastisement, and no aid, and is disused in academies.

EBRIZIUS Color, a term used by some of the old writers, to express a very fine yellow. The word seems originally to have been obrizium, and was certainly derived from the aurum obryzum, or fine gold, of which this ebrizius expressed the colour.

EBRO, in *Geography*, the ancient *Iberus*, from which Spain took the name of Iberia, is a considerable river of Spain, which has its source on the boundaries of the Asturias and Old Castile, in the mountains near Santillana, runs through Biscay and Arragon, begins to be navigable at Tudella, passes by Saragossa, where commences a canal, into which the Ebro falls at Bocal, and then flows through Catalonia into the Mediterranean sea, about 25 miles below Tortosa. Its water is remarkable for its salubrity. Its course is from north-west to south-east, through the greatest part of northern Spain.

The Ebro served as a limit to the conquests of Charles the Great, in the South, and the French did not penetrate further

further into Spain in 1795. But at the end of the year 1808, and in the beginning of 1809, their conquests extended to a considerable distance beyond this river, which is to form the boundary between France and Spain, in case Joseph Buonaparte maintains himself on the throne of the united kingdom of Spain and Portugal.

EBRODUNUM, in *Ancient Geography*, *Embrun*, a town of Gaul, belonging to the Caturiges. It is also called *Eborudoro*, *Hebriduno*, and *Eburono*. It lies at the foot of the Alps, and is therefore referred to Italy by Ptolemy.

EBROIN, in *Biography*, mayor of the palace under the French kings Clotaire III. and Thierri I., is supposed to have been a German by birth. At the succession of Clotaire, in 656, he was raised to the dignity of mayor, and in this capacity he governed the kingdom in conjunction with the queen-mother Batilde. During ten years the administration of public affairs was conducted with impartiality and peace, but at the end of this period disputes ran high between Ebroin and two bishops, which so disgusted the queen, that she withdrew to a convent. Ebroin now held the reins of government with a high hand, and made the principal people in the state his enemies, who, at the death of Clotaire, rose in arms, plundered the minister, and dethroned Thierri, whom he had proclaimed as king. For a short time Childeric, king of Austrasia, reigned in the room of Thierri, but, in 670, the death of Childeric made room for the deposed monarch, who was replaced on the throne, and on this event Ebroin left the monastery, to which he had retired, and scrupled the use of no means to regain his former post, which he at length obtained, when he became as despotic as he was powerful, and inflicted on his enemies the most cruel torments. He was himself assassinated in the year 681, by one whom he had fined for mal-practices in the offices which he held. Moreri.

EBROMAGUS, or EBROMANUS PAGUS, in *Ancient Geography*, a place of Aquitanic Gaul. Anton. Itin.

EBRUS, a river of Illyria, according to Diodorus Siculus.—Also, a river of Greece, in Thessaly, which passed by the town of Larissa.

EBSTORF, in *Geography*, a town of Germany, in the circle of Lower Saxony, and principality of Luneburg: celebrated for its honey, which the inhabitants sell annually to the amount of several thousand crowns; 7 miles W.N.W. of Ultzen.

EBU-HANIFA. See SONNITES.

EBULLITION, in *Physics*, the act of emitting bubbles, by a vehement agitation of the parts of a fluid, produced by fire, or otherwise. See BOILING.

EBULLITION, or *Effervescence*, in the language of Sydenham, and some other humoral pathologists, signified the exacerbation, or hot stage of an intermitting fever, before the sweating stage had commenced. This expression was deduced from the comparison of a paroxysm of fever, with the chemical process of fermentation; whence the subsequent sweating stage was denominated the *desumation* of the febrile humours: the hot stage, in which the circulation appears to be in a state of tumultuous action, being supposed to resemble the intestine motion of a vat of fermenting liquor; and the sweating stage, to represent the throwing off of the scum and froth from the surface. See Sydenham, sect. i. c. 5. Van Swieten ad Aph. 750.

EBULUS, in *Botany*, Dane-wort, or Dwarf Elder, see SAMBUCUS. A fœtid and rather dangerous plant, which was vulgarly supposed to have sprung up from the blood of some of the Danes who were killed in invading England.

The roots and leaves of dwarf-elder are said to be brisk cathartics. The juice of this plant has been recommended in the dropsy, gout, and scorbutic disorders. The flowers are esteemed sudorific; and the leaves boiled, till perfectly soft, make a good cataplasm for the sciatica. See ELDER.

EBUR FOSSILE, in *Natural History*. See *Fossile* IVORY.

EBUR *fossile variegatum*, in the *Natural History* of the ancients, a name given to the substance which we now call the rough or native turquoise.

Fossile ivory, and the bones of other animals, are frequently found buried at great depths in the earth, and are found to have preserved their substance, texture, and colour in different degrees, according to the nature of the matter among which they happen to have lain. Sometimes they are firm and solid, and scarce altered in colour; and sometimes more or less hardened, and tinged to different colours by the different matters in which they have been deposited.

Of this kind was the spotted fossile ivory of the ancients, which was in all respects the same with our rough turquoises of many places, which are no other than the teeth and bones of animals accidentally lodged in the way of particles of copper. See TURCOIS.

EBURA, or EBORA, in *Ancient Geography*, a town of Spain, now *Alcala-real*, between Grenada and Cordova.

EBUROBRICA, or EBUROBRIGA, a place of Gaul, between Auxerre and Troie, now St. Florentin.

EBUROBRITIUM, a place of Spain, in Lusitania, now Ebora-de-Alcobaça.

EBURONES, an ancient people of Belgica, whose country corresponded to the duchies of Cleves, Juliers, and Gueldre. Their chief town was *Atuatuca*. A legion of Cæsar, which wintered there, was defeated by Ambiotrix; and by way of retaliation, he threatened to exterminate them. His treatment of them was very severe. They were succeeded by the Tongri.

EBURUM, an ancient town of Germany, in the country of the Quadi, according to Ptolemy; supposed to be Olmutz, a town of Bohemia.

EBUSUS, now IVICA, an island of the Mediterranean, near the coast of Spain. This island was fertile in the production of vines, olives, and large figs, which were exported to Rome, and other places.

EBUTIANA, a town of Italy, in Samnium, N.W. of Alisæ.

ECACOATE, in *Zoology*, a name by which the natives of some parts of America call the rattle-snake.

ECALESIA, Εκαλησια, in *Antiquity*, a festival kept in honour of Jupiter, surnamed Hecalus, or Hecalesius, from Hecale, one of the borough-towns in Attica.

ECARTELE, in *Heraldry*. See QUARTERLY.

ECASTAPHYLLUM, in *Botany*, Browne's Jamaica 299, t. 32. f. 1. See HEDYSARUM and DALBERGIA.

ECASTOR, in *Antiquity*, an oath wherein Castor was invoked. It was a custom for the men never to swear by Castor, nor the women by Pollux.

ECATESIA, Εκατησια, an anniversary solemnity, observed by the Stratonicensians, in honour of Hecate.

The Athenians likewise had a public entertainment, or supper, every new moon, in honour of the same goddess. The supper was provided at the charge of the richer sort; and was no sooner brought to the accustomed place, but the poor people carried off all, giving out, that Hecate had devoured it. For the rest of the ceremonies observed on this occasion, see Pott. Arch. Græc. lib. ii. cap. 20.

ECATÆA, Εκατεια, statues erected to the goddess Hecate, for whom the Athenians had a great veneration, believing that she was the overseer of their families, and

and that she protected their children. Pott. Arch. Græc. lib. ii. cap. 20. tom. i. p. 380.

ECATOMBÆON, Εκατομβαιων, in *Chronology*, the first month of the Athenian year. It consisted of thirty days, and began on the first new moon after the summer solstice, and consequently answered to the latter part of our June and beginning of July. The Bœotians called it Hippodromus, and the Macedonians Lous. (See Month.) The word is a derivative from the Greek, εκατομβη, *a hecatomb*, because of the great number of hecatombs sacrificed in it.

ECAVESSADE, in the *Manege*, is used for a jerk of the cavesson.

ECBASIS, Εκβασις, in *Rhetoric*, is used for a *digression*, which see.

ECBATANA, in *Ancient Geography*, a celebrated city of Asia, the capital of Media, and the residence of the Median and Persian kings, was built by Dejoces the first, who reigned in Media, after the inhabitants had shaken off the Assyrian yoke. In the book of Judith it is said to have been built by Arphaxad, supposed by some to be Dejoces, and by others Phraortes his successor, who might have repaired the city or made some additions to it. It was situated on a plain, about 12 stadia from mount Orontes, according to Diodorus, who says that it was 250 stadia in circuit. The walls of this city are much celebrated by the ancients, and particularly described by Herodotus. (l. i. 98.) They were seven in number, all of a circular form, and gradually rising above each other by the height of the battlements of each wall. The situation of the grounds, which gently ascend, might suggest the design of thus building them. The royal palace and treasury were within the innermost of these seven circles. In the book of Judith we read, that the walls of this stately metropolis were 70 cubits high, and 50 cubits broad; that the towers on the gates were 100 cubits in height, the breadth in the foundation 60 cubits, and the walls built of hewn and polished stone, each stone being six cubits in length, and three in breadth. The timber of the palace was, according to Diodorus, (l xi. 13.) cedar or cypress: and various parts of it were cased with gold or silver. The whole was pillaged about the time of the arrival of Alexander. We read in the 2d book of Maccabees, that Antiochus Epiphanes was at Ecbatana, when he received intelligence of the defeat of his armies in Palestine. There are now no monuments remaining of the superb palace, where the monarchs of Asia generally passed their summer; nay, there is a disagreement among our modern travellers about the place where that stately metropolis stood. Sir John Chardin thinks it most probable, that Tauris is the ancient and famous Ecbatana. Others suppose it to be Hamadan.

Ecbatana, a city of Syria, at the foot of mount Carmel, on the side of Ptolemais. In this city the unfortunate Cambyses died, in his return from Egypt towards Susa.

Ecbatana, an ancient city of Asia, called "the City of the Magi," to distinguish it from those of Media and Syria. It belonged to the Magi. Darius removed it towards the mountains. This place is mentioned by Pliny.

ECBOLAS, in *Botany*, from εκβαλλω, *to cast out*, is, according to some authors, the name of a fig supposed to cause abortion. See Ecbolium.

ECBOLE, or Elevation, in the most ancient Greek *music*, was the alteration of the enharmonic genus, when a string was accidentally raised five dieses above its usual tuning.

Ecbole, Εκβολη, in *Rhetoric*, is also used for a digression.

ECBOLICS, Ecbolica, from εκβαλλω, *I eject*, in the writings of the ancient physicians, a term used to express such medicines as were given to promote delivery in child-birth; and also such as caused abortion. See Delivery.

ECBOLIUM, in *Botany*, from εκβαλλω, *to cast out*, (whence also εκβολον is an appellation for any drug that promotes delivery or abortion), has been applied by Rivinus and others to the genus now called *Justicia*, in allusion to the elastic force with which its capsules project the seeds. The original *Ecbolium* of Rivinus is the Malabar nut, *Justicia Adhatoda* of Linnæus. *Justicia Ecbolium* of Linnæus is a distinct species, though nearly related to the former.

ECBRASMATA, from εκβραζω, *I cause heats*, in the writings of some of the earlier physicians, a word used to express eruptions, or pustules, of a fiery and inflamed nature appearing on different parts of the body. Virgil calls these *ardentes pustulæ*, and seems to attribute them to the wearing cloaths made of the wool of sheep which had died of a murrain, which he describes.

ECBRYSOMATA, from εκβρυω, *I cause to spread*, a word used by Galen, and the old physicians, for those eminences or protuberances of the bones at the joints, which appear through the skin.

ECCANTHIS, or Encanthis, in *Medicine*. See Encanthis.

ECCARD, or Eckhard, John George, in *Biography*, a learned antiquarian, was born at an obscure village in Germany. Having received a good education, he removed to Leipsic, where he became acquainted with Leibnitz. By the recommendation of this celebrated man, he obtained the professorship of history at Helmstadt, in 1706, and in 1713 he was appointed a counsellor of the electorate of Hanover, and historiographer. He now assisted Leibnitz in his "Origines Guelphicæ," and, in 1717, succeeded him as librarian at Hanover. Shortly after this he travelled at the expence of George I. through a considerable part of Germany in search of MSS. and other materials to enable him to prosecute the compilation of the work which he had undertaken. Some other literary occupations procured him the favour of prince Eugene, and count Von Zindendorf, and through the means of the latter, he was raised by the emperor Charles VI. to the rank of nobility. The friendship of the great produced him honour, but he was extremely poor, and presented a poem to his sovereign, in which he gave a picture of his distressed situation, and begged for relief; before, however, the necessary forms could be complied with, he was obliged to abscond: he proceeded to Cologne, where, in Feb. 1724, at the college of the Jesuits, he formally abjured the Lutheran religion. After this he entered the service of the bishopric of Wurzburgh; where he was entrusted with the care of the library belonging to the court and the university. The dean and chapter committed to his charge the MSS. contained in the diplomatic archives of the cathedral, which he arranged and classed with great ability. He next projected improvements in academical lectures, and other works of public benefit. He printed, in two magnificent folios, his "Commentarii de rebus Franciæ orientalis," and undertook a history of Wurzburgh, which he did not live to finish; in this he comprehended the principal German events from the emigrations of the Franks to king Conrad I. While defining, in his preface, the boundaries of the bishopric under St. Burckhard, he was suddenly seized with a mortal disease, which put a period to his life in February, 1730. Eckhard was a very voluminous writer. His most interesting work is entitled "Corpus historiarum medii aevi," which is compiled from materials collected with great labour during many years. This is considered by Lenglet du Fresnoi as the production of one of the ablest men in Germany: he adds that it contains a great many curious pieces

well arranged, and not to be found in any other collection. Eckhard was deeply skilled in history, geography, and antiquities. He had also made etymology his study many years, with a view of publishing a dictionary of the German language. A list of his works is given in the General Biography, to which our readers may be referred.

ECCATHARTIC, in *Medicine*, a term synonymous with *cathartic*, but not now in use.

ECCE-HOMO, among *Painters*, a name given to a picture, wherein our Saviour is represented in a purple robe, with a crown on his head, and a reed in his hand, such as he was presented before Pilate by the Jews.

The phrase is Latin, borrowed from the words of the Jews themselves: *q. d.* this is the man.

ECCENTRIC. See Excentric.

ECCENTRICITY. See Excentricity.

ECCHELLENSIS, Abraham, in *Biography*, who flourished in the 17th century, is famous for the assistance which he rendered M. le Jai, in preparing for the press the magnificent Polyglot Bible. He also furnished the Arabic and Syriac texts of the book of Ruth, with the Latin version. He was unfortunately engaged in some disputes, which were little creditable to the contending parties. One of his opponents charged him with incapacity for the undertaking in which he had embarked; but he repelled the accusation, and conducted himself in such a manner as to obtain the appointment of professor of the Syriac and Arabic languages, in the College Royal at Paris. He was next engaged by the college "De propaganda Fide," to assist in translating the scriptures into Arabic, which employed him from the year 1636 to the year 1652. He was likewise made professor of the Oriental languages at Rome; and was chosen by the archduke Ferdinand II. to translate out of the Arabic into Latin the 5th, 6th, and 7th books of "Apollonius's Conics," in which he was assisted by Borelli. The whole work was printed at Florence, with Archimedes's book, "De Assumptis," in 1661, in folio. He published many other works, and died at Rome in the year 1664. Moreri.

ECCHYMOSIS, in *Surgery*. This term signifies a livid or blue discolouration of the skin, in consequence of the rupture of vessels, and extravasation of blood.

The word is derived from the Greek εκχυω, *to pour out*; an ecchymosis being in fact only a kind of swelling, formed by an effusion of blood from the vessels.

An ecchymosis is usually produced by falls, blows, and sprains, which rupture many of the small vessels on the surface of the body, and occasion an extravasation of fluid, unattended with any external breach of continuity. Contusions are always attended with a degree of ecchymosis. (See Contusion.) A very considerable ecchymosis may be produced by bruises and blows, when any of the ruptured vessels are sufficiently large to pour out a copious quantity of blood into the cavities of the cellular substance.

In general, an ecchymosis does not exhibit the discolouration which characterises it, until some time has elapsed after the receipt of the violence. We may indeed remark, that it is not till after several hours that the blue and livid discolouration of the skin becomes most conspicuous. A black eye, which is one of the most common examples of an ecchymosis, is always most disfigured six or eight hours after its occurrence.

In the common operation of bleeding, an ecchymosis often arises at the time when the blood is flowing out. This happens in consequence of the fluid not having a ready vent, so that some of it gets into the cellular substance, near the opening in the vein. When the patient changes the posture of his arm, after the puncture is made, the orifice in the skin sometimes slips a little away from the wound made in the vessel; and as the blood still continues to flow from the latter, it necessarily produces an ecchymosis, by insinuating itself into the cellular substance.

Common cases of ecchymosis are in general easily cured, by applying discutient lotions, and administering one or two doses of any mild purgative salt. The best topical applications are vinegar, the lotio salis ammoniaci, spiritus vini camphoratus, and aqua ammoniæ acetatæ. The grand indications are to prevent inflammation, and to promote the absorption of the effused blood.

Every man of experience must be so well aware of the success which attends the practice of dispersing collections of extravasated blood, by exciting the action of the absorbents, that he can hardly picture to himself a case of ecchymosis, in which it would be proper and advantageous to make an incision for the discharge of the effused fluid. We have frequently seen tumours on the head, formed by extravasations of blood, and containing four or five ounces of this fluid, subside with wonderful rapidity, while the treatment merely consisted in employing general antiphlogistic remedies, and applying a discutient lotion.

On the contrary, when an opening is made into these swellings, the whole of the blood can very seldom be entirely pressed out, owing to its coagulated state; and the portion, which remains behind, becoming exposed to the air, soon putrefies, and acquires an irritating quality; and the too frequent consequences are a great deal of inflammation and suppuration, which need not be induced.

ECCLES, John, in *Biography*, was the son of Solomon Eccles, a performer on the violin, and author of several grounds, broken into common divisions, of common chords, without improving the tune. Bellamira, one of his grounds, has words set to it in the Beggar's Opera. From the instructions of his father, John became an eminent and popular composer for the theatre, furnishing it with act tunes, dance tunes, and incidental songs, in most of the new comedies, after the death of Purcell. The air which he set to "A Soldier and a Sailor," sung by Ben, in Congreve's comedy of "Love for Love," is so truly original and characteristic, that it can never be superseded for any other air. He set an ode, written by Congreve for St. Cecilia's day in 1701. He likewise set Congreve's "Judgment of Paris," when there was a contention for prizes, and gained the second, of 50 guineas. Several of his single songs were the best of the time, and have still the merit of originality. Indeed we never remember to have seen the slightest composition by Eccles, whether catch, ballad, or rope-dancing tune, that was not stamped with some mark of genius. Upon the death of Dr. Staggins, about the year 1698, Eccles, at a very early period of his professional life, was appointed master of queen Anne's band; and after the decease of Dr. Crofts, in 1727, he seems only to have set the odes, and to have retired from all other professional employments to Kingston, for the convenience of angling, in which amusement he appears to have been as much delighted as Walton. He died in 1735, and was succeeded as master of the king's band and composer to his majesty by Dr. Green.

Eccles had two brothers: *Henry*, a performer on the violin, said to have been in the king of France's band, and author of 12 excellent solos for his own instrument, printed at Paris, 1720. These we have never heard or seen, even in a catalogue. *Thomas*, who had been taught the violin by Henry, and had the character of a very fine player, but

preferred the life of a ſtrolling fidler at taverns to that of a regular profeſſor, and was more fond of drinking than either of good company or clean linen.

He ſeems to have been one of the laſt vagrant bards, who uſed to inquire at taverns if there were any gentlemen in the houſe who wiſhed to hear muſic? Since ſmoking has been diſcontinued, few evenings are ſpent in taverns, which has diminiſhed the number of modern minſtrels, particularly ſuch as are as well qualified to amuſe good company and lovers of muſic as Tom Eccles, who uſed to regale his hearers with Corelli's ſolos and Handel's beſt opera ſongs, which he executed with preciſion and ſweetneſs of tone, equal to the moſt eminent performers of the time. He ſurvived his brother, John, more than 20 years; and continued to officiate as a prieſt of Bacchus to the laſt.

ECCLESBOURN, in *Geography*, a river of England, which runs into the Derwent, in Derbyſhire.

ECCLESFECHAN, a town of Scotland, in the county of Dumfries: 15 miles E. from Dumfries.

ECCLESFIELD, a large pariſh in the wapentake of Strafforth and Tickill, in the Weſt Riding of the county of York, England, is a very populous diſtrict, compriſing 984 houſes, and 5114 inhabitants. The principal part of theſe are employed in the various branches of cutlery and hardware goods. The place is only 5 miles from Sheffield, which has long been noted for its large manufactories of knives, and forks, ſciſſars, razors, &c. In the vicinity of Eccleſfield are ſome remains of a Roman encampment, which is known by the name of the Devil's-ditch.

ECCLESHALL, a market-town and pariſh in the hundred of Pirchill, Staffordſhire, England, was, at a former period, the ſeat of the biſhops of Lichfield. In the time of the civil wars, it was garriſoned for the king, but being taken by the parliamentary forces, was nearly deſtroyed; after which it was rebuilt by biſhop Lloyd The town is pleaſantly ſituated on the banks of the river Sow, about 7 miles from Stafford, and 148 from London. It contains 590 houſes, and 3487 inhabitants. Here are a weekly market on Friday, and three annual fairs. The living is a vicarage, in the patronage of the biſhop of Lichfield.

ECCLESIA, a Latin, or rather Greek term, ſignifying church.

In our ancient law-books, Fitzherbert obſerves, that eccleſia, εκκλησια, properly ſignifies a parſonage. Whence, if a preſentation were made to a chapel, as to a church, by the name of eccleſia, it changed the name thereof, and it preſently commenced a church.

When the queſtion was, Whether it were eccleſia, aut capella pertinens ad eccleſiam? the iſſue was, whether it had baptiſterium & ſepulturam? For if it had the adminiſtration of the ſacraments and ſepulture, it was in law judged a church. See CHAPEL.

ECCLESIA, *Reſtitutione extracti ab.* See RESTITUTIONE.

ECCLESIÆ, *Recto de advocatione.* See RECTO.

ECCLESIÆ, *Warda.* See WARDA.

ECCLESIÆ *Sculptura*, the image or ſculpture of a church in ancient times was often cut out in plate or other metal, and preſerved as a religious treaſure or relique; and to perpetuate the memory of ſome famous churches.

ECCLESIANS, ECCLESIANI, in *Church Hiſtory.* Upon any falling out, or miſunderſtanding, between the emperors and the churchmen, the adherents to the emperor called ſuch as adhered to the intereſts of the church and churchmen, eccleſiani, a term of reproach, anſwering to our high-church men.

ECCLESIASTES, one of the books of the Old Teſtament thus called, from a Greek word, ſignifying preacher; becauſe the author in it declaims or preaches againſt the vices and vanities of the world; or becauſe of the peculiar gravity and dignity of the ſubjects, of which he treats.

This is Marina's judgment: Grotius thinks otherwiſe; taking the book to derive its appellation from its being a collection of fine ſentences and reflections on the vanity of the things of our earth, &c. from the word קהל, which ſignifies to *aſſemble* or *collect*. συναθροιζειν. Some Hebrew doctors, ſuppoſing the ſame etymon, will have it to have been thus called on account of its aſſembling a great deal of wiſdom: others, becauſe the author's aim is to aſſemble and call together all ſuch as are willing to conſult their ſafety, and avoid the dangers of the world, which is the opinion of Gejerus. Laſtly, others, with Calovius, deduce it from his aſſembling them about him, as a preacher aſſembles his auditors: accordingly Ludolphus obſerves, that the word *Cohelleth*, in the Ethiopic language, ſignifies a *circle*, or a company of men gathered together, in the form of a circle.

There are different ſentiments as to the author of this book: the moſt common is, that it is Solomon's, who is ſuppoſed to have written it towards the cloſe of his life, to give tokens of his penitence to poſterity.

Grotius, indeed, takes the work to be poſterior to Solomon, and to have been written after his death, by ſix authors, unknown, who, to give their book the greater authority, put Solomon's name to it, and repreſented him as a repentant. What he chiefly founds his opinion on is, that we meet with words in this book which are no where elſe ſeen, but in Daniel, Ezra, and the Chaldee paraphraſes; whence he thinks it probable, that it was written after the captivity in Babylon: but it is certain, all Hebrews, Greeks, and Latins, have always ſpoken of it as a work of Solomon, Indeed there are authors who have attributed all the books of Solomon to Iſaiah; but theſe are only to be underſtood as if that prophet had collected them. If it be true, that there are Chaldee words in the Eccleſiaſtes, it is eaſier to ſuppoſe Solomon underſtood that language than to deny him to be the author of the book. The Talmudiſts aſcribe this book to Hezekiah; rabbi Kimchi, to Iſaiah; and Grotius, to Zorobabel.

Calovius aſſures us, that the true reaſon why Grotius would not allow Solomon to be the author of the book of Eccleſiaſtes, is, that it ſpeaks too clearly and preciſely for his time, of the univerſal judgment, eternal life, and the pains of hell; but theſe are truths eſtabliſhed before Solomon, in the Pſalms, Pentateuch, and Job.

There appears no reaſon, therefore, for denying this book to Solomon, but ſeveral for aſcribing it to him. As, 1. The title of the book, which aſſerts its author to be the ſon of David, and king of Jeruſalem. 2. Several paſſages in the book, which agree to nobody but that prince, as chap. i. ver. 12. chap. vii. ver. 25. chap. xii. ver. 9, &c. And, 3. The conſtant tradition of the ancient Jews and Chriſtians.

The deſign of the author is to diſcover what conſtitutes the chief good or complete felicity of man. Accordingly this book conſiſts of two principal parts: the firſt of which, comprehended in the 6 firſt chapters, contains a recital and confutation of men's falſe opinions about their chief good; and the other teaches in what our genuine true and ſolid felicity conſiſts, both in this life and the next. In both he ſhews, what is the end to which a man ſhould direct all his counſels, ſtudies, and endeavours; what he ought to follow, as above all things moſt deſirable; and what to avoid, as the worſt of all evils.

The

The Talmudists, and other Rabbins note, that it was some time before the book of Ecclesiastes was put in the canon. See the Gemara on the Pirke Abboth. fol. 1. col. 1. Massech. Schabbath, cap. ii. fol. 30. col. 2. Aben Ezra on the Ecclesiastes, vii. 4. Maimonides, Moreh. Nebochim, lib. iii. cap. 28. and Mercerus, Calovius, and Gejerus, on this book.

ECCLESIASTIC, or Ecclesiastical, something belonging to, or set apart for the church, in contradistinction to civil or secular, which regard the world. See Civil. &c. There are ecclesiastical things and persons; ecclesiastical law, jurisdiction, history, ceremonies, discipline, preferments, &c. Ecclesiastical persons are those whose functions consist in performing the service and maintaining the discipline of the church. See Clergy. Ecclesiastical persons are either regular or secular. (See Regular and Secular.) In the empire there are three ecclesiastical electors, *viz.* the archbishops of Mentz, Treves, and Cologne.

Ecclesiastic *chambers*, *community*, *corporation*, *courts*, *faith*, *patronage*, *tradition*. See the different substantives.

ECCLESIASTICAL Jurisdiction. By stat. 37 Hen. VIII. c. 17, the doctors of the civil law, although they be laymen, &c. may exercise ecclesiastical jurisdiction.

Ecclesiastical *Laws*. See Canon *Law* and *Ecclesiastical* Courts.

Ecclesiastical *State*, in *Geography*, the pope's dominions in Italy, reaching from the Po to beyond Terracina, a length of more than 260 British miles, comprehending about 13,808 square miles, and containing little more than two millions of inhabitants.

These dominions have been differently divided by former geographers; but the most regular and convenient division was into the following territories: 1. The duchy of Ferrara, acquired in 1598. 2. That of Bologna, gained by Julius II. in 1513, and now supposed to contain 80,000 inhabitants. 3. The province of Romagna. 4. The duchy of Urbino, acquired in 1626. 5. The marquisate of Ancona, gained in 1532, and now containing about 20,000 inhabitants. 6. The Perugiano. 7. The Orvietano. 8. The duchy of Castro. 9. The Patrimony of St. Peter. 10. Campania di Roma. 11. Sabina. 12. The duchy of Spoleto al Ombria. 13. The country called Citta di Castello. Beside which, the pope formerly possessed the following countries out of the papacy, *viz.* the duchy of Benevento, in the kingdom of Naples, annexed to the pope's dominions in the 11th century; the counties of Avignon and Venasin, in the southern parts of France. He had, besides, a considerable number of fiefs in Italy, which hold of the papal see: the principal of which were the kingdom of Naples, and the states of Parma and Placentia. See Naples, &c. &c.

The pope may be considered in two respects, as the spiritual head and monarch of the Roman church, and as a considerable temporal prince in Italy. In the first character, his subjects may be divided into two classes, *viz.* clergy and laity; the former may not unfitly be compared to a spiritual standing army, whose business is to maintain his rights and conquests; and the rest, the laity, as his tributary subjects, who are obliged to maintain those forces at their own charge; and if one may judge of the greatness of their number, by what pope Paul IV. used to boast, that he had 228,000 parishes under his jurisdiction (all of which have at least one or more priests), and 4400 monasteries, it will appear no inconsiderable army. But their number has been much lessened since the Reformation and the Revolution of France.

In the second view, the pope was formerly considered as a potent prince in Italy, whose sovereignty was chiefly supported by the jealousy between Spain, France, and the Empire; though in most other respects, it was not to be compared with that of other princes of Europe. His revenues were very considerable, and he was able to maintain a great military force. But by the new conquests and arrangements of Buonaparte, the emperor of France, the dominions of the pope are so dilapidated and curtailed, that he retains very little of the secular power that formerly belonged to him, and he has been despoiled of the greatest part if not the whole of his importance as a temporal prince. By the 8th article of the treaty of Campo Formio 1797, the three legations of Bologna, Ferrara, and Romagna are annexed to the *Cisalpine republic*, which see. See also Italy.

ECCLESIASTICO *primo beneficio habendo*. See Primo.

ECCLESIASTICUS, an apocryphal book, composed by Jesus the son of Sirach, and admitted by the Romish church into the canon of the Old Testament.

It is frequently cited by the abbreviation, *Eccli*, to distinguish it from the Ecclesiastes, which is cited by *Eccle*. Some of the ancients have denominated it πανάρετος, *i. e.* the book of every virtue; but the most usual name among the Greeks is that of "the Wisdom of Jesus the son of Sirach."

It is called Ecclesiasticus, as some say, because the ancients divided the books of the Old Testament into four sorts, *viz.* the Pentateuch, the Prophets, the Hagiographa, and the Ecclesiastical, or Apocryphal books, as not being in the Jewish canon. Among the latter, this of Jesus the son of Sirach, being the most remarkable and useful, was called καθ' ἐξοχὴν, or by way of eminence, Ecclesiasticus, whilst the rest of the same class have lost their name. According to others, this title was given to it by the Latins, to denote its use in the church, as it was read for edification in the public religious assemblies; or, because, like Solomon's Ecclesiastes, which it resembles in name, as well as matter, it teaches such as attend to it by the admirable precepts which it delivers, and earnest exhortations to wisdom, which is another word for religion.

Isidore, lib. vi. Etym. cap. ii. and among the moderns, Grotius and Drusius, deny the author of Ecclesiasticus to be Jesus the son of Sirach, grandson of the high-priest Jesus, who returned from Babylon with Zorobabel. Genebrard asserts, that Jesus the son of Sirach, was of the race of Jesus son of Josedec; but this does not appear. Some of the ancients have erroneously ascribed this book to Solomon. Cyprian, and Ambrose have cited it under his name.

St. Jerom assures us, in his preface to the books of Solomon, that he had seen this book in Hebrew; and that the Hebrews intitled it *Parables*, or *Proverbs*: from which the Jesuit Mariana concludes, that the high-priest Jesus wrote this book in Hebrew, as it appears likewise from the prologue to the book itself; and that his grandson translated it into Greek, which likewise appears from the prologue; that he made this translation in Egypt, where the author lived in his thirty-eighth year; that it was done under the reign of Ptolemy Euergetes, successor of Ptolemy Philadelphus, who began to reign in the year of Rome 508, 246 years before Christ; that the grandfather had entitled it *Parables*, which the grandson changed into Ecclesiasticus: lastly, that the book, however, is attributed to the translator, because he changed, and added many things to the original.

Fa. Calmet takes the book of Ecclesiasticus to have been composed under the Pontificate of Onias III. son of Simon, and the reign of Antiochus Epiphanes, king of Syria, about 171 years B. C. He adds, that neither the author of the Latin translation, nor the time when it was made, is known; but

but being quoted regularly by all the ancient fathers, there is no doubt of its being very ancient. He takes it to have been done by the tranſlator of the Book of Wiſdom.

Munſter and Fagius mention Hebrew copies of this book, as well as St. Jerom; but Scaliger, Druſius and Huetius think that none of theſe were the original, but either Ben Sira's alphabet, or ſome late verſion made from the Greek. It is probable, that many uſeful maxims of the Hebrew Sirachides, as well as ſome of his own, were added by the laſt Jeſus, the ſon of Sirach, to his grandfather's book, or from marginal additions of other men's ſayings, of the like nature; which being too few to fill a book of themſelves, were joined to this larger work. We cannot otherwiſe account for the variations in the ſeveral Greek copies of Eccleſiaſticus, and the tranſlations of it, nor for the entire ſentences, which are found in ſome and wanting in other copies. The Hebrew Sirachides wrote his book, as we may reaſonably ſuppoſe, in the language of the Jews of Jeruſalem, ſuch as was uſed after their return from the captivity, probably either in the Chaldee dialect, or Syriac, as a manual for the Jews in Egypt. The learned ſuppoſe that the original work itſelf is come down to us imperfect, either through the author's death, or the loſs of ſome part of it in Egypt (See Biſhop Chandler's Vindic. of Def. p. 81—85.); and this may account for the great incoherence, and abrupt tranſition in many places. How long the original was preſerved, we are not now able to aſcertain. The Greek is the preſent only original; and it is the moſt early and authentic tranſlation of this work, made for the uſe of the Jews in Egypt in their diſperſion, who had then almoſt forgotten their native tongue; and ſo this, as well as other books not canonical in their language, might eaſily be loſt. This ſeems to have been too literal a tranſlation, which often occaſions the ſenſe to be either obſcure or deficient. The tranſlator himſelf has the modeſty to acknowledge, that he doubts his having failed in expreſſing the full ſpirit of the then language, whether it was the ancient and pure, or more modern and corrupt Hebrew, and ingenuouſly apologizes for not attaining to the exact propriety and expreſſiveneſs of the original. Druſius is of opinion, that, beſides this inaccuracy, he has ſometimes actually miſtaken the meaning of the original in ſome of the more obſcure and intricate paſſages. There is a ſtrange tranſpoſition of chapters in the beſt Greek copies of this book from ch. xxx. to ch. xxxvi.; beſides the tranſpoſition of whole ſentences or verſes; ſo that the printed editions greatly differ from one another, which is very much owing to the careleſſneſs of tranſcribers; in conſequence of which, the preſent ſtate of this book is corrupt and mutilated. And as to the Greek tranſlation itſelf, the language is neither beautiful, nor altogether correct. This latter circumſtance is chiefly owing to the idiom of the Greek Macedonian language, and the particulars now referred to are not ſo properly faults, as modes of that adopted tongue. In this book there occur frequent alluſions to Grecian rites and cuſtoms; from which we may infer, that the Jews had learned their philoſophy, and embraced ſeveral of their opinions, ever ſince their intercourſe with that people under Alexander the Great, the Ptolemies, and Seleucidæ his ſucceſſors, who reigned in Egypt and Syria. The old verſions, particularly the Syriac and Arabic, ſo much differ from the Greek, as almoſt to lead one to ſuſpect, that they were not made from it, and yet there is no reaſon to think, that they tranſlated from any Hebrew copy. Nor do the Oriental verſions agree any better with the Latin.

As to the Vulgate, it is uncertain what copy it follows, or what was its authority. It ſometimes adds whole ſentences, which have nothing correſponding to them in the Greek; ſo that Huetius conjectures, that the tranſlator inſerted ſome parallel maxims from ſome other work. It does not appear to have been interpolated; or that any alterations have been made by the pious fraud of ſome Chriſtians in order to make it conform to, or countenance, any favourite ſentiments and opinions, as Grotius intimates. Boſſuet, Calmet, and other commentators, follow the Vulgate too implicitly, and make that verſion the foundation of their annotations; and it is no wonder that the popiſh expoſitors ſhould religiouſly adhere to a verſion, which the council of Trent has confirmed and ratified. The old Engliſh verſions, as Coverdale's and the Biſhops' Bible, generally copy the Vulgate too cloſely; but the Geneva often departs from it with advantage. Our laſt tranſlators ſeem chiefly to have regarded the Complutenſian, which, though it lies under a ſuſpicion of conforming its Greek to the Vulgate, yet exhibits a text in this book, according to Dr. Grabe (Prolegom. ch. iii. § 1.) "non nuper fictum aut interpolatum, ſed jam olim a Patribus ita lectum." However they ſcruple not occaſionally to prefer the Latin to the Greek, where they think it gives a better ſenſe, and ſometimes even to adopt conjectures, unſupported by any copy, for the ſame purpoſe. After all we may obſerve, that their rendering is in very many places inaccurate and obſcure, and in ſome, faulty and miſtaken.

This book was originally compoſed for the inſtruction and benefit of thoſe, who were diſpoſed to regulate their lives agreeably to the laws of God; and with this view the grandſon of Ben Sirach rendered it into Greek, and with the ſame deſign it has been tranſlated into many other ancient and modern languages. In the weſtern church it has met with general eſteem, and it was introduced by our firſt reformers, and the compilers of the articles of our eſtabliſhed church, into the public ſervice. It begins with an exhortation to the purſuit of wiſdom; and this is followed by numerous moral ſentences or maxims, as far as the 44th chapter, where the author begins his encomiums of the patriarchs, prophets, and famous men among the Jews, which he continues to the 51ſt chapter, containing a prayer to God. Calmet ſays, that it is a received opinion of the Catholic church, that this book was placed in the canon of ſcripture, and that it may be demonſtrated by the teſtimony of ſeveral fathers, and by the tradition of all Chriſtian churches, and by its being quoted by a great number of eccleſiaſtical writers, as a work inſpired by the Holy Ghoſt. But theſe aſſertions are unfounded. Epiſcopius, in order to ſhew the agreement of Chriſtian churches with the Jews in this point, enumerates the deciſions of nine of the Eaſtern, nine of the Weſtern, and two of the African churches, which determine for the canon as we now have it, and exclude all others, but the 22 books received by the Jewiſh church, and contained in the Hebrew Bible. The authority of the church of Rome cannot outweigh the deciſions of thoſe of Jeruſalem, Alexandria, Antioch, and Conſtantinople, to the contrary. As to the reſpect paid to it by ancient eccleſiaſtical writers, we may obſerve, that they uſed the term ſcripture in a very lax ſenſe for any book that contained excellent and pious inſtructions; and when either the Greek or Latin fathers attribute to any books the title of Holy Writings, they do not place them in any higher rank than that of ſcriptures, which are of inferior, imperfect, and doubtful authority. Dupin's Compleat Hiſtory of the Canon, b. i. chap. 3. § 16. Arnold on the Apocrypha. See APOCRYPHA, BIBLE, and CANON.

ECCLISIS, from ἐκκλίνω, *I decline*, a word uſed by Hippocrates, and from him by many other of the old phyſicians, for

for a recession of a bone from its proper situation, that is, a luxation.

ECCOPÆUS, from εκκοπτω, *I cut*, the name of an instrument, described by some of the ancient writers in *Medicine*, and used for the same purposes for which the modern surgeons employ a lenticular or raspatory. The ancient instrument was a sort of knife, with which they cut down morbid eminences of bones, or took out bones, in case of a fractured skull.

ECCOPE, Εκκοπη, in *Surgery*, the same with excision, or amputation.

The word is formed from the Greek, εκκοπτειν, *exscindere, to cut off.*

ECCOPE is likewise used for a kind of fracture, or solution of continuity, of the skull, by a simple incision.

ECCOPROTICS, Εκκοπρωτικα, in *Medicine*, laxative, or loosening remedies, which purge gently, by softening the humours and excrements, and fitting them for expulsion.

The work is composed of the Greek particle εκ, and κοπρος, *excrement.*

ECCRIMOCRITICA, from εκκρισις, *excretion*, and κριτικος, signs to judge of a distemper, from particular excretions.

ECCRINOLOGICA, from εκκρινω and λογος, a term used by some writers, for that part of medicine which relates to the doctrine of excretions, or the discharge of any of the excrements out of the body.

ECCRISIS, an excretion of any excrementitious or morbid matter from any of the natural emunctories, as it happens in a perfect crisis. The matter thus excreted is also sometimes called by this name.

ECDICI, Εκδικοι, among the *Ancients*, patrons of cities, who defended their rights, and took care of the public money. Their office resembled that of the modern syndics.

ECDORA, from εκδερω, *I excoriate*, a word used by the ancient physicians, to express any kind of excoriation, but in a more particular manner that of the urethra.

ECDORIA, a term used by the ancient writers in *Medicine* for such caustic or escharotic medicines, as have a power of taking off the skin.

ECDYSIA, Εκδυσια, in *Antiquity*, a festival observed by the Phœssians in honour of Latona.

ECETRA, in *Ancient Geography*, a town of Italy, belonging to the Volsci.

ECHALAR, in *Geography*, a town of Spain, in Navarre; 20 miles N. of Pamplona.

ECHALLENS, a town and bailliage of Switzerland, in the canton of Bern, belonging to the cantons of Bern and Friburg, conquered by the Swiss in 1475, and ceded to the two cantons in 1474; 6 miles from Lausanne. On an eminence in this bailliage stands the castle of St. Barthelemi, in one of the most beautiful positions in Switzerland; about three miles from Orbe, near the high road from Lausanne to Yverdun.

ECHANBROIGNES, Les, a small town of France, in the department of the two Sevres; six miles N. of Chatillon sur Sevre, and three miles E. of Maulevrier.

ECHAPE, in the *Manege*, is used to denote a horse got between a stallion and a mare of a different breed and country.

ECHAPER, is used in the French academies for giving the horse head, or putting him on full speed. Hence they say, *laisser echapper de la main.*

ECHARD, Lawrence, in *Biography*, was son of a clergyman, and born near Beccles in Suffolk, in 1671. Having laid a foundation of classical learning, he went to Christ's college, Cambridge, where he took his degree of A.M., and was afterwards admitted into holy orders. His first settlement was in Lincolnshire, where he published, in 1699, "The Roman History from the Building of the City to the Settlement of the Empire by Augustus," which was followed by a continuation from that period to the time of Constantine. These were afterwards printed in 3 vols. 8vo. In 1702, he published "A General Ecclesiastical History from the Birth of Christ to the Establishment of Christianity." This work, which was printed in folio, was exceedingly popular, and was in the course of a few years reprinted in an octavo size five times. He next published "The Gazetteer, or Newsman's Interpreter," being a geographical index, or dictionary, of all the principal places on the globe. This run through many editions, and may be regarded as the forerunner of our present improved gazetteers, than which few books are more popular. Mr. Echard published likewise a history of England, from the invasion of Julius Cæsar, to the end of James I.'s reign, which he afterwards brought down to the revolution: he translated some of the comedies of Plautus, and took a part in the translation of Terence: he compiled a volume of maxims and discourses, moral and divine, from the works of archbishop Tillotson. His church preferment was the appointment to the archdeaconry of Stow, in 1712: he was also made prebend of Lincoln, and chaplain to the bishop of that diocese; and towards the latter end of an useful and industrious life he was presented by the king to the livings of Rendlesham, Sudborne, and Alford, in Suffolk, to which county he removed; but the change was unfavourable to his health, and he died in 1730. Biog. Brit.

ECHARPE. See Battery *en echarpe.*

ECHARRI, in *Geography*, a town of Spain, in Navarre; 17 miles W. of Pamplona.

ECHAUFOUR, a small town of France, in the department of the Orne, situated on a rivulet which flows into the Rille between Laigle and Sées; 12 miles N.E. of Sées, in the district of Alençon.

ECHAUGUETTE, in the French *Military Art*, an elevated and covered place for a centinel. Richelet explains it by the Latin *specula, excubiæ.* See Guerite.

Some distinguish the echauguette from the guerite, giving the former name to centry-boxes, made of wood, and square; and the latter name to those made of stone, and round.

ECHEBRUNE, in *Geography*, a small town of France, in the department of the Lower Charente; fifteen miles off Saintes.

ECHEDAMIA, in *Ancient Geography*, a town of Greece, in the Phocide, according to Pausanias.

ECHEDORAS, a river of Macedonia, in the Amphaxitide territory, according to Ptolemy, called Chidoros by Herodotus, who places its source in Crestonia. He says, that it traverses Mygdonia, and pursues its course along a marsh near the river Axius, into which it discharges itself.

ECHEIA, harmonic-vases used in the ancient theatres for the augmentation of sound. Vitruvius, book v. cap. 5, tells us, that they were placed in cells or niches, between the rows of seats occupied by the spectators, to which the voice of the actor had free passage; that they were made of brass, or earthen-ware, and proportioned in magnitude to the size of the building; and lastly, that in the small theatres, they were tuned in harmonical proportions of fourths, fifths, and eighths, with their repitcates; and in theatres of great magnitude, there was a vase to correspond with every sound in the disdiapason, or great musical system, in all the genera.

The Romans, according to the same author, were obliged to the Greeks for this invention, as well as for tragedy itself. For the echeia were brought first into Italy from Corinth, by

by Mummius. Perhaps they had ſomething of the effect of the whiſpering gallery at St. Paúl's church, which, by its orbicular form, augments ſound in the ſame manner as the belly of an inſtrument, a hogſhead, or a draw-well.

Sir Francis Bacon long ſince obſerved, that ſound diffuſes and waſtes itſelf in open air, but if incloſed and confined in a canal, or narrow limits, its force is augmented: and adds, that incloſures not only increaſe and fortify ſound, but preſerve it. Reſonance is but an aggregate of echoes, or of quick repetitions and returns of the ſame ſound, which ſoon uniting into one point, are conſolidated and embodied; and by this means, the force of the tone firſt given is greatly augmented upon the delivery, and preſerved ſome time after the firſt cauſe ceaſes. This conſtitutes the ringing of muſical inſtruments, and places favourable to ſound; but with reſpect to the whiſper, which is inſtantly carried from the perſon who utters it, to the oppoſite ſide of the gallery, it runs along the ſmooth ſurface of the wall, and arrives at the place of its deſtination with nearly the ſame degree of force as it is delivered.

It is not eaſy now, however, to deſcribe, or even to conceive, the form and effects of the theatric vaſes; but their exiſtence and uſe having been recorded by ſo ſcientific a writer as Vitruvius, has excited much curioſity, and produced many conjectures, and, as yet, ineffectual experiments. Our ſmaller theatres, luckily, are in want of no ſuch helps; but this is certain, if theſe veſſels were tuned to muſical tones and intervals, nothing but noiſe and confuſion could be produced from them by common ſpeech, or ſuch as is uſed in modern declamation. For if any one cough, ſpeak loud, or ſtrike forcibly upon the caſe of a harpſichord, with the lid propped up, or on any hard body near it, the ſhock will make every ſtring in the inſtrument ſound at the ſame inſtant; but if a fixed and muſical tone be produced by the voice, or upon a violin or flute, none but the uniſon will be heard upon the harpſichord; and though the cloathing of the jacks be in cloſe contact with all the ſtrings, which renders it impoſſible to produce a clear tone from any one of them, by the common means of quills, or hammers, yet if any perſon ſing near them, every note will be exactly echoed by the inſtrument.

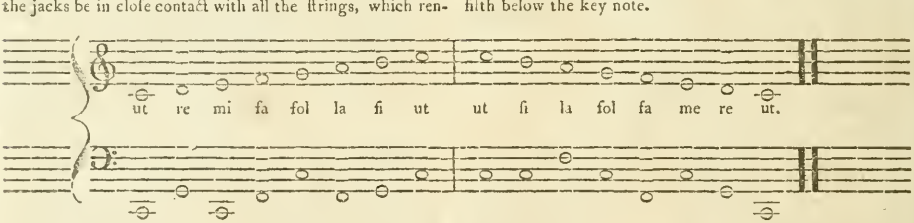
If, therefore, theſe echeia were of the uſe related by Vitruvius, it muſt have been from the voice approaching them in fixed and muſical tones, modulated in uniſon with the tones of the vaſes.

The beſt commentary upon this obſcure ſubject in Vitruvius is that of Perrault, who has given an engraving of part of an ancient theatre, on purpoſe to exhibit the ſituation of the harmonic vaſes. "Les dix Livres d'Architecture de Vitruve," Par. 1684. 2d edit. folio. Kircher, whoſe pen was never impeded by doubts or difficulties, has not only deſcribed, but given them imaginary forms reſembling bells. See Muſurgia, tom. ii. p. 285.

Every thing was upon a large ſcale in the ancient theatres. The figure, features, and voice, were all gigantic. The voice was, in a particular manner, the object of an actor's care; nothing was omitted, ſays father Brumoy, that could render it more ſonorous; even in the heat of action it was governed by the tones of inſtruments, that regulated the intervals by which it was to move, and to expreſs the paſſions.

When a new opera-houſe was built at Turin about 30 or 40 years ago upon a very large ſcale, all the architects, mathematicians, and the learned in (phonics) harmonics, or the philoſophy of ſound, were conſulted about the form and ſituation of thoſe vaſes; but the problem we believe has not yet been ſolved.

ECHELLE, Fr. a ſcale, or gammut. The names which French muſicians give to the eight notes of C major, *ut, re, mi, fa, ſol, la, ſi, ut*, are retained in all keys, whether the notes ſo denominated are flat, ſharp, or natural. This ſcale is generated by the harmonics of three baſes, C, G, and F; or the key note and its two fifths, the fifth above and the fifth below the key note.



This is termed the natural or diatonic ſcale, that is, compoſed of tones and ſemitones.

But the moderns have another ſcale, which they call ſemitonic or chromatic, from its proceeding by ſemitones, or what are called half-notes. For a baſe to this chromatic ſcale, ſee *Muſic Plate* XXIV. and prepared baſe to ditto, *Plate* XVI. This ſcale furniſhes the means of modulation into what key we chuſe to make the fundamental, and of tranſpoſing our ideas from the natural to the fictitious or artificial keys as they are called.

Echelle Neuve, or Scala *Nuova*, in *Geography*, a ſea port town of Turkey, in Aſia, ſituated in the province of Natolia, about 50 miles off Smyrna. The Engliſh and the French had conſiderable mercantile eſtabliſhments at this place till the middle of the 17th century, when the jealouſy of the cuſtom houſe officers of Smyrna cauſed this port to be ſhut to all European nations. Its principal trade now conſiſts in exporting annually about 2000 bales of cotton and cotton yarn, ſome wax, Morocco leather, and fine ſpunges. Dict. de Geogr. Commercante.

ECHELLES, Les, in Latin *Scalæ*, a ſmall town of France, in the department of Mont Blanc, chief place of a canton, in the diſtrict of Chambéry, with a population of 1245 individuals. The canton contains nine communes and 6494 inhabitants, on a territorial extent of 120 kilometres.

The high road of the Echelles Bourgades, 16 kilometres W. of Chambéry, behind the mountain of the grotto on the road to Lyons, may be conſidered as the boldeſt work that was ever undertaken. Charles Emanuel II., duke of Savoy, cauſed a monument to be erected here, of which the French mutilated one of the fineſt parts, as well as the inſcription, during their revolutionary frenzy in 1793.

ECHELSBELK, a ſmall town of France, in the department of the North; ſix miles N. of Bergues, with a very fine caſtle.

ECHEMBROTUS, in *Biography*, an Arcadian, who, according

according to Pauſanias, in his enumeration of the muſical conteſts that were added to the ancient Pythic games, at the cloſe of the Criſſæan war, accompanied upon the flute, Cephallon, the ſon of Lampus. The Amphictyons afterwards retrenched the flute accompaniment, on account of that inſtrument being too plaintive, and fit only for lamentations and elegies, to which it was chiefly appropriated. A proof of this, ſays Pauſanias, is given in the offering which Echembrotus made to Hercules of a bronze tripod, with this inſcription:

"Echembrotus, the Arcadian, dedicated this tripod to Hercules, after obtaining the prize at the games of the Amphictyons, where he accompanied the elegies that were ſung in the aſſembly of the Greeks, with the flute." See Pythic Games.

ECHENAY, in *Geography*, a town of France, in the department of the Upper Marne, and diſtrict of Joinville; ſeven miles E.N.E. of Joinville.

ECHENEIS, in *Ichthyology*, a genus of the thoracic tribe, having the head naked, flat above, and tranſverſely furrowed, the gill-membrane furniſhed with ten rays, and the body deſtitute of ſcales.

Three ſpecies of this ſingular genus are deſcribed, one of which, the *remora*, is ſufficiently well known to the Engliſh navigators in the Mediterranean by the name of the ſucking fiſh. The ſpecies *neucrates* is leſs frequent, and exceeds the other in ſize. The third, *lineata*, is a recently diſcovered kind, of which a particular account occurs in the Linnæan Tranſactions.

Species.

Remora. Tail furcated; back of the head with eighteen ſtreaks. *Echeneis remora*, Forſk. Arab. *Remora Imperati & Aldrovandi*, Will. *Echeneis*, Plin. &c.

Native of the Atlantic and Mediterranean ſeas, in the latter of which it is moſt abundant. Its length is uſually from twelve to eighteen inches, the body of moderate thickneſs, with the head pointed, and the general colour brown; deepeſt on the back, and becoming white on the belly; the fins ſmall, inveſted with a thick ſkin, and of a cinereous colour, edged with brown. The ſkin is ſmooth, marked with numerous impreſſed points, and covered with a thick mucus.

The extraordinary faculty which this fiſh poſſeſſes, of adhering at pleaſure to other bodies by means of the organ at the back of the head, is mentioned by many writers. Pliny, and ſome other authors among the ancients, do not heſitate to aſſirm that the remora is able to arreſt the progreſs of a ſhip in full ſail, by faſtening againſt its hull. The moderns are more moderate, and ſimply relate that it is known to affix itſelf to any ſmooth ſurface ſo firmly, as not to be removed without a conſiderable exertion of ſtrength; it would be difficult, it is ſaid, for the ſtrongeſt arm to effect its ſeparation, unleſs it be pulled in a lateral direction, ſo as to ſlide it along the ſurface of the body to which it adheres. This ability of adheſion appears to be a peculiar property deſigned by nature to facilitate its means of obtaining food; for the remora ſwims ſo feebly and indifferently, that it is neceſſary to avail itſelf of other methods of purſuing its courſe in the water, the moſt convenient of which is to faſten itſelf to ſome larger fiſh, or other floating body. The remora for this reaſon is almoſt conſtantly found attached to whales, ſharks of the more gigantic kinds, and other voracious animals.

Neucrates. Tail entire; head with twenty-four ſtreaks. Haſſelq. *Echeneis in extremo ſubrotunda*, Seba. *Iperuquiba et Piraquiba braſilienſis*, Marcg.

This ſpecies grows to the length of five, ſix, or even ſeven feet; the body is of a more lengthened form than the preceding, and the tail is ovate. The head is of a moderate ſize; the body above the lateral line olive green, beneath white; the fins yelloweſh, edged with violet; the ſkin is marked with numerous minute pores as in the other. This ſpecies is confined principally to the Indian and American ſeas. Commerſon relates, that it is very common about the coaſts of Mozambique, where it is ſometimes employed in catching turtle. The proceſs is altogether ſingular: a ring is ſecurely faſtened round the tail of the fiſh to prevent its eſcape, and a long cord being tied to the ring, the fiſh is carried in a veſſel of ſea water till the boatmen obſerve a turtle ſleeping on the ſurface of the water, when they approach as near as poſſible without diſturbing it, and throw the remora into the ſea. The fiſh inſtinctively directs its courſe to the ſleeping turtle, which, by the length of its cord, it is enabled to reach, and immediately faſters itſelf ſo firmly on its breaſt, that the turtle is drawn by the men into the boat, by means of the cord, with very little trouble.

Lineata. Tail cuneated; head with ten ſtreaks. *Echeneis lineata*, Menz. Linn. Tranſ. 1. p. 187. pl. 17. f. 1.

A new ſpecies found in the Pacific ocean, and deſcribed as above in the Tranſactions of the Linnæan ſociety. The body is about five inches long, ſubulate, ſmooth, and of a dark brown colour, dotted all over with minute darker ſpots, and ornamented with two whitiſh longitudinal lines on each ſide, which begin at the eyes and end in the tail; the under mandible is a little longer than the upper, and both are furniſhed with minute teeth; the clypeus on the top of the head has but ten tranſverſe ſtreaks. The ſpecimen deſcribed was found adhering to a turtle.

ECHETLA, in *Ancient Geography*, a town of Sicily, towards the ſprings of the river Achates. It was formerly a very ſtrong place, and during the Punic war, it was ſituated on the frontiers of the Carthaginians and Syracuſans. It is now *Ochula* or *Acquila*.

ECHETRA. See Ecetra.

ECHEVIN. See Eschevin.

ECHIDNA, in *Ichthyology*, a ſpecies of *Muræna*, which ſee.

Echidna, in *Natural Hiſtory*, a name given, by ſome authors, to the ſeveral kinds of ophites, or ſerpent-ſtone, from ἐχιδνα, a *viper*, or *ſerpent*.

ECHILLEUSE, in *Geography*, a ſmall town of France, in the department of the Loiret; 9 miles E. of Pithiviers.

ECHINARACHNIUS. See Echinus.

ECHINASTRUM, in *Botany*, a name given by ſome perſons to the *Geranium tuberoſum* of Bauhin and Linnæus, on account of the reſemblance of its root to the *Echinus* or Sea-Urchin.

ECHINATUS, is a term applied to any thing beſet with ſpines, like a hedge-hog, as the fruit of the horſe-cheſnut. It is nearly ſynonymous with *muricatus*. It gives the generic character of *Hydnum*, a fungus whoſe head is *ſubtùs echinatus*, prickly underneath.

ECHINI Foſſiles. It is a very remarkable obſervation of Auguſtino Scilla, that all thoſe foſſil echini which he had found in the Meſſineſe and Calabrian hills, and about Malta, were, when bruiſed, as was frequently the caſe, always bruiſed by a perpendicular preſſure. See Echinites.

Echini *ſpatangi*. It is obſerved, that the foſſil echini ſpantagi, or ſpatagi, are very frequent in the iſland of Malta, and people who are for having all foſſil ſhells to be real terreſtrial bodies, produced of ſeeds in the earth, and never to have been parts of real animals, object to theſe having ever been ſuch, their being found ſo plentifully in this foſſil ſtate, and ſo rarely in the native or recent one. This is no objec-

tion of weight; because the cornua ammonis give a much stronger, which are a more common fossil, and have never been found recent at all. This is no argument of weight, however, since it is easy to conceive, that the sea, at the time of the universal deluge, might throw up shells from its deep bottom, which we never can get at in fishing or otherwise. And Scilla has proved the absurdity of the objection, in regard to the echini spatangi, and shewn that those people who raised it, have been led into it by their ignorance. For he has affirmed, that they may be picked up by hundreds at a time in the port of Messina, and that himself once took up more than a hundred recent ones in an hour.

The shells of this species, found fossil in the island of Malta, are very frequently full of the marle of which the upper stratum of that island consists; and some of them are cracked, and have been depressed a little inwards. This is an evident proof that they once were real shells, having, in this case, given way, as far as the included marle would let them, on the pressure of some external force. See ECHINUS.

ECHINITES, or ECHINITÆ, in *Natural History*, the name given by authors to the fossil shells of the several species of echini marini, and to the stones formed in them. Of these there is almost an endless variety in the fossil world. Many of those which we daily find in our chalk pits are the same with those now known to us in their recent state, or living in the sea; but we have numbers of others, of which our imperfect knowledge of the animal world gives us no certain account, in their recent state.

The shells of some of these are found scarce at all altered from their original condition. In many others we have plated spar filling the places of the shells, and retaining every lineament of them. But their most frequent appearance is in the form of masses of hard flint, or other stone, which have been cast and formed in them, having been received, while in a fluid state, into the hollow of the shell, and therefore retaining all the lineaments of the inner surface. And, not unfrequently, these also are coated over with a sparry or stony matter, supplying the place of the shell they were formed in; and having been made, by the insensible deposition of hard matter, in the place of the particles of the shell insensibly wasting away; these retain all the lineaments of the outer part of the shell, as the formed flint does of the inner one. Sometimes pure crystal is found in the place of flint in these, and often crystal, but lightly debased by earth; and these make very elegant specimens.

The various genera of fossil echini, or echinitæ, are known among some authors by the names of spatangi, cordati, galeati, pileati, discoides, ovarii, pentaphylloides. See ECHINUS.

What is generally understood by the word *echinitæ*, is a sort of arched shells, or stones formed in them, covered with divers eminences and cavities, some of which are disposed into beautiful lines, diverging from the summit; and always having two apertures, the one for the mouth, the other for the anus of the animal. Of these,

The echini cordati are such as have a remarkable furrow on one side, or end, which is usually broader than any other part of the body, and by means of this furrow, represents, in some degree, the figure of a heart on cards.

The galeati are such as have the basis somewhat oblong, and the apertures, one in the very margin, and the other near the margin, on the opposite side. (See *Galeaster* under ECHINUS.) The pileati, and discoides, are sub-distinctions of this kind.

The pileati are higher, and approach to a conic figure.

The discoides are flatter, and more compressed.

The ovarii have only one aperture at the base, and have large and unequal tubercles and papillæ.

The pentaphylloides have rows of short lines, which are so disposed as to represent a cinquefoil leaf.

The spatangi is a very comprehensive term, taking in most of the others as sub-distinctions. It comprehends all that have two apertures in the base, and that are covered with small tubercles. See ECHINUS.

ECHINOCYAMUS. See ECHINUS.

ECHINODERMA, in *Natural History*, the name of the sea animal more commonly known by the name of the *echinus marinus*, or sea hedge-hog. See ECHINUS.

ECHINODISCUS. See ECHINUS.

ECHINOGLYCUS. See ECHINUS.

ECHINOMELOCACTUS, in *Botany*, the Turk's-cap, or Melon-thistle. See CACTUS, sect. 1.

ECHINOMETRA, a name given by some to the several depressed species of the echinodermata. See ECHINUS.

ECHINONEUS. See ECHINUS.

ECHINOPHORA, in *Botany*, (ἐχῖνος, *a hedge-hog*, and φέρω, *to bear*, alluding to its prickly heads of flowers and feed,) Prickly Sampire, or Sea Parsnep, Linn. Gen. 129. Schreb. 180. Willd. Sp. Pl. v. 1. 1379. Sm. Fl. Brit. 293. Juss. 225. Class and order, *Pentandria Digynia*. Nat. Ord. *Umbelliferæ*.

Gen. Ch. *General umbel* of numerous rays, of which the inner ones are shortest; *partial* of numerous flowers, the central one sessile. *General involucrum* of about five unequal, sharp-pointed, permanent leaves; *partial* turbinate, of one leaf, in six acute unequal segments, permanent. *Perianth* minute, with five unequal teeth, deciduous. *Cor. Universal*, irregular, radiated; *male flowers* numerous, with abortive pistils; *female* solitary, in the centre of each partial umbel; *partial* of five unequal, spreading, plaited, inflexed, and cloven petals. *Stam.* Filaments five, simple, longer than the petals; anthers roundish. *Pist.* Germen of the female flowers oblong, inferior, imbedded in the partial involucrum; styles two, simple, longer than the petals; stigmas simple. *Peric.* none, except the hardened, spinous, partial involucrum. *Seed* one or two, ovate-oblong. Sometimes stamens are found in the central, or female flower.

Obs. The above description is corrected from the manuscripts of Linnæus, compared with nature.

Ess. Ch. Partial involucrum turbinate, of one leaf, in six segments. Marginal flowers radiant, male, stalked; central one female. Seeds imbedded in the partial involucrum.

1. E. *spinosa*, Linn. Sp. Pl. 344. Sm. Prod. Fl. Græc. v. 1. 179. Cavan. Ic. t. 127. Mart. Mill. Dict. v. 2. (Crithmum spinosum; Dod. Pempt. 705. Ger. Em. 533. Pastinaca marina; Lob. Ic. 710. Bauh. Hist. v. 3. 196.) "Leaflets awl-shaped, spinous, three-cleft, or undivided, entire." A native of sandy sea-shores, especially of the Mediterranean, and in the Levant, flowering from July to September. There are so many authorities on record for its having been found, in former times, in various parts of our own coasts, that though no recent inquiries on the subject have been successful, it could not be refused a place in the *Flora Britannica*. We have gathered this plant near Genoa, Mr. Salisbury at Montpellier, and Dr. Sibthorp in Greece, and Asia Minor. A most admirable drawing of it by Mr. Ferd. Bauer, exists among those destined for the *Flora Græca*. *Root* perennial, tap-shaped, often branched, long, fleshy, whitish, eatable, having the taste and smell of a parsnep. Turra says it is diuretic and aphrodisiac. *Plant* so repeatedly branched, and armed with such a multiplicity of spinous leaves, that it forms an impenetrable, inaccessible, hemispherical bush, two or three feet in diameter, decorated with

with numerous, white, or reddish, large, radiant umbels, well contrasted with the rather glaucous, somewhat downy, foliage, so as to be not deficient in beauty. The inflexed point of each petal is curiously fringed. The juices of the whole abound with alkaline salt. E. orientalis montana spinosa; Tourn. Cor. 45. Buxb. Cent. 5. Append. f. 27; is scarcely distinct from this species.

2. E. *tenuifolia*, Linn. Sp. Pl. 344. Sm. Prod. Fl. Græc. v. 1. 179. Mart. Mill. Dict. v. 2. (Pastinaca echinophora apula; Column. Ecphr. 98. t. 101.) Leaflets pinnatifid, sinuated, flat, scarcely spinous. Native of exposed places near the sea, in Greece, Asia Minor, and the western side of Italy, flowering in July and August. *Root* perennial, long, slender, blackish. *Herb* much branched, downy. *Leaves* bipinnate; leaflets sinuated and pinnatifid, their points somewhat pungent, scarcely spinous. *Umbels* numerous, small, of a dull yellow. Columna reports the roots to be very good food, like carrots.

3. E. *trichophylla*. Leaflets thread-shaped, elongated, undivided, scarcely spinous. Native of the Levant, preserved in the herbarium of the younger Linnæus. *Herb* smooth. *Leaves* twice or thrice ternate; leaflets undivided, very long, and slender, so as to be almost capillary, slightly channelled above, their points acute, but not spinous. *Umbels* the size of the first species, on long stalks, each with a dark-purplish convex tumour in the centre; partial ones, when in seed, globose, muricated. *Petals* whitish. The plant abounds with gum. S.

Echinophora, in *Ichthyology*, a name given by Rondeletius to a species of sea-snail, of the round-mouthed kind, or class of the cochleæ lunares.

He calls it echinophora, because it is all over beset with tubercles; but this is a very ill-chosen name, as it confounds it with the echini, or sea-eggs; he had much better have called it cochlea tuberculosa. See Lunaris *cochlea*.

ECHINOPHTHALMIA. This surgical term is derived from ἐχινος, *a hedge-hog*, and ὀφθαλμία, *an inflammation of the eye*. It signifies an inflammation of the eye-lids, attended with a projection of the eye-lashes, which project out like the quills of a hedge-hog.

ECHINOPS, in *Botany*, (altered by Linnæus from *Echinopus*, a name which seems to have been first given by John Bauhin, from ἐχινος, *a hedge-hog*, and ὀψις, *aspect*, or *appearance*, more especially alluding to the resemblance of its round prickly heads, to a sea urchin.) Globe Thistle, Linn. Gen. 453. Schreb. 592. Willd. Sp. Pl. v. 3. 2396. Juss. 175. Gærtn. t. 160. Mart. Mill. Dict. v. 2. Class and order, *Syngenesia Polygamia-segregata*. Nat. Ord. *Compositæ*, Linn. *Cinarocephalæ*, Juss.

Gen. Ch. *Cal.* The *common* one of many awl-shaped totally reflexed leaves, containing many flowers; *partial*, to each flower, inferior, oblong, imbricated, angular, of numerous, awl-shaped, erect, permanent, leaves, spreading in their upper part. *Cor.* of one petal, the length of the calyx, tubular; its limb five-cleft, reflexed, a little spreading. *Stam.* Filaments five, capillary, very short; anthers united into a cylindrical five-toothed tube. *Pist.* Germen oblong; style thread-shaped, the length of the corolla; stigmas two, oblong, somewhat depressed, revolute. *Peric.* none, except the enlarged calyx. *Seed* solitary, ovate-oblong, tapering at the base, obtuse at the summit. *Down* obsolete. *Common receptacle* globose, nearly naked.

Ess. Ch. Partial calyx single-flowered. Flowers all perfect. Corolla tubular. Receptacle nearly naked. Seed-down obsolete.

1. E. *sphærocephalus*, Linn. Sp. Pl. 1314. Mill. Illustr. t. 70. "Leaves pinnatifid, white, and cottony beneath. Stem branched." A native of Italy and Germany, a common hardy perennial in our gardens. This is the best known species. Its *stems* are four or five feet high. *Leaves* a foot or more in length, pinnatifid with angular lobes, downy above, white and cottony beneath. *Heads* of flowers numerous, terminal, near two inches in diameter, globose, white, or bluish, viscid to the touch, and exhaling a faint sweetish smell, like some sorts of pomatum. Five more species are enumerated by Willdenow, chiefly found in the south of Europe, smaller, or more slender, than the above, and more prickly.

Propagation and Culture.—The most of these are hardy perennials, easily propagated by seed, but requiring to be frequently renewed by the same means, like many plants of warm, or dry climates, when kept in our gardens. The first species scatters itself widely in shrubberies, so as to become a weed.

ECHINOPUS. See Echinops.

ECHINORINCHUS, in *Zoology*, a genus of intestinal vermes, the body of which is long and cylindrical, and the anterior part furnished with a short retractile proboscis, armed at the tip with recurved prickles.

All the species of this numerous genus live in the viscera of various quadrupeds, birds, reptiles, and fishes, generally in the intestines. None have yet been found in man. They adhere very firmly by means of their recurved prickles at the anterior extremity to the viscera, in which they usually form a kind of trough, and remain fixed in one spot during the whole life of the animal upon which they prey. The hooked prickles vary in form, and are more or less numerous in different species, and are in some kinds disposed with more regularity than in others.

These destructive creatures are gregarious. They subsist on the lymphatic humours and other fluids, which they copiously extract, by wounding and irritating with the hooked prickles, before mentioned, those parts to which they are immediately attached. Nor is it very unfrequent with them to perforate the membranes, and thereby expose to destruction the life of the animal in which they are nourished. Contrary to the commonly received opinion, that these animals are hermaphrodites, we have reason to conclude, there are both males and females of the several species in this genus; and that they are of the oviparous kind, is inferred from the number of small oval bodies found in the supposed females. The species of this genus, at present ascertained, are very numerous; but their manners of life, and the maladies occasioned to the more valuable kinds of animals, from the ravages of these voracious inmates, are far less clearly ascertained than the importance of the inquiry merits. The following species are described by Müller, Goëze, and other writers, who treat on this subject.

* *Infesting Mammiferous Animals.*

Phocæ. Body pale; intestine milk-white, and spiral. *Ascaris phocæ*, Fabr.

Found in great numbers in the intestines of the harp and rough seal, which it often devours. The body is pellucid, membranaceous, tapering to both ends, and from three to eight inches long.

Tubifera. Whitish, glabrous, and tapering behind into a fine hair. *Ascaris tubifera*, Fabr.

Length one inch. Discovered in the stomach of the harp seal.

Gigas. Clear white; without neck; proboscis sheathed, with numerous rows of hooked prickles; orifices of suction seven. Goëze. *Taenia hirundinacea*, Pallas.

Found in the intestines of swine; and grows to the length of

of eighteen inches; the filaments of the proboſcis appear as if united by two lateral ligaments.

Balænæ. Inhabits the inteſtines of the whale. Phipps' Journ.

** *Infeſting Birds.*

Buteonis. Clear white; veſicles of the tail bluiſh and lentiform. Goèze.

Found in the inteſtines of the buzzard, and rather exceeds two inches and a quarter in length.

Scopis. Proboſcis covered with numerous prickles. Goèze.

Inhabits the larger inteſtines of the ſtrix ſcops.

Aluconis. Body ſub-rugoſe and opake; proboſcis thick. Müll.

Diſcovered in the ſtomach of ſtrix aluco.

Strigis. Proboſcis clavate. Goèze.

In the larger inteſtines of ſtrix ſtridula.

Pici. White, without neck; proboſcis with ſmall ſerrated prickles. Goèze.

Lives in the inteſtines of ſome wood-peckers; has been found in thoſe of the two ſpecies viridis and erythrocephalus. The ſpecies is gregarious, and half an inch long.

Borealis. Found in the inteſtines of the eider duck. Phipps' Journ.

Boscadis. Neck filiform; proboſcis rather prickly. Goèze.

In the inteſtines of the common duck.

Anatis. Scarlet; body ovate; thorax and proboſcis covered with prickles, with a long ſmooth neck between them. Goèze.

Inhabits the inteſtines of the velvet duck.

Mergi. Head and neck armed with prickles.

Length an inch and a half. This kind is found in conſiderable numbers in the inteſtines of the mergus minutus.

Alcæ. Body with lateral wrinkles beneath on the forepart. Müll.

In the inteſtines of the awk tribe. The length of this kind is four inches; the body is roundiſh, beneath flat, pointed at the anterior part, and terminating behind in an extremely fine point; colour whitiſh, with a black line down the back.

Ardeæ. Body ſtriated; proboſcis clavated. Goèze.

The body is conic behind, and ſinuated, each in the middle. A ſpecies found in the great white heron.

Vanelli. Tail with a white veſicle. Goèze.

In the inteſtines of tringa vanellus.

Merulæ. Ovate; thorax prickly.

In the inteſtines of the black-bird.

*** *Infeſting Reptiles.*

Ranæ. White; proboſcis united by two ſlender white filaments within. Goèze. *Tænia hæruca*, Pallas.

A ſpecies of a greeniſh, or greyiſh colour, found in the inteſtines of frogs.

Falcatus. Proboſcis long, and armed with many longitudinal rows of hooks; body marked on the fore-part with a pellucid blotch, and the poſterior with a pellucid dot of the ſame. Froelich.

Found in the ſalamander.

**** *Infeſting Fiſhes.*

Anguillæ. Body white and ſmooth; proboſcis globular. Schreb.

In the inteſtines of the eel.

Xiphiæ. In the inteſtines of the xiphias gladius. Redi.

Often perforates the inteſtines, and occaſions the death of thoſe fiſhes.

Candidus. Body opake, ſubrugoſe, and wrinkled. Müll. *Acanthrus ſpinuloides*, Act. Stockh.

Length three inches; the body pale-aſh, variable to brown, yellow, &c. Inhabits the inteſtines of many fiſhes, both of the freſh and ſalt water kinds.

Lineolatus. Body with tranſverſe brown lines, interrupted in the middle. Pallas, &c.

Inhabits the inteſtines of the cod fiſh; length two inches.

Longicollis. Reddiſh-white; head rounded, and longitudinally ſtriated; neck filiform; proboſcis ſlightly hooked. Goèze.

Found in the inteſtines of the torſk.

Pleuronectis. Sides of the body with undulated impreſſions. Müll.

In the inteſtines of the turbot.

Attenuatus. Globiferous; body equal, yellow, and ſmooth; neck filiform. Müll.

In the inteſtines of the flounder.

Annulatus. Globiferous; body ending in a point; neck wrinkled. Müll.

In the inteſtines of the torſk and bream.

Plateſſoidæ. Snout pointed; body with an elevated terminal belt behind. Müll.

Body pale, ſmooth, and about two inches and a half long; found in the ſtomach of pleuronectes plateſſoides.

Percæ. Body ſoft, wrinkled, and obtuſe at each end. Müll.

In the inteſtines of the perch.

Cernuæ. Proboſcis armed with from ten to twelve rows of prickles. Schreb.

In the perca cernua.

Cobitidis. Striated; proboſcis clavated. Goèze.

In the cobitis barbatula.

Salmonis. Body clavated, ſmooth; proboſcis cylindrical. Müll.

Found in the inteſtines of the ſalmon.

Sublobatus. White globiferous, and ſomewhat lobate at the ſides behind; neck cylindrical and annulate, proboſcis with ſixteen ſeries of ten hooks each. Müll.

In the inteſtines of the ſalmon, when young.

Quadrirostris. White; tail rounded and inſerted into the body; proboſcis quadruple. Goèze.

In the liver of the ſalmon.

Truttæ. In the inteſtines of the trout. Goèze.

Maræna. Fuſiform, ſmooth and ſlightly wrinkled; behind tapering, and rather obtuſe. Mart. Act. Stockh.

In the inteſtines of ſalmo maræna.

Lucii. Body pellucid and ſmooth. Schreb.

Body yellowiſh, narrower, and obtuſe behind.

Argentina. Inhabits the inteſtines of the argentine. Act. Hafn.

Alosæ. Body filiform; anterior part clavated and reddiſh, with eight rows of looſe prickles; proboſcis pale, with eight rows of denſer prickles. Herrmann.

Length two inches. Found in the inteſtines of the ſhad.

Barbi. Ovate, yellow, faſciated; neck long, white, cylindrical, and glaſs-ſhaped. Schranck.

Inteſtines of the barbel.

Carpionis. Inhabits the inteſtines of the carp. Koelr.

Idbari. Inhabits the inteſtines of cyprinus idbarus. Müll.

Affinis. Inhabits the inteſtines of cyprinus rutilus. Müll.

Rutili. Proboſcis tuberous and prickly at the tip; body

body with a ſingle mouth or ſucker on one ſide, and four on the other. Müll.

Found in the ſame fiſh as the former, but leſs frequently.

Branæ. Neck filiform; proboſcis armed with very minute prickles. Gœze.

Inhabits the inteſtines of the bream.

Lophii. In the inteſtines of lophius piſcatorius. Müll.

Sturionis. Rounded and white. Gœze.

In the inteſtines of the ſturgeon.

ECHINOS, in *Ancient Geography*, iſlands of the Ionian ſea, called by the Greeks Echinæ and Echinades, ſituated over-againſt Etolia and the mouth of the river Achelous. They are now called *Cuzzolari*.

ECHINOU, in *Geography*, a town of European Turkey, in the province of Albania; 8 miles N.E. of Zeiton.

ECHINUS, in *Ancient Geography*, a town of Greece, in Acarnania.—Alſo, a town of Greece, in the Phthiotide territory, ſituated, as Pliny ſays, at the mouth of the river Sperchius; or, as others ſay, at the bottom of the Malac gulf.

Echinus, in *Architecture*, a member or ornament, near the bottom of the Ionic, Corinthian, and Compoſite capitals; which, from its circular form or contour, is called by the French, *quart de rond*, and by the Engliſh, *quarter round*, or *boultin*; and from its being uſually carved, or cut with figures of eggs, &c. is called alſo by the Latins, *ovum*; by the Italians, *ovolo*; the French, *œuf*; and the Engliſh, *eggs* and *anchors*. Laſtly, the eggs being encompaſſed with a cover, and thus bearing ſome reſemblance to a chetnut cut open; the Greeks have called it ἐχῖνος, *echinus*, a word which denotes the prickly cover of a chetnut.

Echinus, in *Botany*, Loureir. Cochinch. 633. a diœcious tree of Cochinchina, ſuſpected by Loureiro to be the *Ulaſſium* of Rumph. Amboin. book 4. chap. 18. t. 23. It appears to belong to the natural order of *Amentaceæ*, and he deſcribes the fruit as two united roundiſh muricated capſules, with a round ſmooth black ſeed in each. The *leaves* are ſcattered, ovate, pointed, undivided or three-cleft, entire, reticulated with veins, downy beneath. *Flowers* many together on a ſtalk. Whatever may be determined concerning this genus, its name is untenable in botany, being preoccupied in zoology.

Echinus. See Salsola and Statice.

Echinus is alſo uſed by ſome botaniſts for the prickly head or top of any plant; thus called from its likeneſs to a hedge-hog, or the cover of a chetnut.

Echinus, the hedge-hog, in *Zoology*. See Erinaceus.

Echinus, a genus in the Linnæan ſyſtem, included in the molluſca order of vermes. Theſe have the body roundiſh, covered with a bony cruſt, and furniſhed in general with moveable ſpines; the mouth placed beneath, and moſtly conſiſting of five valves.

This is the character aſcribed to the echinus genus by Linnæus, and retained by Gmelin. A ſlight attention to the genus, as it ſtands thus defined, will be ſufficient, it is preſumed, to convince every impartial naturaliſt that ſome amendment is requiſite in the claſſification of theſe bodies, admitting only thoſe ſpecies which Linnæus deſcribes; and if this be allowed, it will be ſeen that the Gmelinian arrangement, being far more copious, is much more liable to objection. Linnæus includes three or four diſtinct natural genera under his genus echinus; Gmelin, no leſs than ten; and many of theſe ſo remote in character, as to bear no affinity whatever with each other, except in being, as Linnæus expreſſes it, of a roundiſh form, covered with a bony cruſt, beſet with ſpines, and having the mouth placed beneath. By ſome it may be urged, that this really conſtitutes them of the echinus genus; and every other difference, whether in figure or any other peculiarity, ought to be regarded as diſtinctions of ſpecies and not of genera. To a certain extent we concede the truth of this; but from the many examples before us, which this extenſive tribe preſents, there can be little difficulty in diſcriminating which characters define natural families, and which form diſtinctions of ſpecies only; the former of which will not fail to afford the beſt generical diſtinctions that can be adopted in the arrangement of this tribe of animals. That conſiderable reformation is requiſite in the Linnæan arrangement, we think, muſt be allowed; nor can we heſitate in believing that Linnæus would himſelf have made much amendment in his claſſification of the echini, had he been acquainted with half the number of ſpecies which have been diſcovered ſince his time. Were we, in fact, to regard all bodies, which may be ſafely included within the definition of his echinus, as appertaining ſtrictly to one genus, we might with equal conſiſtency recaſt the whole ſyſtem of conchology, and conſolidate every ſpecies of whatever families into a ſingle genus. All ſhells have a greater or leſs degree of tendency to a roundiſh form, whether multivalve, bivalve, or univalve, and have the covering alike of a teſtaceous ſubſtance. All echini have a greater or leſs degree of tendency to a roundiſh form, and have the covering alike of a bony ſubſtance: yet, how abſurd would it appear to admit the firſt as a generical diſtinction, though from habit we implicitly admit the latter? It is indeed added, that the echini have moveable ſpines; to which, in ſpeaking of ſhells, we may contraſt the circumſtance of the ſpines on ſhells, when preſent, being always immoveable. This parallel might be purſued ſtill further; but enough, we conceive, has been advanced to prove that the definition of echinus, as retained by the Linnæan ſchool, admits of far more general application than can be conſiſtent with a generical diſtinction: and it will be hereafter ſhewn, that the ſeveral families, which in the latitude of its expreſſion that genus embraces, exhibit as prominent generic features as the ſeveral tribes of ſhells.

That no improper blame be attached to Linnæus, it ſhould be recollected, that ſo lately as the publication of the tenth edition of the "Syſtema," no more than ſeventeen ſpecies of echinus were known to that author; and though theſe included examples of ſeveral diſtinct natural genera, when we conſider the conciſe amount of theſe, he is not altogether inexcuſable for retaining them together: had he divided them into about three genera, it might have been ſufficient. Gmelin poſſeſſed every advantage, and has ſtill done little towards improvement. When Linnæus wrote, his moſt material aſſiſtance was derived from the works of Rumpfius, an early edition of Klein, and Breynius, and laſtly, ſome few ſpecimens in the cabinet of count Teſſin. For the diſpoſal of theſe in methodical order, he formed two ſections: one for thoſe having the body of regular form, and the vent vertical; the other irregular, and having the mouth and vent beneath. The firſt of theſe ſections contain eleven ſpecies; and the ſecond, ſix. Gmelin derived very aſſiſtance from better authors: the labours of Müller on this ſubject, in "Zoologia Danica;" Phelſum's work, entitled, "Briefaan C. Nozeman over de Gewelr-Siekken of Zeeeglen;" and, more eſpecially, the Leſkeian edition of Klein's "Naturalis Diſpoſitio Echinodermatum, &c.;" all which appeared ſubſequent to the time of Linnæus. From theſe publications, Gmelin found the tribe of echinus to be far more numerous than had been before conceived; and clearly ſaw the neceſſity of extending the genus to a conſiderable length for their reception, if he adhered to the

Linnæan method; or of constituting several new genera, if he deviated from it. The former presented difficulties; the latter, innovation and trouble. Those writers had not only described many species which belonged to either one or another of the families proposed by Linnæus, but many more, which, without great impropriety, could not be referred to either; the species altogether amounting to above one hundred subjects. The only circumstance to be regretted was the want of harmony in the different systems; for, although the several writers agreed in the most essential point, namely, the necessity of forming a number of new genera, they were neither disposed to accord in the construction of those genera, or in the application of names, even to those particular families, which in any system might be designated by the same appellation. Gmelin does not attempt to unravel these, and overcome the perplexity: he at once severs the gorgon knot, by rejecting the genera of every author indiscriminately, and referring the whole of the species to the genus echinus. For the admission of these, he forms twenty-seven principal and secondary divisions; and, in this state, it may be truly observed, that there is no genus whatever, throughout the whole Linnæan system, the cancri perhaps excepted, which presents such an incongruous assemblage.

Any arrangement formed on such a plan must prove defective; and the echinus genus, as constructed by Linnæus, ought rather to be considered, in the present time, as the character of an extensive order of vermes than as a genus. There is in each of the systems which have appeared much to commend; none, however, which in our opinion is so constructed as to deserve entire approval. Some of those established by Leske, and others by Müller, are excellent; and several of the new genera of La Marck ought in particular to be retained. In the following arrangement of genera, we have endeavoured to combine the advantages of each; and are inclined to believe, that no difficulty can occur in referring any of the known species of Linnæan echini to its natural genus, according to the method now proposed. The several genera, though considered distinctly, are brought together into one point of view, to avoid that perplexity to the Linnæan reader which must necessarily arise, were each genus referred to its alphabetical order through the work.

Before we conclude this topic one point must be considered. It must be confessed that there is one radical fault in the arrangement of these bodies, in which all writers have participated, with the exception of Linnæus; and that is, the incorporation of the recent with the remains of fossil species. Some of the former we have occasional opportunities of examining, in a perfect state, in museums and collections; while, on the contrary, the others occur almost constantly in a state of mutilation, or are so enveloped and disguised in stony matter, as to render their characters ambiguous. The latter, when tolerably elucidatory of the species, or especially with any remains of the spines affixed, are deemed inestimable. The remains of fossil echini mentioned by writers are, therefore, to be at all times received with caution; and some within our own knowledge must be rejected: neither is it adviseable to form any genera of the fossil kinds, except from such examples as perfectly display every character of the general form, together with both the situation of the mouth and the anal aperture.

Naturalists have entertained very different opinions concerning these bodies. Aristotle, who is one of the earliest writers on the subject, calls them echinos, echinometra, and spatagus, placing them with multivalve shells. This example is followed by Pliny, and many much later writers. Among the moderns, it should be mentioned that Bruguiere forms a distinct class of these, and the asterias; Cuvier refers them to the zoophytes class, and La Marck to his *radiares*, the class in which he comprehends the asterias and holothuria.

The recent animals of this class are inhabitants of the sea, and those species which occur in a fossil state are found most commonly in secondary calcareous rocks, or more frequently in chalk and flint. The crust or covering is composed of a great number of plates, amounting, in many species, to nearly a thousand in a single shell; their form is various in different families, and the perforations of the shell disposed as variously. These perforations in the shell are the apertures to which the tentacula of the inclosed animal are protruded. The surface of the shell is also more or less beset with tubercles, upon which the spines are situated. These in the living animal are attached by very strong ligaments, but almost constantly fall off when the animal dies. The mouth, which is placed beneath, consists of five or six teeth of a triangular form. Their internal organization, notwithstanding the investigations of Cuvier, remains in considerable obscurity, and their sexual organs are unknown. They are ascertained to be oviparous, and to spawn in the spring. The spines are the instruments of motion, an interesting account of which appeared from the pen of Reaumur, in the Memoirs of the French Academy of Sciences, in 1772. Their tentacula are the processes by means of which they adhere very securely to the rocks, or seize upon their prey, and by the assistance of which they conduct it to their mouth. They live chiefly on crabs and testaceous animals, marine worms, &c.

The succeeding appear to be the principal natural families into which the Linnæan echini, ascertained at this time, may with propriety be divided; and which, as before remarked, to avoid confusion, are concentrated in the present article.

Echinus.

Body hemispherical, globular, or suboval, with avenues of pores, which diverge equally on all sides from the vent to the mouth; vent vertical; mouth beneath and central.

Esculentus. Hemispherical-globular, with ten avenues of pores, the spaces between covered with small tubercles supporting the spines. *Echinus esculentus*, Linn. *Echinometra*, Rondel. *Melo marinus*, Plancus. *Cidaris miliaris*, Klein.

Native of the Mediterranean and other European seas, and one or more of its varieties found in India. The body is generally reddish and yellow, varied with green or purple spines, which fade in colour, and fall off after the death of the animal. The flesh is eatable.

Sphæra. Spherical, red, with blueish spines. Müll.

Inhabits the northern seas, and is by some supposed to be the young of the species esculentus.

Dræbachiensis. Hemispherical, pale, with long pale spines. Müll.

Found in the northern seas.

Miliaris. Hemispherical, depressed with ten avenues of pores, the spaces between with two rows of protuberances. Gmel. *Cidaris miliaris saxatilis*, Klein. *Echinus ovarius*, Rondel.

An European species.

Basteri. Shell depressed, with few tubercles, and serrated line down the middle of the spaces; pores of the avenues placed in alternate rows of two and three foramina. Klein.

A native of Europe, and by some authors considered as a variety of the former. The colour is greenish-grey, variable to olive or reddish violet. The larger spaces are marked

marked with eight rows of ſmall tubercles, and ſprinkled with a few others of ſmaller ſize; the leſſer ſpaces with two rows of larger, and as many ſmall tubercles; avenues with a triple row of double pores; ſpines ſtriated whitiſh.

Hemisphæricus. Hemiſpherical, depreſſed, with ten avenues of pores, the ſpaces with a ferrated ſuture down the middle, and tranſverſe lines; mouth pentangular, the angles obtuſe. Klein.

Reſembles E. eſculentus. Colour red with paler avenues, the baſe ochraceous; rough with larger and ſmaller protuberances.

Angulosus. Hemiſpherical; the ſpaces granulate and bifariouſly warted, the larger ones bipartite by a ferrated ſuture down the middle; avenues trifariouſly porous. Klein.

Shell grey, with a violet tinge; ſpaces with rows of granulations and protuberances; avenues with double diſtant pores. Klein deſcribes alſo a variety of this ſpecies of a ſmaller ſize, and greeniſh grey colour.

Excavatus. Hemiſpherical; ſpaces granulated, and bifariouſly tuberculated; avenues excavated and bifariouſly porous. Klein.

Found in a petrified ſtate at Verona.

Globulus. Hemiſpherical, ſub-globular, with ten avenues, the ſpaces muricated at the ſides, and porous in the middle. Linn.

Inhabits the Indian ocean.

Sphæroides. Hemiſpherical, gibbous; avenues ten, muricated throughout, and porous in the middle.

Native of the Indian ocean.

Gratilla. Hemiſpherical, gibbous; avenues ten, triplicate, the ſpaces muricated in a decuſſate manner. Linn.

Inhabits ſame ſeas as the latter.

Lixula. Hemiſpherical, with ten avenues in contiguous pairs, the ſpaces tranſverſely muricated and punctured. Linn.

Native of the Indian ocean.

Saxatilis. Hemiſpherical, depreſſed; pores of the avenues in a curved line, the curves oblique at the baſe. Linn. *Cidaris rupeſtris*, Klein.

Several ſuppoſed varieties of this ſpecies are found in the Mediterranean and Indian ſeas. The colour is commonly violet-grey or white, with the protuberances reddiſh or yellowiſh in two or three longitudinal rows; pores of the avenues double; ſpines rigid, reddiſh-brown, with violet tips.

Fenestratus. Orbicular, with a flat feneſtrate baſe; ſpaces ten, with unequal ſmall and large tubercles; mouth with ten angles. Klein.

White, and granulated throughout; in the larger ſpaces are ſix rows of papillous warts; avenues broad with three pair of pores; ſpines violet-black; vent pentangular.

Subangularis. Hemiſpherical, orbicular, with ten ſpaces, the leſſer ones elevated, and ten rows of tubercles in each. Klein.

Shell greeniſh-grey, rather inclining to cheſnut; ſpaces with four tubercles placed in a rhombic form; pores of the avenues curved in four or five pairs.

Native place unknown.

Ovarius. Ovate, the larger ſpaces bifariouſly tuberculate. Plott, &c.

Found in a foſſil ſtate in England.

Diadema. Hemiſpherical, depreſſed, with five avenues longitudinally tuberculate; the ſpaces lanceolate. Linn.

Inhabits the Indian ſeas. The ſhell is orbicular with the top depreſſed, colour generally blueiſh; mouth large; vent circular, and ſurrounded with a pentangular ſkin; ſpaces bifariouſly tuberculate, the tubercles perforated at the tip; avenues with three pair of pores at the baſe and one at the tip; ſpines violet and blue-grey. There are ſeveral varieties of this ſpecies differing in colour and diſpoſition of the ſpots, &c.

Calamarius. Spheroid, depreſſed; avenues five, with black porous margins, granulated in the middle with a row of larger prominent dots. Pallas.

Native of the Indian ſea, the colour greeniſh-white; the ſpines reſemble the ſtem of the equiſetum, and are whitiſh annulated with green and grey at the tip.

Araneiformis. Orbicular, grey, with purple-grey ſpines thicker in the middle. Gmel. *Spinnekopf*, Phelf.

Inhabits American ſeas.

Stellatus. With the lower ſpines capillary. Gmel. *Kleine komeet*, Phelf. *Echinometra purpurea americana*, Seba. *Erinaceus marinus*, Pontopp. Norſk. Naturh.

Found in the American ſeas.

Radiatus. With five radiated avenues, forked at the tip. Klein. *Groote komeet*, Phelf. *Echinanthus major ſpinis orbus*, Seba.

Native place unknown.

Circinatus. With ten granulate ſpaces, bifariouſly tuberculated, the larger ones excavated, the leſſer ones elevated, and ſub-pulvinate at the baſe. Leſke. *Echinometra circinata*, Breyn. *Krunsje*, Phelf.

Found in a foſſil ſtate.

Cidaris. Hemiſpherical, depreſſed, with five ſlexuous linear avenues, the ſpaces alternately bifarious. Linn.

Many very diſſimilar kinds of echini are included by Gmelin as varieties of this ſpecies, ſeveral of which we are perſuaded will be found on further inveſtigation to be diſtinct. E. cidaris inhabits European and Indian ſeas.

Mammillatus. Hemiſpherical, oval, with ten winding avenues; the ſpaces muricated and warty, the narrower ones abbreviated. Linn. *Cidaris mammillata*, Klein.

Inhabits the ſouth ſeas, is of a depreſſed form and yellowiſh aſh-colour inclining to browniſh, beneath paler.

Lacuntur. Hemiſpherical-oval with ten ſlexuous avenues; ſpaces muricated, the narrower ones longitudinal. Gmel. *Cidaris lacuntur*, Klein.

Variable in colour from yellow-cinereous to blueiſh or blackiſh. The ſpecies inhabits the Indian ocean.

Atratus. Hemiſpherical-oval and ſlightly depreſſed; with very ſhort obtuſe-truncated ſpines; the marginal ones clavated and depreſſed. Klein.

Orbicular cinereous inclining to violet; ſpines violet. Native of the Indian ſeas.

Coronalis. Hemiſpherical-orbicular with ten ſpaces alternately narrower and covered with ſcattered papillæ; avenues flat, uniting in confluent pairs before the area of the crown. Leſke.

Found in a foſſil ſtate in chalk and flint in various parts of the world.

Asterizans. Orbicular depreſſed; tubercles furrowed with a groove up to the tip, and ſurrounded with a circle of granulations, Leſke. *Sterrewrat Zee-egel*, Phelf. *Zee-eg.*

A mineralized ſpecies met with in chalk.

Assulatus. Shell ſcutellate, the ſcutels united by tranſverſe ſutures. Klein.

Sardicus. Orbicular depreſſed tuberculate, with ten impreſſed avenues; the ſpaces multifariouſly tubercled, with an impreſſed ſuture down the middle. Klein. *Sardiſche Zee-egel*, Phelf.

A large ſpecies, found in the Tuſcan and Adriatic ſeas; the colour grey, tinged with yellowiſh red; the baſe nearly flat and yellow; larger ſpaces with tubercles diſpoſed in

about

about twelve rows, with lesser ones and small granulations in the interstices; the lesser spaces with about six rows of smaller tubercles; avenues with five pairs of pores placed in an arched series; mouth small.

Flammeus. Hemispherical depressed; the spaces void of tubercles in the middle towards the upper parts, the lesser ones more elevated; avenues narrow and bounded each side by a row of tubercles. Klein. *Gevlamde Zee-egel*, Phelf.

Native place unknown. The colour is olive green, with the tubercles and base whiter; larger spaces with twelve rows of tubercles at the broadest part. lesser spaces with three; each tubercle surrounded with a circle of lesser ones; mouth small, vent surrounded with pentangular scales.

Variegatus. Orbicular subangular; middle spaces rosy, rich green each side; avenues whitish-green; base whitish. Leske, *Buntgeflamte Zee-egel*, Phelf.

A rare kind, the native place unknown.

Pustulosus. Larger spaces divided in the middle by a suture, with numerous transverse rows of tubercles increasing in number towards the middle; lesser spaces more elevated. Klein.

This is a small species, about an inch in height and two in diameter, the colour brownish-grey inclining to red, the lesser spaces paler, base whitish, and protuberances tinged red. Mouth with broad sinuosities. Country unknown.

Granulatus. Sub-orbicular, sub-angular; middle of the spaces naked and divided by a suture serrated each side, the larger ones with seven rows of tubercles, the lesser ones with four. Klein. *Zand-korlige Zee-egel*, Phelf.

About one fourth less than the former; colour dull green, with the margin of the larger spaces, and the base inclining to greyish; avenues with three pair of pores placed in a triangle; vent circular with ten scales at the margin expanded like a rose.

Tessellatus. With ten spaces divided in the middle by a suture, and tessellated; avenues ten biporous; mouth circular. Klein. *Leyendak*, Phelf.

Found in a fossil state.

Botryoides. Spaces divided by a longitudinal suture in the middle, the larger ones bifariously tuberculated; avenues with a double curved row of pores. Klein. *Geribde Zee-egel*, Phelf.

Found in same state as the former.

Toreumaticus. Hemispherical, with ten spaces bifariously tuberculated, the tubercles crenated and surrounded by a circle of granulations, the larger spaces with four longitudinal grooves, the lesser ones with two grooves. Klein. *Gegraveerde Zee-egel*, Phelf.

Cinereous greenish or blueish, the base and avenues yellowish; avenues biporous, the pores placed in a thickly-serrated line; vent surrounded with ten scales.

Clypeus.

Body shield form; vent vertical; mouth beneath and central.

Sinuatus. Convex; avenues ten, striated; spaces ten; tubercles surrounded with a circle of granulations. Plott.

Found in a fossil state in Britain.

Semiglobosus. Hemispherical, grooved, with a flat base, the protuberances placed in rows. Klein.

Found in a fossil state.

Quinquelabiatus. Painted with innumerable annulations, with a hollow in the middle, surrounding a five-rayed convex star. Klein. *Vyslip*, Phelf.

Found in a fossil state.

Conoideus. Sub-conic, with an elliptic circumference; spaces and avenues ten, the latter transversely grooved, and porous at the margin, the former divided by a straight suture. Leske.

Found in a fossil state.

Galerites.

Conoid, or oval, with avenues of pores radiating from the summit to the base; mouth central; vent in the margin or contiguous.

Albogalerus. Spaces ten; covered with numerous small tubercles, the larger ones united by a serrate suture and transversely lineated, the lesser ones terminated by a foramen at the crown; avenues ten and biporous. Gmel. Plott, &c.

A fossil species, met with in various parts of Britain.

Depressus. Spaces ten, the larger ones divided in the middle by a suture; avenues ten, biporous; crown depressed; vent orbicular. Leske. *Egelsteen tienband plattop*, Phelf.

A fossil species.

Vulgaris. Orbicular, with ten avenues, two of which are near each other. Morton, &c.

Common in a fossil state in various parts of Europe.

Quadrifasciatus. With four avenues of pores. Gehler, &c.

Found in a fossil state.

Sexfasciatus. With six avenues of pores, Gehler, &c.

A fossil species.

Discoideus.

Body roundish, with the base exactly circular; mouth and vent beneath, small and orbicular.

Subuculus. Avenues ten, biporous; spaces ten, alternately large and smaller. Klein.

In this species the spaces are beset with very small circles; pores of the avenues very minute, and crowded close together.

Found in a fossil state.

Echinoneus.

Body oval or orbicular, and rather depressed; rays of pores numerous and radiate from the summit to the base; mouth somewhat central; vent beneath and near the mouth.

Cyclostomus. Oblong, sub-depressed; crown with five pores; mouth placed in the middle and round; vent oblong and near the mouth. Leske. *Spatagus pusillus*, Müll. *Rond-mond*, Phelf.

Cinereous or yellowish; spaces ten, divided by a serrated line down the middle, and beset with minute tubercles inclosed in a circle; avenues ten, biporous, and extending to the mouth. A fossil species.

Semilunaris. Vent longitudinally oblong; mouth transverse and semilunar. Klein. Mus. *Echinus ovalis*, Tellin. *Spleet-mond*, Phelf.

Colour pale yellowish-ash. The species inhabits the Asiatic seas.

Scutiformis. Mouth pentangular; avenues ten, striated; larger spaces divided into plates, the pieces pentangular. Leske.

Native place unknown.

Galeaster.

Body usually convex above and flat beneath; base ovate and acute; vent and mouth beneath and opposite.

Scutatus. Convex, beneath flat; spaces tuberculated and alternately larger, the large ones divided by a serrated suture in the middle; mouth transversely kidney-shaped. Lhuyd. *Galea vertici scutata*, Klein. *Vyfblad*, Phelf.

Found in a fossil state in Britain.

Ovatus. Ovate, divided into plates of an hexangular form; crown naked; vent somewhat oval. Klein.

A fossil species. The shell is composed of twenty rows of plates, which are alternately larger and smaller, and all united by a serrated suture; mouth round and small; vent slightly oval.

Pustulosus. Spaces obsolete and tuberculated; avenues with raised dots disposed in pairs; crown impressed. Plott, &c.

Found in a fossil state in England and Germany.

Quadriradiatus. With four double rows of dots. Klein. *Echinites Niendorpiensis*, Moll. de lap.

Found in Germany in a fossil state.

Minor. Ovate, with a flat or concave base; spaces and avenues ten, the avenues biporous; mouth transverse, roundish; vent sub-oval. Leske.

A fossil species.

Dubius. Ovate, with ten porous avenues; half the vent marginal. Leske.

The five larger spaces are marked with impressed circles.

Found in a fossil state.

Clypeaster.

Body irregular, convex above, beneath subconcave; margin angularly sinuous; surface with a quinque-petalous mark of pores; mouth beneath, and central; vent beneath, and near the margin.

Rosaceus. Flattish, and roundish-oval; avenues five, oval, with a dotted surface. Linn. *Echinanthus humilis*, Klein. *Groot egel-rosaen slomp-blad*, Phelf.

Native of the Asiatic seas.

Altus. Crown elevated and orbicular; avenues broad, with convergent granulated tips. Walch, &c.

A fossil species.

Pentaphyllus.

Body irregular and ovate, above convex, beneath flat; margin entire; surface with a quinque-petalous mark of pores; mouth transverse; vent marginal.

Oviformis. Convex, beneath flat; avenues ten, biporous, and expanded in a stellated form; crown with four pores. Klein.

Found in a fossil state.

Orbiculatus. Granulated; avenues biporous, the pores united by a transverse impressed line, and the intermediate spaces divided by a serrated line in the middle; the rest of the surface quinque-partite. Leske. *Monostroites minor*, Mercat.

A species of the fossil kind, and perhaps not strictly of this genus.

Echinodiscus.

Body flat above and beneath; surface perforated with foramina, and a quinque-petalous mark of pores; mouth central; crown with four pores.

** Section. With sinuate Margin.*

Biforis. Base with five grooves, and ten flexuous radiated lines; near the vent two oblong foramina. Leske.

Native place unknown.

Pentaphorus. Avenues emarginate at the tip; vent near the mouth; with five foramina. Klein, &c. *Vyfbuizige egelkoek*, Phelf.

Colour above whitish-ash, tinged with reddish, beneath white and yellow, with blue veins; crown marked with a pentagonal star.

Hexaporus. Orbicular, with narrow avenues, and six narrow foramina near the vent. Seba, &c.

Inhabits the Indian, American, and South seas. The colour cinereous; crown umbilicated, base rather hollow.

Emarginatus. Sub-pentagonal, with ovate avenues; vent oval, more remote from the mouth, with six foramina close to the margin. Leske. *Loefwerk*, Phelf.

This is of an oval form, and somewhat heart-shaped; the length above four inches; the crown is petulous base rather flatter, and marked with deep flexuous ramose lines. The species inhabits the island of Bourbon, and is of a greenish-brown colour.

Auritus. Margin waved, the lower one rounded, the upper one nearly square, and twice divided, with an opening pore between every two of the avenues. Leske. *Geoorde slomp-bert*, Phelf.

Native of the Persian seas. Yellowish-grey, with the upper margin tawny; base flat, punctured, and marked with radiated striæ; vent oblong, and placed near the mouth.

Inauritus. Sub-cordate, and divided into plates, the pieces hexagonal; avenues five, oval, emarginate at the tip, the fifth longer, and a pore between every two of them. Leske. *Ongeoorde slomp-bert*, Phelf.

Inhabits Amboyna. Height five or six inches, and breadth the same; colour above reddish-ash, beneath violetred.

Tetraporus. Orbicular, slightly sinuous, and perforated each side with four foramina; vent circular. Seba, &c.

Colour pale yellow-grey. Native place unknown.

*** Section. With the Margin toothed or lobate.*

Decadactylos. Shell perforated with four oblong foramina; the margin with ten teeth. Leske.

Native place unknown. The shell is rough with granulations, above bluish-green, varied with cinereous; the avenues and sutures pale flesh-colour; base yellowish-flesh-colour, with ten impressed flexuous grooves, bifid at the tip, and greenish-ash; mouth rounded; vent ovate.

Octodactylos. Anterior part orbicular, and perforated with two foramina; posterior part with eight teeth; avenues lanceolate. Breyn, &c.

Whitish-ash, divided into convex plates; crown umbilicate; avenues emarginate. Country unknown.

Orbiculus. Fore-part orbicular and entire; hind-part unequally toothed; avenues lanceolate, cleft, and bent. Rumpf., &c.

Native of the Indian sea. This shell is flat, sub-orbicular, not perforated, and composed of hexangular pieces; the base flat, with impressed grooves; avenues oval; mouth rounded; vent oval.

Echinoglycus.

Body flat above and beneath, with entire surface, and quinque-petalous mark of pores; mouth central; crown with four pores.

Laganum. Avenues oval, finely striated and cleft at the tip; crown prominent; vent circular and near the margin. Leske. *Zeeraad*, Rumpf.

Found in a fossil state.

Subrotundus. Orbicular, with radiated avenues. Klein. Aldrov., &c.

A fossil species.

Reticulatus. Ovate, flattish, with five oval avenues; the surface reticulated. Rumpf. *Echinoglycus ovalis*, Phelf.

Native of the American and Indian ſeas.

Corollatus. Orbicular, with ſhort, oval, obtuſe avenues. Klein.

A mineralized ſpecies.

Echinocyamus.

Body uſually globular or oval, with ten avenues on the crown; rays on the ſurface biporous, ſtraight, and forming a ſtar of five rays; mouth and vent contiguous in the middle of the baſe

Nucleus. Surface globular, with an orbicular circumference; baſe narrow and flat in the middle; ſides grooved; avenues pulvinate; crown excentric. Klein, &c.

Yellowiſh-aſh; crown perforated with four pores; mouth circular; vent rather oblong, and ſmaller than the mouth. Native place of this and the two following unknown.

Centralis. Surface globular, circumference orbicular; baſe pulvinate; ſides very finely grooved; avenues ſlightly pulvinate; crown central.

Allied to the former; the mouth minute and orbicular.

Ervum. Surface globular, circumference ſomewhat oval; baſe a little narrowed; ſides furrowed; avenues ſomewhat pulvinate; crown central. Phelſ.

Craniolaris. Surface globular on the anterior part; poſterior nearly five-angled, pulvinate, and ſloping; circumference elliptic; baſe a little narrowed; ſides grooved; avenues pulvinate; crown excentric. Pallas, &c.

Native of India. The colour white, covered with granulations, ſurrounded by a hollow line; crown with four pores.

Turcicus. Surface and baſe pulvinate, circumference elliptic; ſides ſlightly grooved; avenues ſub-pulvinate; crown ſlightly depreſſed and central. Phelſ.

Vicia. Surface globular, circumference obtuſely oval; baſe a little narrowed; ſides grooved; avenues flattiſh; crown central. Phelſ.

Reſembles echinus craniolaris, and inhabits the Adriatic.

Ovulum. Surface pulvinate, circumference obtuſely oval; ſides ſlightly grooved; crown central. Leſke.

Lathyrus. Surface and baſe pulvinate; circumference oval; ſides ſlightly grooved; avenues pulvinate; crown nearly central. Phelſ.

Colour dull yellowiſh-grey.

Equinus. Surface and baſe pulvinate; circumference elliptic; ſides ſmooth; avenues ſub-pulvinate; crown central. Leſke.

Minutus. Surface pulvinate and nearly flat, circumference ovate and ſub-pentangular; baſe narrowed; ſides grooved; avenues pulvinate; crown central. Pallas, &c.

A ſmall ſpecies, found frequently on the ſandy coaſts of the Netherlands.

Faba. Surface and baſe pulvinate; circumference obtuſely oval; ſides hardly grooved; avenues flat; crown a little prominent and central. Phelſ.

Very ſmall, ochraceous, and granulate.

Inequalis. Surface gibbous on the fore-part, poſterior flat and ſloping; circumference oblong-oval and nearly pentangular; baſe globular and rather narrowed; ſides grooved; avenues ſub-pulvinate; crown central. Phelſ.

In this ſpecies the back is unequal.

Raninus. Surface globular, and more ſloping behind; circumference acutely oval; baſe globular; ſides grooved; avenues ſub-pulvinate; crown central. Phelſ.

Reſembles echinus minutus.

Bufonius. Surface globular; circumference ovate, heart-ſhaped, and ſub-triagonal; baſe pulvinate; ſides ſlightly grooved; avenues pulvinate; crown nearly central.

Much allied to the laſt.

Cassidulus.

Body elliptic or ſub cordiform; upper ſurface with a five rayed ſtar of pores; mouth ſub-central beneath; vent above, and near the margin.

Americanus. Body ſub-globoſe; circumference ſomewhat oval; crown with four pores. Boſc.

Inhabits American ſeas.

Spatangus.

Body cordiform or ovate; vent lateral.

*Section *. Heart ſhaped; the crown grooved.*

Cor Anguinum. Above convex, with five impreſſed quadrifariouſly porous avenues, and five ſpaces. Lhuyd, &c. *Pokhart*, Phelſ.

A foſſil ſpecies found in Britain.

Lacunosus. Ovate, gibbous, with five depreſſed avenues. Linn. *Spatangus lacunoſus*, Klein. *Groote holblad*, Phelſ.

Native of the Indian and European ſeas.

*Section **. Heart-ſhaped, the crown not grooved.*

Radiatus. Avenues four, with impreſſed ſtriæ, porous on each ſide; crown with four pores; ſpaces ten, divided by a ſerrated ſuture in the middle, and arched tranſverſe ſutures. Walch.

Found in a foſſil ſtate; the baſe is flat; mouth rather kidney-ſhaped, and ſurrounded with a ſub-pentagonal ſtar of pores; vent roundiſh.

Purpureus. Avenues four, petal-ſhaped and lanceolate; larger tubercles placed in a zig-zag manner; ſpines acicular, incurved, and white. Klein. *Dickblad*, Phelſ. *Pas de poulain*, Argenv. *Scolopendrites*, Aldr.

Native of the North ſeas. The back convex, ſides ſloping; anterior part with two projections; poſterior truncated; beneath flat; ſurface granulated, and covered with ſubclavate, and ſpatulate briſtly ſpines.

Pusillus. Oval, with five avenues; vent remote. Müll.

A minute ſpecies found in the North ſeas.

Complanatus. Rather flattened each ſide; ſpaces and avenues ten, two of which are placed in the furrows of the back. Klein.

This is of a roundiſh form, and is found in a foſſil ſtate.

Subglobosus. Both ends convex, ſub-globular, and divided into plates; avenues ten, with biporous ſtriæ; vent ovate. Laſt, &c.

Found in a foſſil ſtate in Britain; the ſhell is granulated, with four pores on the crown; ſpaces divided by a longitudinal ſerrated ſuture, and grooved with tranſverſe curved lines; mouth ſomewhat kidney-ſhaped, and ſurrounded with tubercles diſpoſed in a ſtellated form.

Ananchytis. Oblong; heart-ſhaped and ſub-conic; the baſe flatter; avenues and ſpaces ten; mouth rounded and ſurrounded with an elevated margin; vent oval and emarginate below. Klein.

A foſſil ſpecies.

Bicordatus. With a double crown. Leſke.

A rare ſpecies, found in a foſſil ſtate.

Carinatus. Middle of the back carinated. Bayer.

Reſembles the laſt, but is narrower behind; mouth kidney-ſhaped; vent obſolete. A foſſil kind.

*Section ***. Body ovate, the avenues grooved.*

SPATAGUS. Ovate, gibbous, with four depressed avenues. Linn.

Native of European seas. Many of the echini tribe are described by Gmelin as varieties of this species, but which are certainly distinct.

*Section ****. Ovate, the avenues not grooved.*

BRISSOIDES. Oblong; with four biporous ovate lanceolate avenues, united by transverse grooves, with larger tubercles placed archwise between them. Klein.

A fossil species.

TERES. Convex, with four biporous petal-shaped avenues not united. Klein.

Resembles the last, but has the mouth broader.

OLIVA. Above convex, punctured olive, with a double naked band reaching from the mouth to the vent. Leske. *Kleine egelnoot*, Phels.

Found in the recent state, the native country unknown; shell with four stellated rays above.

AMYGDALA. Resembling an almond in form. Klein.

Native place uncertain.

OVALIS. Divided into plates; with ten avenues and spaces; the latter divided by a serrated suture in the middle. Leske. *Egelschuitje twee top*, Phels.

A fossil species.

PYRIFORMIS. Ovate, and gibbous at one end, the base flat; avenues five, somewhat petal-shaped; and obsoletely porous. Klein.

Found in a fossil state.

LAPISCANCRI. Obtusely oval, convex; crown excentric, and perforated with four pores; avenues five, biporous, ovate-lanceolate, and cleft at the tip. Klein.

Found in the same state as the former. The base of this shell is flat and slightly excavated.

PATILLARIS. Very much depressed, with avenues resembling a star. Klein.

Circumference ovate; back slightly convex; base rather excavated; sides granulated; mouth orbicular.

A fossil species.

ECHINARACHNIUS.

Body circular; mouth central; vent lateral and square.

PLACENTA. Sub-conic, with ten spaces alternately narrower; avenues five, lax, flat, and gaping at the tip. Breyn.

Native of the Southern ocean. Shell a little convex and conoid, the circumference somewhat angular; the base flat; spaces divided by an obtusely-toothed vertical line; vent placed on the surface, and nearly marginal.

ECHIOIDES, in *Botany*. See LYCOPSIS and MYOSOTIS.

ECHIQUETTE, in *Heraldry*. See CHECKY.

ECHIRE, in *Geography*, a town of France, in the department of the Two Sevres, and district of Niort; four miles N. of Niort.

ECHITES, in *Botany*, was so named by Browne, in his Natural History of Jamaica, from ἔχις, a *serpent* or *viper*, as professor Martyn presumes, on account of its deleterious quality. Perhaps its smooth twining habit may have confirmed the idea. Linn. Gen. 117. Schreb. 164. Willd. Sp. Pl. v. 1. 1237. Juss. 146. Browne Jam. 182. Class and order, *Pentandria Monogynia*. Nat. Ord. *Contortæ*, Linn. *Apocineæ*, Juss.

Gen. Ch. *Cal.* Perianth small, deeply five-cleft, acute. *Cor.* of one petal, funnel-shaped, pervious; limb five-cleft, flat, widely spreading. Nectary five glands placed round the germens. *Stam.* Filaments five, slender, erect; anthers rigid, oblong, pointed, converging. *Pist.* Germens two; style single, thread-shaped, the length of the stamens; stigma oblong-capitate, two-lobed, connected with the anthers by a viscid juice. *Peric.* Follicles two, very long, each of one cell and one valve. *Seeds* numerous, imbricated, crowned with long down, and affixed to a linear receptacle.

Ess. Ch. Corolla contorted, funnel shaped, with a naked orifice. Follicles two, elongated, straight. Seeds with a hairy crown.

Browne founded this genus upon a single species, E. *umbellata* of Linnæus, Jacq. Amer. t. 22, which Linnæus was at first inclined to reduce to *Tabernæmontana*. Jacquin, however, confirmed the genus *Echites*, and enlarged it with nine more species. Swartz discovered several others, so that with the addition of a few from the Cape and the East Indies, Willdenow enumerates twenty-two. These are not all perhaps correctly of the same natural genus, at least no one botanist has sufficiently compared them together, to determine this point; but on the other hand, their number is to be augmented by some fine non-descript plants of this genus from Sierra Leone.

The habit of *Echites* is climbing, and for the most part smooth; the leaves opposite, stalked, simple, undivided, entire, shining, with parallel veins interbranching at their extremities. Flowers generally axillary, clustered or umbellate, yellow, white or greenish, rarely red, almost universally, according to Jacquin, without scent. The shape and proportions of the corolla are very different in different species. The seed-vessels are remarkably long and slender. The plants abound with acrid milky juice. Being mostly natives of very hot climates, they have scarcely been introduced, with any success, even into our stoves, though many of them seem highly ornamental.

ECHIUM, supposed to be the ἐχιον of Dioscorides, and to have been so called from ἔχις, a *viper*, either because it cured the bite of that serpent, or because the seeds were shaped like its head. It is not improbable that the mucilaginous juices of this whole family of plants might act like olive oil in allaying the poison of a viper's bite, if applied to the wound. Viper's Bugloss. Linn Gen. 78. Schreb. 103. Willd. Sp. Pl. v. 1. 781. Sm. Fl. Brit. 221. Juss. 130. Gærtn. t. 67. Tourn. t. 54. Class and order, *Pentandria Monogynia*. Nat. Ord. *Asperifoliæ*, Linn. *Borragineæ*, Juss.

Gen. Ch. *Cal.* Perianth in five deep awl-shaped segments, erect, permanent. *Cor.* of one petal, bell-shaped; tube very short; limb erect, gradually dilated, five-cleft, obtuse; its segments more or less unequal; the two uppermost longest, the lower one smallest, acute, reflexed; orifice pervious. *Stam.* Filaments five, awl-shaped, about the length of the corolla, declining, unequal; anthers oblong, incumbent. *Pist.* Germens four; style thread-shaped, the length of the stamens; stigma obtuse, deeply cloven. *Peric.* none, the hardened calyx protecting the seeds. *Seeds* four, roundish, obliquely pointed.

Obs. In E. *lævigatum*, *italicum*, and *grandiflorum*, the corolla is almost regular.

Ess. Ch. Seeds four, naked. Corolla of one petal, irregular, pervious, and naked. Stigma deeply cloven.

About 30 species of *Echium* are described by authors, Willdenow has 26, all natives of Europe or Africa. Their herbage is clothed with thick-set, rigid bristles, often originating from, or intermixed with, curiously formed callous tubercles, and in some of the more shrubby kinds, natives of

of a warm climate, so fine and slender as to be almost silky. The flowers are commonly pink in the bud, blue when expanded, and thence not inelegant; in some they are always red, and in others white. E. *vulgare*, Engl. Bot. t. 181, common with us in dry chalky fields, or waste places, a well-known species, makes a gay appearance in the open country of Cambridgeshire. E. *grandiflorum*, Andr. Repos. t. 20, native of the Cape of Good Hope, is perhaps the most handsome of all, being shrubby, with green bristly leaves, and large tubular scarlet flowers. This is with us a tender green-house plant, scarcely perfecting its seeds, and with difficulty increased by cuttings. In a conservatory it soon becomes straggling, naked, and unsightly.

E. *giganteum*, Linn. Suppl. 131, bears huge dense clusters of innumerable white flowers, and is sometimes seen in our green-houses. Mr. Masson brought it from Teneriffe. The three following new species, discovered in his tour to Greece, by the late Dr. Sibthorp, are as such defined in the Prod. Fl. Græc. v. 1. 125, though not perhaps to be met with in Greece itself.

E. *pustulatum*, leaves linear-oblong, waved, tuberculated, bristly. Stem erect. Spikes lateral. Stamens prominent. Native of Sicily. Biennial.

E. *hispidum*, leaves linear-oblong, bristly, somewhat tuberculated. Stem erect, very hairy. Spikes lateral. Stamens prominent. Native of the country near Naples. Biennial.

E. *diffusum*, leaves linear-spatulate, tuberculated, bristly. Stem diffuse. Spikes terminal, solitary. Stamens concealed. Native of Crete. Annual. These two last have scarlet flowers.

ECHIUS, or ECKIUS, JOHN, in *Biography*, was born in Suabia in the year 1486. When he had attained to a proper age, he embraced the ecclesiastical life, and was appointed professor of theology in the university of Ingolstadt. He became celebrated for the part that he took in the public disputes, concerning the reformation, against Luther, Carlostadt, and Melancthon. He began his contests with Luther, on the subject of the propositions against indulgences, and was the means of exciting a great degree of attention to the controversies that were then dying away, but which he rekindled to the injury of the power assumed by the Roman pontiffs. He next challenged Carlostadt to public disputations on the subject of the freedom of the human will, and defied Luther himself to enter the lists with him, while he defended the authority and supremacy of the pope. The disputations were carried on at Leipsic, in the year 1519, before a numerous and highly respectable audience; they were conducted with great skill by all parties, but Echius, who had been the challenger, was generally deemed the vanquished party. His opponents, not satisfied with the mere victory, pursued the blow which they had given to the credit and authority of the pope. Echius could not bear the idea of being thrown in the back ground: his haughty spirit urged to seek for vengeance; but his zeal and fury were fatal to the cause which he espoused, and the doctrines of Luther obtained a rapid progress in Germany. Echius was next employed with Faber and others to draw up a confutation of the famous confession of Augsburg, which, by command of the emperor Charles V., was laid before the diet assembled at that city, and the unlimited submission of the protestants required to the doctrines and opinions contained in it. This confutation was very ably answered by Melancthon, in a work, entitled "The Defence of the Confession of Augsburg." During the rest of his life, Echius was a principal in all the disputes between the catholics and protestants, and was zealous as a writer, as well as a disputant, against the protestants. He died at Ingolstadt in 1543, in his 58th year. He was regarded as one of the most learned and able defenders of the pretensions and opinions of the church of Rome. He was author of two treatises, "On the Sacrifice of the Mass," "A Commentary on the Prophet Haggai," "Homilies," in four volumes, and a great number of controversial tracts. Moreri. Mosheim.

ECHO, in *Architecture*, is applied to certain vaults, and arches, most commonly of elliptical or parabolical figures; used to redouble sounds, and produce artificial echoes.

The method of making an artificial echo is taught by the Jesuit Blancani, in his Echometria, at the end of his book on the sphere.

Vitruvius tell us, that in divers parts of Greece and Italy there were brazen vessels, artfully arranged under the seats of the theatres, to render the sound of the actors' voices more clear, and make a kind of echo; by which means of the prodigious multitude of persons present at those spectacles, every body might hear with ease and pleasure.

ECHO, in *Geography*, a town of Spain, in the kingdom of Aragon; 13 miles N.N.W. of Jaca.

ECHO, in *Music*, pieces composed in imitation of echoes. Sometimes also the word echo stands for piano, intimating that the instrument, or voice, is to play, or sing, after a soft and sweet manner. Organs and harpsichords have what they call an echo stop.

ECHO, (from the Greek ἠχὼ, *sound*, of the verb ἠχέω, *I sound*,) in *Natural Philosophy*, is a reflected sound; for sounds are reflected by bodies of certain configurations, somewhat like the reflection of light from polished surfaces; so that if a person, situated before one of those bodies, and at some distance from it, utters a word, he will, a short time after, hear the echo; that is, the repetition of that word, as if another person mocked him.

The ancient philosophers, who were entirely unacquainted with the true nature of the echo, ascribed it to several causes, which are too absurd to deserve any notice in this place. The poets supposed it to have been once a nymph, who pined into a sound for love of Narcissus. The modern state of philosophical knowledge, established upon experience, and upon unerring calculation, shews, that sound, or that vibratory motion of the air which constitutes a sound, is reflected by hard solids, and, in certain cases, even by fluids. Thus, the sides of a hill, houses, rocks, banks of earth, the large trunks of trees, the surface of water, especially at the bottom of a well, and sometimes even the clouds, have been found capable of reflecting sounds. The configuration of the surface of these bodies is much more concerned in the production of the echo than their substance. A smooth surface reflects sounds much better than a rough one. A convex surface is a very bad reflector of sound; a flat one reflects very well; but a small degree of concavity, and especially when the sounding body is in the centre, or focus, of the concavity, renders that surface a much better reflector, and the echo is heard considerably louder. Thus, in an elliptical chamber, if the sounding body be placed in a focus of the ellipsis, that sound will be heard much louder by a person situated in the other focus of that ellipsis, than in any other part of the chamber. In this case, the effect is so powerful, that even when the middle part of the chamber is wanting; *viz.* when the two narrow opposite elliptical shells only exist, the sound expressed in one focus will be heard by a person situated in the other focus, but hardly at all by those who stand in the intermediate space.

Without attempting to explain the manner in which the vibrating air impinges upon, and is sent back by the reflecting body, which has not as yet been thoroughly investi-

gated; the facts which have been afcertained are as follow:

If a perfon, ftanding before a high wall, a bank, a rock, &c. at a certain diftance, and uttering a word, with a pretty ftrong voice, or, in fhort, producing a found with a hammer, or ftone, &c. hears a repetition of that word, or found; he will find that the time elapfed between his uttering the word, and hearing the echo, is equal to that time which a found is known to employ in going through an extenfion equal to twice the diftance between him and the reflecting wall, or rock, &c.; for the vibratory motion of the air muft proceed from the founding perfon to the wall, or rock, and back again from the latter to the former. Now, found is known to travel equally at the rate of 1142 feet *per* fecond; therefore, if the perfon that expreffes the word, or any found whatever, ftands at the diftance of 1142 feet from the echoing-wall, then two feconds of time muft elapfe between his uttering the found and his hearing the echo of it. If the diftance be equal to 4568 feet, then eight feconds of time muft elapfe between the uttering of the found and the arrival of the echo, and fo on. But the fame original found, and the repetition of it, *viz.* the echo, may be heard by other perfons fituated at different diftances, both from the original founding place, and from the reflecting body. The effect, however, will not be exactly alike; *viz.* thofe who are nearer to the reflecting body will hear the echo fooner than other perfons; thofe who are farther off, will hear it later; and a fituation is eafily found, from which they will hear both the original found and the echo at the fame time; in which cafe they will perceive, as it were, one found, but louder than they would without the echo.

But though feveral perfons, in different fituations, will hear the echo, or repetition, of the fame found; yet, in a particular direction, the echo may be heard much better than in any other direction. Now, if two ftraight lines be drawn from the centre, or middle, of the reflecting furface, one to the place from which the original found proceeds, and the other in the above-mentioned beft direction; thofe two lines will be found to make equal angles with, or to be equally inclined to, that furface. Hence, it appears, *that, in the reflection of found, the angle of incidence is equal to the angle of refraction.* Therefore, if a perfon wifhes to hear the echo of his own voice in the beft manner poffible, he muft ftand in a direction perpendicular to the reflecting furface. And this fhews, that though found proceeds from an original founding body, or from a reflecting furface, in every direction; yet a greater quantity of it proceeds in fome particular direction than in any other, which is probably owing to the original impulfe being given to the air more forcibly in one direction than in any other, as alfo to the want of perfect freedom in the motion of the aerial fluid.

Several phenomena may be eafily explained upon the above-mentioned property of found. Thus, for inftance, feveral reflecting furfaces frequently are fo properly fituated with refpect to diftance and direction, that a found proceeding from a certain point is reflected by one furface firft, then by a fecond, foon after by a third, and fo forth; but by all in one direction; in which cafe, a multiple, or manifold, or tautological echo is produced; *viz.* the fame word is heard repeated feveral times fucceffively in the fame tone and accent; the expreffion of one *ha* will appear like a laughter; a mufical inftrument, properly played, will produce an agreeable repetition, as if many inftruments of the fame fort imitated each other.

According to the various diftances from the fpeaker, a reflecting object will return the echo of feveral, or of a few fyllables, for all the fyllables muft be uttered before the echo of the firft fyllable reaches the ear, otherwife it will make a confufion. In a moderate way of fpeaking, about three and a half fyllables are pronounced in one fecond, or feven fyllables in two feconds. From the computation of fhort-hand writers, it appears, that a ready and rapid orator, in the Englifh language, pronounces from 7000 to 7500 words in an hour; *viz.* about 120 words in a minute, or two words in each fecond. (Memoirs of Gibbon's Life.) Therefore, when an echo repeats feven fyllables, the reflecting object is 1142 feet diftant; for, fince found travels at the rate of 1142 feet *per* fecond; the diftance from the fpeaker to the reflecting object, and again from the latter to the former, is twice 1142 feet. When the echo returns 14 fyllables, the reflecting object muft be 2284 feet diftant, and fo on. A famous echo is faid to be in Woodftock park, near Oxford. It repeats 17 fyllables in the day time, and 20 at night, when the air being fomewhat denfer, the found does not travel quite fo faft. (Dr. Plot's Nat. Hift. of Oxordfhire.) Another remarkable echo is faid to be on the north fide of Shipley church, in Suffex. In favourable circumftances it repeats, diftinctly, 21 fyllables. Harris's Lex. Tech. Art. ECHO.

Therefore, the farther the reflecting object is, the greater number of fyllables the echo will repeat; but the found will be enfebled nearly in the fame proportion, and, at laft, the fyllables cannot be heard diftinctly. When the reflecting object is too near, the repetition of the found arrives at the ear, whilft the perception of the original found ftill continues, in which cafe, an indiftinct refounding noife is heard. This effect may be frequently obferved in empty rooms, paffages, &c. efpecially, becaufe in fuch places, feveral reflections from the walls to the hearer, as alfo from one wall to the other, and then to the hearer, clafh with each other, and increafe the indiftinctnefs.

From what has been faid above, it will be eafily conceived, that, with refpect to echoes, a vaft variety of effects may be produced, by varying the form, the fhape, the diftance, and the number of reflecting furfaces; and hence we hear of various furprifing echoes being met with at different places. At Rofneach, near Glafgow, in Scotland, there is an echo that repeats a tune played with a trumpet three times, completely and diftinctly. (Birch's Hift. of the Royal Society, vol. i. p. 137.) At the fepulchre of Metella, wife of Craffus, there was an echo which repeated a fentence five times. A tower is faid to have exifted at Cyzicus, where an echo repeated feven times. And there is an echo at Bruffels which repeats fifteen times.

Barthius, in his Notes on Statius's Thebais, lib. vi. ver. 30, mentions a very extraordinary echo, and, perhaps, too extraordinary to be entirely believed; however, he affures the reader, that this echo not only repeated words feventeen times, but different from common echoes, where the repetition is not heard till fome time after hearing the word fpoke; in this, the perfon who fpeaks, or fings, is fcarcely heard at all; but the repetition is heard very clearly, and always in furprifing varieties; the echo feeming fometimes to approach nearer, and fometimes to be farther off. Sometimes the voice is heard very diftinctly, and fometimes fcarcely at all. One perfon hears only one voice, and another feveral; one hears the echo on the right, and the other on the left, &c.

Addifon, and other travellers into Italy, mention an extraordinary echo in that country, at Simonetta palace, near Milan. It will return the found of a piftol fifty-fix times, even though the air be very foggy. The echo is heard behind the houfe, which has two wings; the piftol is difcharged from

from a window in one of those wings; the sound is returned from a dead wall in the other wing, and is heard from a window in the back-front. Addis. Trav. edit. 1718, p. 32. Phil. Transf. N° 480. p. 220.

Several authors, who treat of echoes, have used a few peculiar words, which are not in common use, therefore we deem it proper to mention those words and their meanings in this place. That department of philosophy which treats of sound, is called *acoustics*; and this is divided into branches; one of which is called *catacoustics*, and treats of reflected sound, such as the echo, and the effects of the whispering domes, galleries, &c. which also depend upon the reflection of sound. (See WHISPERING GALLERIES.) The word *echo* has sometimes been used for denoting the place itself where the repetition of the sound is produced, or heard. In echoes, the sounding point, or place where the person stands who utters the words, &c. has been called the *centrum phonicum*, and the object, rock, or place, that reflects the sound, has been called the *centrum phonocamptticum*.

ECHO, in *Poetry*, denotes a kind of composition, wherein the last words or syllables of each verse, contain some meaning, which being repeated apart, answers to some question, or other matter contained in the verse.

Such is that famous echo of Erasmus, "Decem annos consumpsi in legendo Cicerone—one," *i. e.* ass, asine.

The first echo in verse, according to Pasquier, is that in the Sylvæ of Johannes Secundus: but Pasquier is mistaken; for the ancient Greek and Latin poets have wrote echoes. This Martial intimates plainly enough; when, laughing at some sorts of baubles, he says, there is nothing like them among his poems. "Nusquam Græcula quod recantat echo:" by which, on the one side, he shews there were Latin poets, in his time, who made echoes, and, on the other, that the invention came from the Greeks.

Aristophanes, in his comedy entitled Θεσμοφοριαζουσαι, introduces Euripides in the person of Echo: and Callimachus, in the epigram, Εκβαιρω το ποιημα το κυκλικον, seems to have intended a kind of echo.

There is a humorous specimen of this kind of poetry in Hudibras.

ECHOMETER, in *Music*, a rule, or graduated scale divided into many parts for the purpose of measuring the length or duration of sounds, determining their different value, and even the ratios of their intervals. The word is derived from the Greek ηχος, *sound*, and μετρον, *measure*. We shall not attempt to describe this machine, as it is never used, and there is no good echometer. Those who wish for more information on the subject, will find it in the Mem. de l'Acad. des Inf. for 1701. M. Sauveur suggested the invention.

ECHOS, Ηχος, *a sound*, in *Physic*. In Hippocrates, this frequently imports what the Latins call *tinnitus aurium*, and the English a ringing of the ears; a symptom very frequent in acute distempers.

ECHPHYAS, from εκ and φυω, *I produce*, an excrescence, or appendix, a word used by many of the ancient writers in medicine. The appendicula vermiformis is thus called by many authors.

ECHTERNACH, in *Geography*, a small town of France, in the department of Forêts, chief place of a canton, in the district of Bilsbourg, with a population of 2736 individuals. The canton contains 17 communes, and 10,477 inhabitants, on a territorial extent of 250 kiliometres.

ECHTHELYNSIS, from εκθηλυνω, of θηλυς, *feminine*, *I render effeminate*, a term used by the ancient physicians for a laxness, or flabby softness of the flesh of the legs, or any other part of the body. Some have also used the word to express a fault in bandages, when too loose.

ECHTRUS, in *Botany*, from εχθρος, *hateful*, or *inimical*. Loureir. Cochinch. 344. Class and order, *Polyandria Monogynia*. A genus founded by Loureiro, but which from his description is evidently nothing else than *Argemone mexicana* of Linnæus. He mentions it as common every where by the way sides in Bengal and the coast of Coromandel, and he applied the above name on account of the innumerable thorns with which the plant is armed.

ECIJA, or EXIJA, in *Geography*, a town of Spain, in the kingdom of Seville, delightfully situated on the banks of the Xenil, eight leagues from Cordova. It has pleasant walks, serving like those of the great cities of Spain, for an evening resort. It contains 28,176 inhabitants, and has six parish churches, eight chapels, 20 convents, and six hospitals. The churches, built entirely of brick, are fitted up in the old taste, and crowded with pillars, which are loaded with preposterous ornaments, and covered with gold. The most extravagant of all is the church of "Nuestra Senora del Rosario," in the convent of the Dominicans, which may serve as a model for the perfection of vitiated taste. The "Plaza Mayor" is a fine object, very spacious and much to be admired for its balconies, occupying the whole front of the houses. The rent of land in the vicinity of this town is high, being commonly two bushels of wheat and one of barley, for every bushel of their seed; or if the rent be paid in money by the occupiers, it is not delivered immediately to the land-owner, but as under-tenants to rich land-jobbers, from whom no moderation can be expected. Inclosed farms let at a much higher rate than those that are open, because the latter are liable to be fed by the Merino sheep; whereas, if they should enter the former, one-fifth of the number trespassing would be forfeited. Hence arise various contentions, which frequently terminate in murders. Wool and hemp are the chief riches of this place. N. lat. 37° 53'. Long. 11° 43' E. of Peak of Teneriffe. Townshend's Spain. vol. ii.

ECKARD, in *Biography*, a harpsichord-player of great abilities, though little known, except in private, by connoisseurs. There are many great German musicians, dispersed throughout Europe, whose merit is little known in England, or even in their native land; among these is Eckard, who has been 50 years at Paris. We never heard him perform; but his compositions manifest great skill, refinement, and knowledge of his instrument. He is said, but erroneously, to have been one of the first, who, after the manner of the celebrated Alberti, introduced in France a perpetual base in batteries of semiquavers; but Jerig. Edelman, and Balbastre, long before Eckard arrived at Paris, had tired all ears with the abuse of this easy expedient.

The treble part of Alberti's sonatas is so elegant, and so much the melody of songs of the first class, as to make ample amends for the want of variety in the base.

This admirable dilettante (Alberti) who sung as well as played in an exquisite taste, finding that the tones of the harpsichord were too transient to sustain vocal passages, and to interest an audience through a whole movement, has given a spirited base, which keeps the tone alive, without calling off the attention from the treble, or disturbing that unity of melody, which Rousseau so strongly recommends, and we believe, in a great measure, formed his precepts upon the examples. Alberti was a Venetian gentleman, extremely admired for his compositions and performance, during the time that Rousseau was resident in that city as secretary to the French ambassador. Now, M. Eckard was in want of no such model; he had resources of his own, which, in extempore playing, could amuse and charm the most fastidious judges for several hours together; and in the lessons which we have seen of his composition, there is an elegance of

style

ſtyle built upon ſuch ſound principles of harmony and modulation as few have ſurpaſſed. His variations to the Minuet d'Exaudit, or, as we call it, Marſhal Saxe's minuet, are in the higheſt degree, ingenious, elegant, and fanciful.

ECKARDTSBERGA, in *Geography*, a ſmall town of the kingdom of Saxony, in the circle of Thuringia, with 1200 inhabitants and ſome manufactures, chiefly of worſted ſtockings and alum works. Of the ancient caſtle Eccardſburg, built in the year 998 by margrave Eccard, there are but two towers left, which are kept in repair, and ſerve as corn magazines.

ECKEREN, a ſmall town of France, in the department of the two Nethes, chief place of a canton, in the diſtrict of Anvers, or Antwerp, 27 miles S.W. of Breda, 24 miles S.E. of Bergopzoom, and ſix miles N. of Antwerp, with a population of 2826 individuals. It is remarkable for the battle which was fought in its neighbourhood in 1703, between the allies and the French. The canton has an extent of 170 kiliometres, and contains 10 communes, with 10,764 inhabitants.

ECKERNFORDE, or ECKELNFÖHRDE, a ſmall but neat town of Denmark, in the duchy of Sleſwick, diſtrict of Hutten, ſituated on the Baltic, with a commodious harbour, 15 miles S.E. of Sleſwick. It is remarkable for being the place where the famous count St. Germain, of life elixir notoriety, ended his days.

ECKERO, a ſmall iſland of Sweden, between the Baltic and the gulf of Finland, W. of the iſland of Aland.

ECLAMPSIA, or ECLAMPSIS, in *Medicine*, is nearly ſynonymous with *Epilepſy*, which ſee. The difference between the two diſeaſes, as ſtated by Sauvages, appears to be altogether hypothetical, and not to be aſcertained in practice. Eclampſia, he ſays, differs from epilepſy, in being an acute, febrile diſeaſe, ſometimes remittent, or abſolutely unceaſing *i. e.* not recurring by diſtant paroxyſms. Thus, under the head of eclampſia, are arranged the convulſions of puerperal women, thoſe occaſioned by wounds, by inanition, plethora, dentition, ſevere pain, fever, &c. Yet under the genus epilepſy, wounds, fever, ſevere pain, plethora, &c. are alſo mentioned as cauſes of the diſeaſe, and as ſerving to diſcriminate the different ſpecies. As the diſtinction, therefore, is not leſs uſeleſs in a practical view, than it is fanciful in noſology, we ſhall refer the whole to the article EPILEPSY.

The word eclampſia, probably from εκλαμπω, *effulgeo, I ſhine*, is uſed by Hippocrates and Galen under different acceptations. The moſt obvious origin of its application to epilepſy, appears to ariſe from the ſparklings and flaſhes of light, which often precede the epileptic convulſion, in many individuals. But the two phyſicians of antiquity, juſt named, have alſo uſed the word to denote the higheſt degree of the paroxyſm of fever, immediately preceding the criſis, when the heat and violence of the ſymptoms are at the greateſt height.

ECLANUM, in *Ancient Geography*, a town of Italy, called *Æculanum* by Ptolemy. It is ſituated in the Campania, and now known under the name of "The Colony."

ECLARON, in *Geography*, a ſmall town of France, in the department of the Marne, ſituated on the river Blaiſe, 15 miles N.W. of Joinville.

ECLECTICS, ECLECTICI, a name given to ſome ancient philoſophers, who, without attaching themſelves to any particular ſect, formed the flattering deſign of ſelecting, from the doctrines of all former philoſophers, ſuch opinions as ſeemed to approach neareſt the truth, and combining them into one ſyſtem. But in executing this plan, they only piled up a ſhapeleſs and incoherent maſs, "rudis indigeſtaque moles," not unlike that chaos, which they admitted as an eſſential article in the ſcience of nature. They attempted, however, but without ſucceſs, to adorn and enrich the ſyſtem with fancies of their own.

Hence their denomination: which, in the original Greek, ſignifies, *that may be choſen*, or, *that chooſes*; of the verb, εκλεγω, *I chooſe*.

Laertius notes, that they were alſo, for the ſame reaſon, denominated *analogetici*; but that they call themſelves *philalethes*, *i. e.* lovers of truth.

The chief, or founder of the eclectici, was one Potamo, of Alexandria, who lived under Auguſtus and Tiberius, according to Suidas; but it is more probable, from the account of Laertius, that he commenced his undertaking about the cloſe of the ſecond century. This Platoniſt, weary of doubting of all things with the Sceptics and Pyrrhonians, formed the eclectic ſect; which Veſſius calls the eclective.

Towards the cloſe of the ſecond century a ſect aroſe in the Chriſtian church under the denomination of Eclectics, or modern Platonics. They profeſſed to make truth the only object of their inquiry, and to be ready to adopt, from all the different ſyſtems and ſects, ſuch tenets as they thought agreeable to it. However, they preferred Plato to the other philoſophers, and looked upon his opinions concerning God, the human ſoul, and things inviſible, as conformable to the ſpirit and genius of the Chriſtian doctrine. One of the principal patrons of this ſyſtem was Ammonius Sacca, who, about the beginning of the third century, laid the foundation of that ſect, afterwards diſtinguiſhed by the name of the new Platonics, in the Alexandrian ſchool. This philoſopher was born of Chriſtian parents, and educated in the Chriſtian faith, and probably never deſerted the outward profeſſion of this religion, though Porphyry maintains, in oppoſition to the teſtimony of Euſebius, that in maturer life he became a pagan; and Fabricius, who is followed by Dr. Lardner, alleges that there were two perſons of the ſame name, the one a heathen philoſopher, and the other a Chriſtian writer. Thoſe, who are deſirous of acquainting themſelves with the grounds of theſe oppoſite opinions, may conſult Fabricius's Bibl. Græc. lib. iv. cap. 26. p. 159. Lardner's Collection of Jewiſh and Heathen Teſtimonies, vol. iii. p. 195, &c. and Moſheim, De Rebus Chriſtianorum ante Conſt. Mag. p. 281, &c.

It was evidently the deſign of Ammonius to reconcile and unite all ſects, philoſophical and religious, and to inculcate a doctrine that ſhould comprehend all the Chriſtians not excepted, in one common profeſſion. For this purpoſe he maintained, that the great principles of all philoſophical and religious truth were to be found, equally in all ſects; that they differed from each other only in their method of expreſſing them, and in ſome opinions of little or no importance; and that, by a proper interpretation of their reſpective ſentiments, they might eaſily be united into one body. Accordingly, all the Gentile religions, and even the Chriſtian, were to be illuſtrated and explained by the principles of this univerſal philoſophy; and the fables of the prieſts were to be removed from paganiſm, and the comments and interpretations of the diſciples of Jeſus from Chriſtianity. In conformity to this plan he inſiſted, that all the religious ſyſtems of all nations ſhould be reſtored to their original purity, and reduced to their primitive ſtandard, *viz.* the ancient philoſophy of the Eaſt, preſerved uncorrupted by Plato; and he affirmed that this project was agreeable to the intentions of Jeſus Chriſt, whoſe ſole view, in deſcending upon earth, was to ſet bounds to the reigning ſuperſtition, to remove the errors that had blended themſelves with the religions of all nations, but not to aboliſh the

the ancient theology from which they were derived. He therefore adopted the doctrines which were received in Egypt concerning the universe, and the deity, considered as constituting one great *whole*, concerning the eternity of the world, the nature of souls, the empire of Providence, and the government of the world by dæmons. He also established a system of moral discipline, which allowed the people in general to live according to the laws of their country, and the dictates of nature, but required the wise to exalt their minds by contemplation, and to mortify the body, so that they might be capable of enjoying the presence and assistance of the dæmons, and of ascending after death to the presence of the Supreme Parent. In order to reconcile the popular religions, and particularly the Christian, with this new system, he made the whole history of the heathen gods an allegory, maintaining that they were only celestial ministers, intitled to an inferior kind of worship; and he acknowledged that Jesus Christ was an excellent man, and the friend of God, but alleged that it was not his design entirely to abolish the worship of dæmons, and that his only intention was to purify the ancient religion. This system, so plausible in its first rise, but so comprehensive and complying in its progress, has been the source of innumerable errors and corruptions in the Christian church. At its first establishment it is said to have had the approbation of Athenagoras, Pantænus, and Clemens the Alexandrian, and of all who had the care of the public school belonging to the Christians at Alexandria. It was afterwards adopted by Longinus, the celebrated author of the Treatise on the Sublime, Plotinus, who continued the school of Ammonius, and completed the eclectic system, Herennius, Origenes, a pagan and a different person from Origen, the celebrated Christian teacher, Amelius, a Tuscan, Porphyry, an inveterate enemy to Christianity, who succeeded Plotinus and taught his doctrines, Jamblichus the disciple of Porphyry, Sopater, Edesius, Eustathius, Eusebius of Mindus in Caria, Maximus of Ephesus, Priscus of Thesprotium, who accompanied the emperor Julian to Persia, Chrysanthius, the master of Julian, appointed by him high priest of Lydia, Julian the Apostate, Eunapius, a pupil of Chrysanthius, Hierocles, and many others, both Pagans and Christians.

Such as we have enumerated were the principal promoters of the Eclectic philosophy in Alexandria, and in various parts of Asia. After Greece became subject to Rome, its philosophers were dispersed; but by the favour of the Roman emperors, particularly Adrian and Marcus Aurelius Antonius, Athens, the ancient seat of wisdom, recovered, in some degree, its former honour. Adrian founded a library, and Aurelius erected magnificent schools, and established professors in rhetoric, and in the principal sects of philosophy. These schools were liberally endowed, and Athens was again distinguished by a numerous train of philosophers and scholars. These Athenian schools, though they suffered great injury, during the incursions of the Goths, at the close of the 4th century, survived that hazardous period, and continued to flourish till after the time of Justinian. It was not till the reign of Julian that the Alexandrian philosophy was publicly professed at Athens. After Chrysanthius, already mentioned, who was appointed preceptor in Athens by Julian, the next professor of this system was Plutarch, the son of Nestorius. He died about the year 435, and left the charge of his school to Syrian, an Alexandrian. Among the pupils of Syrian, his chief favourite was Proclus, and he was allowed to share with him the honours and profits of the Platonic chair. (See PROCLUS.) Upon the death of Proclus in the year 485, the eclectic school at Athens was continued by Marinus, a native of Sichem in Palestine, and a convert from the Samaritan to the Gentile religion. From him it was transferred to Isidorus, and by Isidorus, on his removal to Alexandria, it was committed to Zenodotus, a pupil of Proclus. The succession of the Platonic or Eclectic school in Alexandria terminated in Damascius, a native of Syria. Hypatia, a celebrated female, belonged also to this school, and maintained its honour. (See HYPATIA.) Besides the philosophers of the Alexandrian or Eclectic sect, who have been enumerated, and others of inferior note, there were many persons, who, though not philosophers by profession, espoused the doctrines of Platonism, as they were new modelled in this school. Among these there were several celebrated writers; particularly Macrobius, and Ammianus Marcellinus.

The Eclectic sect, as we have already seen, took its rise among the Egyptians, a people peculiarly addicted to superstition, among whom the art of divination is said to have originated. It was formed in Alexandria, a city colonised from many different nations, whose inhabitants brought with them their respective tenets both in religion and philosophy. From an attentive comparison of various circumstances, which we cannot recite in this place, it would appear, that the Eclectic method of philosophizing began at a period prior to the time of Christ. The dissensions produced by diversity of opinions in the Alexandrian schools, induced many to wish for a general coalition of sects. Potamo, as we have seen, first formed this project, and it was carried into execution by Ammonius and his followers. The philosophy of Plato, already united with that of Pythagoras, was made the basis of this new system; whence the sect was considered as a Platonic school, and its followers have been commonly distinguished by the appellation of the later Platonists. With the doctrines of Plato, they attempted to blend those of Aristotle. The Stoic system was also in the Eclectic school accommodated to the Platonic; and the moral writings of the followers of Zeno were explained upon the principles of Plato. The only sect with which the Alexandrian school could not agree, was that of Epicurus, whose mechanical principles of nature were contrary to the fundamental doctrines of Platonism.

The Platonic sect, we may observe, had leaned, from its first institution, towards enthusiasm. That part of their system, which these later Platonists had borrowed from the oriental philosophy, was wonderfully calculated to cherish the flights of a luxuriant fancy. But in order to mark more precisely some of the more striking features of the Eclectic sect, we may direct our attention to the arts, which the leaders of this sect employed to obstruct the progress of the Christian religion. By combining into one system all the important tenets, both theological and philosophical, which were at that time received, either in the Pagan or the Christian schools, they hoped to confirm the Heathens in their attachment to their old superstitions, and to reconcile the Christians to Paganism. With this view they endeavoured to conceal the absurdities of the ancient religion, by casting over its fables the veil of allegory, and thus representing them as founded upon important truths. The numerous train of heathen divinities they represented as emanations from the Supreme Deity, through whom he himself was worshipped. They attempted to incorporate with their own dogmas several of the peculiar doctrines received among Christians, and on many occasions imitated the language of the Christian fathers. In order to counteract the credit which Christianity derived from the exalted character of its founder, and the purity of manners that distinguished his followers, these philosophers inculcated and practised rigo-

rous abſtinence, and paſſed whole days and nights in contemplation and devotion. In order to ſubvert or diminiſh the authority which the Chriſtian religion derived from miracles, they pretended to a power of performing ſupernatural operations, and maintained, that the miracles of Chriſt were wrought by the ſame magical, or theurgic, powers which they themſelves poſſeſſed. Moreover, for ſupporting the credit of Paganiſm againſt that of Chriſtianity, they obtruded upon the world many ſpurious books, under the names of Hermes, Orpheus, and other illuſtrious ancients.

The Eclectic ſect, thus raiſed upon the foundations of ſuperſtition, enthuſiaſm, and impoſture, was the occaſion of much confuſion and miſchief both to the Chriſtian religion and to philoſophy. In the infancy of the Alexandrian ſchool, many Chriſtians were ſo far deluded by the pretenſions of this ſect, as to imagine that a coalition might be advantageouſly formed between its ſyſtem and that of Chriſtianity. The conſequence, however, was, that Pagan ideas and opinions were gradually blended with the pure and ſimple doctrine of the goſpel; the fanatical philoſophy of Ammonius corrupted the pure religion of Chriſt; and his church became a field of contention and a nurſery of error. A coalition of ſyſtems was no leſs injurious to philoſophy. For a further delineation of the Eclectic doctrine in metaphyſics, theology, and morals, we ſhall refer to the biographical articles *Plotinus*, *Jamblichus*, and *Porphyry*. See alſo PLATONISM and ALEXANDRIA. And for a more diffuſe detail, we refer to Brucker's Hiſt. of Philoſ. by Enfield, vol. ii. and Moſheim's Eccl. Hiſt. vol. i.

ECLECTICS were alſo a certain ſet of phyſicians among the ancients, of whom Archigenes, under Trajan, was the chief, who ſelected from the opinions of all the other ſects, that which appeared to them beſt, and moſt rational; hence they were called eclectics, and their preſcriptions medicina eclectica.

ECLEGMA, or ECLIGMA, Εκλειγμα, or *Eclectos*, in *Medicine*, a pectoral remedy, of the conſiſtence of a thick ſyrup; called, alſo, *lohoch*, *linctus*, and *lambative*. The word is Greek, formed of εκ, and λειχειν, *to lick*, becauſe the patient is to take it by licking it off the end of a liquorice ſtick dipt therein; in order that, being taken thus by little and little, it may remain the longer in the paſſage, and moiſten the breaſt the better.

There are eclegmas of the ſyrups of poppy, others of lentils, others of ſquills, &c. Their intention is to heal or eaſe the lungs, in coughs, peripneumonies, &c. They are uſually compoſed of oils, incorporated with ſyrups.

ECLIPSAREON, in *Aſtronomy*, is an inſtrument invented by Mr. Ferguſon for exhibiting the time, quantity, duration, and progreſs of ſolar eclipſes, at all parts of the earth. This machine conſiſts of a terreſtrial globe, A, (*Plate* X. *Aſtronomy*, *fig.* 74) turned, by a winch, M, round its axis B, inclining $23\frac{1}{2}°$, and carrying an index round the hour-circle D; a circular plate E, on which the months and days of the year are inſerted, and which ſupports the globe in ſuch a manner, that when the given day of the month is turned to the annual index G, the axis has the ſame poſition with the earth's axis at that time; a crooked wire F, which points to the middle of the earth's enlightened diſc, and ſhews to what place of the earth the ſun is vertical at any given time; a penumbra, or thin circular plate of braſs I, divided into 12 digits, by 12 concentric circles, and ſo proportioned to the ſize of the globe, that its ſhadow, formed by the ſun, or a candle, placed at a convenient diſtance, with its rays tranſmitted through a convex lens, to make them fall parallel on the globe, may cover thoſe parts of the globe, which the ſhadow and penumbra of the moon cover on the earth; an upright frame H H H H, on the ſides of which are ſcales of the moon's latitude, with two ſliders K and K fitted to them by means of which the centre of the penumbra may be always adjuſted to the moon's latitude; a ſolar horizon C, dividing the enlightened from the darkened hemiſphere, and ſhewing the places where the general eclipſe begins and ends with the riſing or ſetting ſun; and a handle M, which turns the globe round its axis by wheel work, and moves the penumbra acroſs the frames by threads over the pulleys L, L, L, with a velocity duly proportioned to that of the moon's ſhadow over the earth, as the earth turns round its axis.

If the moon's latitude at any conjunction exceeds the number of diviſions on the ſcales, there can be no eclipſe; if not, the ſun will be eclipſed to ſome parts of the earth; the appearances of which may be repreſented by the machine, either with the light of the ſun, or of a candle. For this purpoſe, let the indexes of the ſliders K, K, point to the moon's latitude, the plate E be turned till the day of the given new moon comes to G. and the penumbra be moved till its centre comes to the perpendicular thread in the middle of the frame, which thread repreſents the axis of the ecliptic; then turn the handle till the meridian of London on the globe comes under the point of the wire F, and turn the hour circle D, till XII at noon comes to its index; and turn the handle till the hour index points to the time of new moon in the circle D, and then ſcrew faſt the collar N. Laſtly, elevate the machine, till the ſun ſhines through the ſight-holes in the ſmall upright plates O, O, on the pedeſtal; or, place a candle before the machine, at the diſtance of about four yards, ſo that the ſhadow of the interſection of the croſs thread in the middle of the frame may fall preciſely on that part of the globe to which the wire F points; with a pair of compaſſes take the diſtance between the centre of the penumbra, and the interſection of the threads, and ſet the candle higher or lower, according to that diſtance; and place a large convex lens between the machine and candle, ſo that the candle may be in the focus of the lens; and thus the machine is rectified for uſe.

Let the candle be turned backward till the penumbra almoſt touches the ſide H F of the frame, and then, turning it forward, the following phenomena may be obſerved. 1. Where the eaſtern edge of the ſhadow of the penumbral plate, I, firſt touches the globe at the ſolar horizon, thoſe who inhabit the correſponding part of the earth ſee the eclipſe begin on the uppermoſt edge of the ſun, juſt at the time of its riſing. 2. In that place where the penumbra's centre firſt touches the globe, the inhabitants have the ſun riſing upon them centrally eclipſed. 3. When the whole penumbra juſt falls upon the globe, its weſtern edge at the ſolar horizon touches and leaves the place where the eclipſe ends at ſun-riſe on his lowermoſt edge. 4. By continued turning, the croſs lines in the centre of the penumbra will go over all thoſe places on the globe where the ſun is centrally eclipſed. 5. When the eaſtern edge of the ſhadow touches any place of the globe, the eclipſe begins there; when the vertical line in the penumbra comes to any place, then is the greateſt obſcuration at that place; and when the weſtern edge of the penumbra leaves the place, the eclipſe ends there, and the times are ſhewn on the hour-circle; and from the beginning to the end, the ſhadows of the concentric penumbral circles ſhew the number of digits eclipſed at all the intermediate times. 6. When the eaſtern edge of the penumbra leaves the globe at the ſolar horizon C, the inhabitants ſee the ſun beginning to be eclipſed on its lowermoſt edge at its ſetting. 7. Where the penumbra's centre leaves the globe, the inhabitants ſee the ſun

ſun centrally eclipſed; and laſtly, where the penumbra is wholly departing from the globe, the inhabitants ſee the eclipſe ending on the uppermoſt part of the ſun's edge, at the time of its diſappearing in the horizon.

This inſtrument will likewiſe ſerve for exhibiting the times of ſun-riſing and ſetting, and of morning and evening twilight, as well as the places to which the ſun is vertical on any day, by ſetting the day on the plate E to the index G, turning the handle till the meridian of the place comes under the point of the crooked wire F, and bringing XII on the hour-circle D to the index: then if the globe be turned, till the place touches the eaſtern edge of the horizon C, the index ſhews the time of ſun-ſetting; and when the place comes out from below the other edge of C, the index ſhews the time when evening twilight ends; and morning twilight and ſun-riſing are ſhewn in the ſame manner on the other ſide of the globe. And the places under the point of the wire F are thoſe to which the ſun paſſes vertically on that day. Ferguſon's Aſtronomy, p. 298, &c. 4to. edit. or Phil. Tranſ. vol. xlviii. p. 520.

ECLIPSE, in *Aſtronomy*, the diſappearance of a heavenly body, cauſed either by the interpoſition of an opake body between it and the obſerver, or by the loſs of the reflected light of the ſun.

To the firſt claſs belong ſolar eclipſes, and occultations of the fixed ſtars by the moon or planets; to the ſecond, lunar eclipſes, and eclipſes of the ſatellites of Jupiter.

The phenomena of eclipſes, conſidered with a view to illuſtrate the general principles of the ſcience, are very unimportant: they are merely accidental occurrences, totally unconnected with any theory, and add but little to our knowledge of the great mechaniſm of nature. But they are of conſiderable practical utility: they ſerve to correct and increaſe the perfection of our ſolar and lunar tables; and they are highly uſeful to geography, becauſe they afford a ſure and accurate method of determining the relative ſituation of the diſtant parts of the globe.

Such is the ſtate of the ſcience of aſtronomy at preſent, that it is not by being able previouſly to announce all the circumſtances that will attend theſe phenomena, that the purpoſe of general utility is promoted; but the obſerving them with accuracy when they do occur, and applying the reſults correctly to future inveſtigation. But as the public ſtill take ſome intereſt in theſe predictions, and conſider them as a kind of teſt of the proficiency of the ſcience, the doctrine of eclipſes continues to form a very important part of every treatiſe of aſtronomy. It is impoſſible to produce a ſtronger inſtance of the ultimate triumph of truth over error and ſuperſtition, than the view we are at preſent permitted to take of the ſubject of our preſent inveſtigation.

The time has not always been when an eclipſe was conſidered only as a ſubject of calculation for an aſtronomer, and an object but of ſlight curioſity even to the public. It was an event that once poſſeſſed a great ſhare in the general intereſts of the moral world. It would be but a melancholy taſk to dwell on the hiſtory of ignorance and ſuperſtition. If there are few inſtances in which it has been more profound than in the opinions that have been entertained relative to eclipſes, it muſt be allowed that no ſuperſtition was ever more excuſable in its origin, or more innocent in its effects.

Aſtronomers more eſpecially ſhould regard theſe errors with indulgence, ſince the ſcience is indebted to them for its earlieſt foundation. In all the early nations of antiquity, the ſcience ſeems originally to have been cultivated only with a view of predicting theſe phenomena.

That knowledge of cauſe and effect, which teaches us to aſſign the various occurrences of the moral and phyſical world to their appropriate claſſes, can only be obtained by the long and refined civilization of many ſucceſſive ages.

Should we be ſurpriſed then to find that, in the infant ſtate of the world, moral and phyſical events ſhould have been improperly aſſociated together? Rather let us admire the ſucceſſful ſtruggles that the human race have gradually made to emancipate themſelves from error; and, by comparing the little that remains with that which once exiſted, indulge the hope that even that little will in time yield to the ſuperior power of truth and reaſon.

Aſtronomy bears the ſame relation to aſtrology that chemiſtry does to alchemy: it is the wiſe offſpring of a fooliſh parent. The early aſtronomers, like the early alchemiſts, in common with the reſt of mankind, firſt deceived themſelves; and intereſted motives afterwards induced them to connive at the deception of others.

To what degree of accuracy the ancients arrived in the art of predicting eclipſes, is a queſtion on which writers materially differ. Bailly, in all his aſtronomical writings, endeavours to prove that the early aſtronomers were in poſſeſſion of accurate methods of calculating eclipſes, and that theſe were derived from antediluvian tradition. This theory ſuppoſes that the world once exiſted in a ſtate very different from the preſent; that it was nearly deſtroyed by ſome great and ſudden calamity, in which almoſt the whole human race were involved; that only a few individuals eſcaped this dreadful cataſtrophe, who, thus reduced to a deſolate ſtate of exiſtence, had to invent again all the arts of life. But he ſuppoſes, that in this apparent ſtate of barbariſm, traces are ſtill to be found of the former ſtate of civilization and knowledge. This theory is ſurely little better than a dream: we can ſcarcely ſuppoſe that in a moment of ſuch general conſternation, the object of general ſolicitude ſhould be to ſave a table of logarithms, or a compendious method of calculating an eclipſe; beſides, the whole ſyſtem is founded, or at leaſt ſupported, on a miſtake relative to the preſent and former ſtate of the Indian aſtronomy.

The following extract from Baillie's ancient aſtronomy, contraſted with the more careful and recent inveſtigations of our own countrymen in India, will be ſufficient to convince the reader on what a ſlight foundation this viſionary theory reſts for ſupport.

"That which does moſt honour to the aſtronomy of the Indians, is their method of calculating eclipſes. They perform this with great celerity and preciſion.

"The Brahmins ſeem to be machines mounted to calculate eclipſes. Their rules are in verſe, which they recite during the computation. They make uſe of cowries, a ſpecies of ſhell, which is uſed for money in India.

"This method of calculation has the advantage of being eaſy and expeditious; but the ſteps cannot be retraced: they are deſtroyed as the computation advances; and if an error ſhould occur, the whole muſt be recommenced.

"Their proceedings ſeem to poſſeſs an extraordinary ſimplicity. The theory of the moon, the moſt complicated of our modern theories, does not with them require a tedious or embarraſſing calculation. They find the diameters of the ſun and moon by a very ſimple proceſs, which we ſhall inſert here as a curious example of theſe extraordinary rules. They aſſume the apparent diurnal motion of the moon, and divide it by 25. The reſult of the diviſion, multiplied by 60 and divided by 25, gives the actual diameter of the moon. They calculate the diameter of the ſun, by multiplying its real diurnal motion by 5, and dividing it by 9. It is impoſſible to avoid thinking that theſe tables or rules of the Brahmins belong to ſome learned theory,

theory, the principles of which are now concealed under a blind routine, which by considerable skill is at present rendered simple and easy.

"What is most astonishing is, that these tables of the Brahmins are perhaps of 5000 or 6000 years antiquity.

"Notwithstanding those who occupy themselves with astronomy, that is to say, the Brahmins, may have a correct notion of the new and full moon, the people, plunged into the most profound ignorance, still explain its phases their own way. They pretend that the moon is filled with ambrosia, and that the gods take their repasts from it, which is the cause of the diminution of its light. The regularity of the return of these phases announces that the provision is carefully renewed, and that the gods have very regular appetites."

Mr. Davis, to whom we are indebted for a most intelligent and accurate account of the method by which the Hindu astronomers calculate eclipses, is of opinion that the Hindu science is as well known now as it ever was among them, though perhaps not so generally, by reason of the little encouragement men of science meet with, compared with what they formerly did, under their native princes. The same writer is of opinion, that the Pandits, learned in the Jyótish Sástra, have truer notions of the form of the earth, and of the economy of the universe, than are ascribed to the Hindus in general; and that they must reject the ridiculous belief of the common Brahmins, that eclipses are occasioned by the intervention of the monster Rahu, with many other particulars equally unscientific and absurd. But as this belief is founded on implicit and positive declarations, contained in the Vedas and Puranas, the divine authority of which writings no devout Hindu can dispute, the astronomers have, some of them, cautiously explained such passages in those writings as disagree with the principles of their own science; and where reconciliation was impossible, have apologized as well as they could for propositions necessarily established in the practice of it, by observing that certain things, as stated in other Sastras, "might have been so formerly, and may be so still; but for astronomical purposes, astronomical rules must be followed." Others, with a bolder spirit, attacked and refuted unphilosophical opinions. Bhascara argues, that it is more reasonable to suppose the earth self-balanced in infinite space, than that it should be supported by a series of animals, with nothing assignable for the last to rest upon. And Nerasinha, in his commentary, shews that by Rahu and Cetu, the head and tail of the monster, in the sense they generally bear, could only be meant the position of the moon's nodes, and the quantity of her latitude, on which eclipses do certainly depend: but he does not therefore deny the reality of Rahu and Cetu; on the contrary, he says, that their actual existence and presence in eclipses ought to be believed, and may be maintained as an article of faith, without any prejudice to astronomy.

Thus it appears, that though the history of eclipses, like that of every part of the astronomy of the ancients, is involved in considerable obscurity, there is no reason to suppose it of antediluvian origin. The first eclipses, particularly of the sun, if total or considerable, must have excited extreme terror; and many ages must have passed away, before mankind could have been led to the discovery of their cause. The nature of the solar eclipse was probably the first that was understood, and that of the moon a subsequent discovery. To watch these phenomena, to discover the cause why they did not happen every month, and to mark down the circumstances under which they appeared, in order to reduce them to some form for future prediction, seems to have been the only object of the astronomy of many of the early nations. The Chaldæans are said to have watched the heavens without ceasing; and their astronomers relieved each other, like centinels, that no eclipses might escape them. In following this system, they became acquainted with certain useful periods, which in time brought about a repetition of the same phenomena: but further than this their knowledge never extended. Of the nice modifications which were required to correct this method, they seem to have been entirely ignorant. Solar eclipses seem to have been neglected, as too abstruse and irregular to have been reduced to any given law; and we find that Hipparchus, who assiduously collected the most ancient eclipses he could depend on, from the records of the Chaldæan astronomy, was obliged to confine himself to lunar eclipses alone. This circumstance would lead us to suspect that there was but little reliance to be placed on the supposed predictions of ancient eclipses, which are said to have happened on remarkable occasions. The prediction of an eclipse by Thales (said to have taken place during a battle between the Lydians and the Medes) was most probably made long after the event. Perhaps we might carry our scepticism still farther, and doubt the existence of any eclipse at all: for when once great events were supposed to accompany eclipses, tradition would easily supply eclipses to accompany great events.

To understand the doctrine of eclipses, it is necessary to have a clear idea of the nature of the solar and lunar orbit, and of their apparent points of intersection, called the *nodes*. Though the moon's orbit is infinitely nearer to us than the apparent solar orbit, yet its projection, or perspective representation of it on the great concave surface of the heavens, is a great circle of the sphere. If the lunar orbit was in the same plane as the solar orbit, it would have the same representative circle in the heavens, namely, the ecliptic; but the lunar orbit is inclined to the apparent orbit of the sun, in an angle of about 5°; and though these orbits can really have no common points of contact, from their great distance from each other, yet the great circles which represent them in the heavens intersect each other in two opposite points, which are called the nodes.

New moon is defined to be that situation of the moon, when it has exactly the same longitude as the sun. This phase may take place at any part of the lunar orbit, either in the nodes or at any distance from them. In the first case, she will appear to pass over the disc of the sun; but if at the conjunction, or time of new moon, she should be at some distance from the node, as is usually the case, she will be invisible to us, being wholly enveloped in the rays of the sun; but were she visible at this time, we should see her directly under or over the sun; and the distance would be the greater, the farther the moon was from the node: but this distance never could much exceed 5°, or the angle expressing the inclination of the two orbits.

Full moon is that position of the moon, when her longitude differs 12 signs, or exactly half a circle from that of the sun; that is, its longitude is the same as the longitude of the centre of the earth's shadow, if we suppose it extended till it meet the ecliptic. This phase of the moon may take place likewise in any part of her orbit; she may therefore be above, below, or in the centre of the earth's shadow; in which latter case, being deprived of the light of the sun by the interposition of the earth, she will be eclipsed. From this general illustration, we shall now proceed to investigate these phenomena more minutely, beginning with lunar eclipses, which are much the easiest to understand. The calculations that are incident to solar eclipses do not involve any of the higher branches of mathematics: the principles

on which they depend are very ſimple, but the difficulty ariſes from the great number of conſiderations which ariſe, and which cauſe no ſmall perplexity even to the experienced aſtronomer.

Of an Eclipſe of the Moon.

The earth being an opake body enlightened by the ſun, it neceſſarily projects a ſhadow into the regions of ſpace in a contrary direction; when it ſo happens that the moon, in the courſe of her revolution about the earth, falls into this ſhadow, ſhe loſes the ſun's light, by which alone ſhe is viſible, and appears to us *eclipſed*.

Let us ſuppoſe two ſtraight lines drawn from the oppoſite parts of the ſolar diſc, tangents to the ſurface of the earth, as A B, *a b*, (*fig.* 75.) theſe lines will repreſent the limits of the ſhadow, and as the ſun is much larger than the earth, theſe lines will meet at a point, and croſs each other behind the earth, and the ſhadow will thus take the form of a circular cone. When the moon enters this ſhadow, and a part of its diſc is ſtill enlightened by the ſun, this part is not terminated by a ſtraight line; it has the form of a luminous creſcent, the concave part being turned towards the ſhade. The ſame circumſtance happens when the moon begins to quit the ſhadow.

When the moon approaches the terreſtrial ſhadow, ſhe does not loſe her light ſuddenly, but it gradually becomes more and more faint, till the obſcurity arrives at its greateſt intenſity.

To comprehend this phenomenon, we have only to attend to the figure, and obſerve that an opake body may be ſo placed between an object and the ſun, as only to intercept a part of his light (ſuppoſe the object at M), it will then be leſs illuminated than if it received the whole of the light, but more ſo than if it was placed at *m* in total obſcurity. This intermediate ſtate, comprehended in the angular ſpace E B C on one ſide the *umbra*, and F B C on the other, is called the *penumbra*. This is the effect which is obſerved to take place on the entrance of the moon into the terreſtrial ſhadow.

To find the limits of this penumbra, let two lines be drawn, as A *e*, *a* E, touching the ſurfaces of the ſun and the earth, ſo as to croſs at a point *c* between them, the angles E B C, *e b c*, will determine the ſpace occupied by the penumbra, for at a point ſituated without this ſpace, the whole diſc of the ſun will be viſible, but to a point M within it, only a part A *l* of the ſun's diſc will be viſible, and the viſible portion will diminiſh from the line E B to the line C B, when it will entirely diſappear; conſequently the penumbra will gradually increaſe from its firſt limit E B till its ſecond B C, when it will be united with the umbra.

When the moon enters compleatly into the ſhadow of the earth, we do not quite loſe ſight of it; its ſurface is ſtill faintly illuminated with a reddiſh light, ſomething ſimilar to that reflected by clouds after the ſetting of the ſun; this ariſes from the ſolar rays that have been refracted by our atmoſphere, and afterwards inflected behind the earth. For thoſe rays which are not enough refracted to reach the ſurface of the earth, continue their courſe through the atmoſphere, and if not entirely abſorbed by it, are inflected towards a point, in the ſame manner as by a convex lens. The light thus reflected behind the earth is very conſiderable; conſidering only one luminous point of the ſolar diſc, it can only project one ray to every point into the ſurrounding ſpace, but by the medium of the terreſtrial atmoſphere, a cone of luminous points is collected behind the earth, and an object placed in the focus of this cone would be more ſtrongly illuminated than by the direct light of the ſun. Every point of the ſun producing a ſimilar effect, the length and extenſion of the terreſtrial ſhadow are much diminiſhed, and if the atmoſphere did not abſorb a very great proportion of the ſun's rays, the light reflected from the diſc of the moon in a lunar eclipſe would exceed that of the full moon. We may next conſider the meaſures of theſe appearances more preciſely, and the circumſtances which muſt occur to produce them.

The firſt thing to determine in this inveſtigation is the length of the conical ſhadow projected behind the earth, to find if it always extends to the orbit of the moon, omitting the effect of the atmoſphere of the earth.

Let S be the centre of the ſun, T that of the earth, ſuppoſed ſpherical, A B a tangent to the earth and ſun forming the limit of the perfect umbra, S T the axis of the cone, and T C the prolongation of this cone, which it is required to determine. If the ſtraight line A T be drawn to the centre of the earth, the angle S T A will be the apparent diameter of the ſun, the angle T A B will be its horizontal parallax, and as the firſt of theſe is the exterior angle of the triangle T A C, the angle T C B will be equal to the angle S T A — T A B, or the ſemi-diameter of the ſun minus its horizontal parallax. The length T C may now be eaſily determined, for in the right-angled triangle C B T, the angle C and ſide T B are both known. Therefore the length of the conical ſhadow varies with the apparent diameter of the ſun, and conſequently with its diſtance from the earth. The diſtance of the centre of the earth from the ſummit of the cone is as follows. It is expreſſed in terms of the terreſtrial radius.

☉'s Perigee - - -	212.873
☉'s Mean diſtance - -	216.237
☉'s Apogee - - -	220.207

For if D be the apparent diameter of the ſun, E the horizontal parallax, R the radius of the earth, $CT = R \cdot \frac{1}{\sin.\left(\frac{D}{2} - E\right)}$.

As the angle $\frac{D}{2} - E$ is always very ſmall, we may ſubſtitute its ſine, for theſe calculations do not admit of extreme preciſion: but then we muſt ſubſtitute for radius the number of ſeconds it contains, namely, 206264."8; we ſhall then have the diſtance of the ſummit of the cone from the centre of the earth, $CT = R \cdot \frac{206264.8}{\frac{D}{2} - E}$. If for D we take its three values from the tables when the ſun is perigee, mean diſtance, and apogee, we ſhall obtain the quantities as given above.

By inſpection of theſe values it appears, that the cone becomes longer as the diſtance of the ſun increaſes.

The greateſt diſtance of the moon from the earth does not exceed 63,941 radii of the earth, (ſee DISTANCE,) which is much leſs than the preceding quantities, ſo that the earth's ſhadow always extends much farther into ſpace than the orbit of the moon, conſequently if this orbit was in the plane of the ecliptic, there would be every month an eclipſe of the moon.

To calculate the magnitude and duration of an eclipſe, it is neceſſary to know the diameter of the terreſtrial ſhadow at the place where it is traverſed by the lunar orbit. Let L *l* be this orbit, ſuppoſed circular, the angle L T C will meaſure the apparent ſemi-diameter of the ſhadow ſeen from the earth, and will be equal to the difference of the

angles

angles T I B, T C L. But the first of these angles is the horizontal parallax of the moon, and the second is equal to the semi-diameter of the sun minus its horizontal parallax, as we have already demonstrated. These angles being known, give the angle L T C, or the semi-diameter of the shadow.

To find it, we must add the parallax of the sun to the parallax of the moon, and take from their sum the semi-diameter of the sun; that is, the semi-diameter of the shadow is always equal $P + p - \frac{D}{2}$.

By calculating its value from the known parallax of the moon at its greatest, least, and mean distances, we obtain the following table.

Table of the semi-diameter of the terrestrial shadow at the distance of the Moon.

Sun's perigee.	Moon's apogee -	37′	37″
	Moon in mean distance	40	40
	Moon's perigee -	45	15
Sun in its mean distance.	Moon's apogee -	37	53
	Moon in mean distance	40	56½
	Moon's perigee -	45	31
Sun's apogee.	Moon's apogee -	38	9
	Moon in mean distance	41	12
	Moon in perigee -	45	46

The greatest apparent diameter of the moon not exceeding 33′ 31″, we see that it may always be contained in the terrestrial shadow, which considerably exceeds it. Therefore, every time that the moon passes through the centre of this shadow, it will be totally eclipsed.

The time that the moon will remain in the shadow depends on the difference between her diameter and that of the shadow. To compute this time, we must calculate this difference, and determine from the horary motion of the moon the time she will employ to describe it.

Hitherto, we have only considered the dimensions of the umbra; the limits of the penumbra are next to be determined.

Let A *b* (*fig.* 76.) be a straight line, at the same time a tangent to the earth and the sun, L *l* representing the lunar orbit, the angle *l* T C will be the distance of the penumbra to the axis C T, but this angle being exterior to the triangle *c* T *l* is equal to the sum of the two interior, and opposite T *lc*, *lc* T.

The first of these is the horizontal parallax of the moon, the second equal to *c* A T + *c* T A, or the semi-diameter of the sun *plus* its horizontal parallax, therefore the angle C T *l* is equal to the sum of the parallaxes of the sun and moon + the semi-diameter of the sun.

The magnitude of the penumbra is found by subtracting the semi-diameter of the umbra from the above quantity. But this semi-diameter is equal to the sum of the parallaxes of the sun and moon *minus* the semi-diameter of the sun; consequently the diameter of the penumbra is equal to the diameter of the sun. We must next consider what alterations will be produced in these results by the effect of the earth's atmosphere.

The umbra, as determined above, has for its limit the radius A B, which touches the corresponding surfaces of the earth and sun; C is then the summit of the umbra. But if we take into consideration the effect of the atmosphere of the earth, the ray of light A B will be refracted at the point B, and continuing its path will converge to some point nearer the earth than the point C. A spectator placed beyond this limit, would, by the effect of refraction, not only see the luminous border of the sun's disc, but a luminous zone of it; by receding farther from the earth the disc of the sun transmitted through the atmosphere will be visible in the form of a luminous ring, receding still farther, the rays emerging from the centre of the sun will no longer touch the surface of the earth, but pass higher up in the atmosphere; and lastly, by increasing still more the distance, the exterior limb of the sun will begin to be disengaged from the terrestrial atmosphere, and will appear directly and without refraction.

To determine these different limits, imagine a ray of light S B, (*fig.* 77.) proceeding from the limb of the sun, and just touching the surface of the earth at B, the curve described by this ray about the earth will be symmetrical on each side of B, that is, if S *o* be its direction when it enters the atmosphere, *o* L will be its direction when it passes out of it, and the angles B T I, B *b* I, formed with the tangent T *b*, will be equal to each other; but the angle B T I, or D T S, is very nearly equal to D B S, or the horizontal refraction, because the point I is very little elevated above B. The angle B + I is likewise very nearly equal to the horizontal refraction, consequently the angle S I A, which expresses the inflexion of the ray, is equal to B T I + B *b* I, or to double the horizontal refraction.

The effect of the atmosphere, therefore, is to augment by this quantity the apparent semi-diameter of the sun: hence, in computing the distance of the summit of the umbra from the centre of the earth, the semi-diameter of the sun must be increased by double the horizontal refraction, and with this correction alone, the same formulæ may be employed that have been demonstrated above. If instead of considering the ray of light S B as coming from the exterior limb of the sun, it be supposed to proceed from any point whatever of the disc, at a given distance from the centre; substituting this distance for the semi-diameter of the sun, we shall have the distance from the earth at which this point begins to appear, and thus may be found the successive zones which will begin to be visible at every corresponding distance.

If the horizontal refraction be called *r*, the same notation being continued as above, the distance of the summit of the shadow from the centre of the earth C T will be equal $\frac{R}{\frac{D}{2} + 2r - L}$, and the semi-diameter of the shadow $P + p - D - 2r$. If now $\frac{D}{2}$ be supposed to express the distance of any given point in the disc from the centre, we may find by the first formula the distance at which the given point will begin to appear on the edge of the terrestrial surface. Making D = o we shall have the distance at which the sun begins to be entirely visible, surrounding the earth like a ring. On this principle Du Sejour has computed the following table.

	Sun's Perigee.	Mean Distance.	Sun's Apogee.
Limb of the sun beginning to appear - - -	42,228	42,013	41,842
¼ the disc of the sun at the circumference of the earth -	46,674	46,502	46,408
½ of the disc ☉ at the circumference of the earth -	52,236	52,236	52,236
¾ of the disc ☉ at the circumference of the earth -	59,316	59,820	60,317
The whole disc of the ☉ surrounding the earth like a ring	68,283	69,125	69,645

The

The leaſt diſtance of the moon being 57,660, and the greateſt 63,664, in the moſt unfavourable circumſtances, even at the centre of the ſhadow, a ſpectator on the ſurface of the moon would ſtill ſee half the diſc of the ſun through the atmoſphere of the earth.

This ſufficiently explains, why, in a total eclipſe of the moon, her diſc is ſtill enlightened enough to be viſible, and we muſt attribute to the thickneſs of our atmoſphere, and to the vapours it contains, the cauſe of the great diminution of light which ſometimes makes the moon almoſt entirely diſappear.

It was, perhaps, an effect of this kind which Sauſſure obſerved on the *Col du Geant*, when he ſaw, during ſummer nights, the horizon ſurrounded by a kind of luminous ring, the ſmall depreſſion of the ſun below the horizon might compenſate the ſmallneſs of the diſtance from the earth at which the ſpectator was placed; and this conſideration agrees very well with the phenomena of twilight. See CREPUSCULUM, and TWILIGHT.

In the above explanations the moon has been ſuppoſed exactly placed in the axis of the terreſtrial ſhadow, and ſhe would be ſo placed in every oppoſition if her orbit coincided with the plane of the ecliptic, but ſince the moon is ſometimes elevated above, and ſometimes depreſſed below this plane, it may happen that it will only enter partially into the ſhadow of the earth, or juſt touch it with her limb, or even paſs without touching it. In the firſt caſe, the eclipſe is *partial*, in the ſecond, it takes the name of *an appulſe*; a *total eclipſe* is when the moon is entirely plunged in the ſhadow, and the eclipſe is *central* when the centre of the moon coincides with the axis of the conical ſhadow.

Central eclipſes can only happen when the moon, at the moment of oppoſition, is in the plane of the ecliptic, and conſequently in one of her nodes.

For a total eclipſe, it is ſufficient that the ſemi-diameter of the ſhadow exceeds the latitude of the moon, augmented by her apparent ſemi-diameter.

That there may be a partial eclipſe, it is ſufficient that the ſemi-diameter of the ſhadow exceeds the latitude of the moon, diminiſhed by her apparent ſemi-diameter. If theſe two quantities are equal, the moon will touch the ſhadow, and there will only be an appulſe; if the ſecond ſurpaſſes the firſt, there will be no eclipſe.

The latitude of the moon depends on its diſtance from the nodes of its orbit; it augments as its diſtance from theſe points increaſes; the diſtance from the node may, therefore, be calculated, at which an eclipſe becomes impoſſible: this is called the *ecliptic limit*. To do this, we muſt ſelect the moſt favourable circumſtances, or thoſe which give the diameter of the moon, and the terreſtrial ſhadow, the greateſt poſſible values; the ſum of theſe two quantities will give the greateſt poſſible latitude at which the moon can be eclipſed. Having found this latitude, we may determine the diſtance from the node which correſponds to it; this is done by the ſolution of a right-angled ſpherical triangle, formed by the lunar orbit, the ecliptic, and the circle of latitude; in this triangle one of the ſides is the latitude above found, the angle is the obliquity of the orbit, which we muſt take at its leaſt value; the ſide oppoſite the right angle is the greateſt diſtance from the node. Since theſe reſpective poſitions of the moon and ſun are connected together, by the law of their motions, it is not eaſy to determine the preciſe inſtant in which the re-union of all theſe circumſtances ſhall be the moſt favourable to produce an eclipſe, and it can only be effected by comparing together a great number of ſimultaneous poſitions of the two bodies. According to Delambre (who has taken into the account the effect of the atmoſpherical refraction), there cannot happen an eclipſe of the moon when the diſtance from the node ſurpaſſes 13° 40′, and there certainly will be an eclipſe when the diſtance is leſs than 7° 47′. Between theſe limits, the exiſtence of the eclipſe will depend on the particular poſitions of the ſun and moon, and to decide the queſtion we muſt have recourſe to exact calculation in which theſe circumſtances enter, but the preceding reſults are always extremely uſeful, becauſe they ſhew at once a number of oppoſitions in which no eclipſe can happen, ſo that it only remains to calculate the others to find what ſpecies of eclipſe (if any) will take place.

Of an Eclipſe of the Sun.

An eclipſe of the ſun is produced by the interpoſition of the moon between that luminary and the earth, for which reaſon it can never happen at any other time than at the conjunctions or new moons. Notwithſtanding the moon is incomparably leſs than the ſun, yet from its nearneſs to us it ſo happens that its apparent diameter differs very little from that of the ſun, and even ſometimes exceeds it. Suppoſe an obſerver ſituated in the continuation of a ſtraight line that unites the centres of the ſun and moon, he will ſee the former of theſe bodies eclipſed. If the apparent diameter of the moon ſurpaſſes that of the ſun, the eclipſe will be total, and the obſerver will be entirely plunged in the cone of ſhade which is projected behind the moon: if the diameters are equal, the point of the cone will terminate at the earth's ſurface, and there will be a momentary total eclipſe. If the diameter of the moon be leſs than that of the ſun, the obſerver will ſee a zone of the ſun ſurrounding the moon like a ring, and the eclipſe will be central and annular. And laſtly, if the obſerver on the earth's ſurface is not exactly in the line joining the centres, the eclipſe may be partial, that is, a part of the ſolar diſc may be hid, while the remaining part continues perfectly viſible. Total eclipſes, which are rare, are remarkable for the darkneſs which accompanies them, and which they ſpread over different parts of the ſurface of the earth, in the ſame manner as the ſhadow of a cloud carried by the winds, ſweeps over the mountains and the plains, depriving them for ſome inſtants of the light of the ſun. This total darkneſs, under favourable circumſtances, may laſt about five minutes.

The ſmalleſt apparent diameter of the ſun is 31′ 30″; the diameter of the moon in its mean diſtance is 31′ 25″, that is, leſs than that of the ſun; there cannot, therefore, be a total eclipſe when the moon is beyond the mean diſtance. Eclipſes of the ſun are likewiſe modified by the height of the moon above the horizon, which increaſes her diameter. (See DIAMETER.) This change, combined with the effect of parallax, may ſo much augment or diminiſh the apparent diſtance of the moon from the ſun, that an eclipſe may be ſeen by one obſerver at the earth's ſurface, at the ſame time that no ſuch phenomenon happens to another. For example, if the horizontal ſemi-diameters of the earth and moon differ very little from each other, an eclipſe may be annular to thoſe countries who obſerve it in the morning or evening, and central to thoſe who obſerve it at noon, where the ſun and moon are elevated above the horizon. In this, eclipſes of the ſun differ from thoſe of the moon; the latter are the ſame to all places where they are viſible, but the former are ſo modified by the poſition of the obſerver, by the different diſtances of the ſun and moon from the earth, and from the different diſtances of the moon from the node, that they are ſubject to extreme variations; and from the number of elements on which they depend, the calculation of their appearances is very difficult. The diameter of the moon, obſerved in a ſolar eclipſe, appears ſomething leſs than at other times: this

this is the effect of the irradiation, the luminous circle that furrounds the lunar difc diminifhes a little its apparent magnitude; the exaft quantity of this irradiation is not yet precifely afcertained.

To calculate the Phafes of an Eclipfe of the Moon.

The firft thing to be done, is to find the time of the mean oppofition, to get which from the tables of epacts, amongft the tables of the moon's motion, take out the epact for the year and month, and fubtract the fum from $29^d\ 12^h\ 44'\ 3''$, one fynodic revolution of the moon, or two, if neceffary, fo that the remainder may be lefs than a revolution, and that remainder gives the time of the mean conjunction. If to this we add $14^d\ 18^h\ 22'\ 1''.4$, half a revolution, it gives the time of the next mean oppofition; or if we fubtract, it gives the time of the preceding mean oppofition. If it be leap year, in January and February fubtract a day from the fum of the epacts before you make the fubtraction. When the day of the mean conjunction is O, it denotes the laft day of the preceding month.

Example. To find the time of the mean new and full moons in February 1795.

Epact 1795 - -	9^d	11^h	$6'$	$11''$
February - -	1	11	15	57
	10	22	22	14
	29	12	44	3
Mean new moon -	18	14	21	49
	14	18	22	1.4
Mean full moon -	3	19	59	47.6

To determine whether an eclipfe may happen at oppofition, find the mean longitude of the earth at the time of mean oppofition, and alfo the longitude of the moon's node. Then, according to M. Caffini, if the difference between the mean longitudes of the earth and the moon's node be lefs than $7° 30'$, there *muft* be an eclipfe; if it be greater than $14° 30'$, there *cannot* be an eclipfe; but between $7° 30'$ and $14° 30'$, there *may*, or may *not* be an eclipfe.

M. Delambre makes thefe limits $7° 47'$ and $13° 21'$.

Example. To find whether there will be an eclipfe at the full moon, on February 3d, 1795.

Sun's mean longitude at $3^d\ 19^h$ $59'\ 47.''6$ - - - -	10^s	$13°$	$27'$	$20.''8$
Mean longitude of the earth -	4	13	27	20.8
Longitude of the moon's node -	4	8	1	48.5
Difference - - - -	0	5	25	32.3

Hence there muft be an eclipfe.

Examine thus all the new and full moons for a month before and a month after the time at which the fun comes to the place of the nodes of the lunar orbit, and you will be fure not to mifs any eclipfes. Or, having the eclipfes for the laft eighteen years, if you add to the times of the middle of thefe eclipfes $18^y\ 10^d$, or $11^d\ 7^h\ 3\frac{2}{3}'$, it will give the times when you may expect the eclipfes will return. To the time of mean oppofition, compute the true longitudes of the fun and moon, and the moon's true latitude, and find from the tables of their motions the horary motions of the fun and moon in longitude, and the difference (d) of their horary motions is the relative horary motion of the moon in refpect to the fun, or the motion with which the moon approaches to, or recedes from, the fun. Find alfo the moon's horary motions in latitude, and fuppofe at the time (t) of mean oppofition, the moon is at the diftance (m) from oppofition. Then $d : m :: 1^h :$ the time (w) between t and the oppofition, which added to or fubtracted from the time t, according as the moon is not yet got into oppofition, or is beyond it, gives the time of the ecliptic oppofition.

To find the place of the moon in oppofition, let n be the moon's horary motion in longitude: then $1^h : w :: n :$ the increafe of the moon's longitude in the time w, which applied to the moon's longitude at the time of the mean oppofition, gives the true longitude of the moon at the time of the ecliptic oppofition. The oppofite to that muft be the true longitude of the fun. Find alfo the moon's true latitude at the time of oppofition, by faying $1^h : w ::$ the horary motion in latitude : the motion in the time w, which, applied to the moon's latitude at the time of the mean oppofition, gives the true latitude at the time of the true oppofition. In like manner, you may compute the true time of the ecliptic conjunction, and the places of the fun and moon for that time, when you calculate a folar eclipfe. With the fun's horary motion in longitude, and the moon's in longitude and latitude, find the inclination of the relative orbit, and the horary motion upon it.

To do this, let L M (*fig.* 78.) be the horary motion of the moon in longitude, S M that of the fun; draw M O perpendicular to L M, and equal to the moon's horary motion in latitude. Take S b = M a and parallel to it, and join L a, L b; then L a is the moon's true orbit, and L b its relative orbit in refpect to the fun. Hence, L S (the difference of the horary motions in longitude,) : S b (the moon's horary motion in latitude) :: radius : tan. b L S, the inclination of the relative orbit, and cof. b L S : radius :: L S : L b, the horary motion in the relative orbit. By logarithms the calculations are thus:

Log. S b + 10 — log. L S = log. tan. b L S,
Log. L S + 10 — log. cof. b L S = log. L b.

M. De La Lande obferves, that if we add 8" to the difference of the horary motions in longitude, it will give the horary motion in the relative orbit: for in a right-angled triangle, of which the bafe is the difference of the horary motions in longitude, (which is about half a degree,) and the angle at the bafe about $5\frac{2}{3}$ of a degree; the difference between the bafe and the hypothenufe will always be about 8".

At the time of oppofition, find from the tables the moon's horizontal parallax, its femi-diameter and the femi-diameter of the fun, the horizontal parallax of which we may here take = 9".

To find the femi-diameter of the earth's fhadow at the moon, feen from the earth. Let A B be the diameter of the fun, T R the diameter of the earth, O and C their centres; draw A T, B R, to meet at I, and join O C I. Let F G H be the diameter of the earth's fhadow at the diftance of the moon, and join O T, C F. Now the angle F C G = C F A — C I A, but C I A = O T A — T O C; therefore F C G = C F A — O T A + T O C; that is, *the angle, under which the femi-diameter of the earth's fhadow appears at the moon, is equal to the fum of the horizontal parallaxes of the fun and moon, diminifhed by the apparent femi-diameter of the fun.*

In eclipfes of the moon, the fhadow is found to be a little greater than this rule gives it, owing to the atmofphere of the earth. This augmentation of the femi-diameter is, according to M. Caffini, 20"; according to M. Monnier, 30"; and according to M. de la Hire, 60". Mayer thinks the correction

correction is about $\frac{1}{60}$th of the ſemi-diameter of the ſhadow; or, that you may add as many ſeconds as the ſemi-diameter contains minutes. Some computers always add 50″; but this muſt be ſubject to ſome uncertainty.

As the angle C I T (= O T A − T O C) is known, we have ſin. T I C : coſ. T I C :: T C : C I, the length of the earth's ſhadow.

If we take the angle A T O = 16′ 3″, the mean ſemi-diameter of the ſun, T O C = 9″, the horizontal parallax of the ſun, we have C I T = 15′ 54″: hence, ſin. 15′ 54″ : coſ. 15′ 54″, or 216.2 :: T C : C I = 216.2 T C.

Let P Q (*fig.* 97.) repreſent the ſection of the earth's ſhadow at the moon, C N the ecliptic, N L the moon's orbit. Draw C*n* perpendicular to C N, and C*m* perpendicular to N L; and let the moon at *m* juſt touch the earth's ſhadow at *r* externally, ſo that C*m* may be the ſum of the radii of the moon and earth's ſhadow. Then to determine when this happens, we may take the angle at N = 5° 17′, which is very nearly its value in all eclipſes; the inclination of the lunar orbit being at that time always greateſt, as will afterwards be ſhewn. Hence, ſin. 5° 17′ : rad. :: ſin. C M : ſin. C N. Now the greateſt value of C*m* is about 1° 3′ 30″; hence the correſponding value of C N = 11° 34′. When therefore C N is greater than that quantity, there can be no eclipſe. According to M. Caſſini, if the latitude, C*n*, of the moon, at the time of the ecliptic conjunction, exceed the ſum of the ſemi-diameters of the earth's ſhadow and moon by 18″, there will be no eclipſe; but if it do not exceed that ſum by 16″, there will be an eclipſe. If C*m* = C*r* − *rm*, or the limbs touch internally, the eclipſe will be juſt total: hence, if the diſtance of the moon's node from the place of the earth be leſs than the computed value of C N in this caſe, there muſt be a total eclipſe of ſome duration. If, therefore, it was before doubtful, and it now appears there will be an eclipſe, proceed as follows to compute it:

Let A P B be that half of the earth's ſhadow where the moon paſſes through, N L the relative orbit of the moon; one figure repreſenting a partial eclipſe, the other a total one. Draw C*m r* perpendicular to N L, and let *z* be the centre of the moon at the beginning of the eclipſe, *m* at the middle, *x* at the end; *v* at the beginning of total darkneſs, *w* at the end. Alſo, let A B be the ecliptic, and C*n* perpendicular to it. Now, in the right-angled triangle C*mn*, we know C*n* the latitude of the moon at the time of the ecliptic conjunction, and the angle C*nm* the complement of the angle which the relative orbit of the moon makes with the ecliptic: hence, radius : coſ. C*mn* :: C*n* : *nm*, which we call the reduction; and radius : ſin. C*nm* :: C*n* : C*m*. By logarithms, the calculations are thus:

Log. coſ. C*nm* + log. C*n* − 10 = log. *nm*.
Log. ſin. C*nm* + log. C*n* − 10 = log. C*m*.

The horary motion of the moon upon its relative orbit being known, we know the time of deſcribing *mn*, by ſaying, *h* : *mn* :: 1ʰ : the time of deſcribing *mn*. The computation of this is moſt readily performed by logiſtic logarithms.

Hence, knowing the time of the ecliptic conjunction at *n*, we know the time of the middle of the eclipſe at *m*. Next, in the right-angled triangle C M *z*, we know C*m* and C*z*, the ſum of the ſemi-diameters of the earth's ſhadow and the moon, to find *mz*, which is done thus by logarithms. As $mz = \sqrt{Cz^2 - Cm^2} = \sqrt{Cz + Cm \,.\, Cz - Cm}$, the log. of $mz = \frac{1}{2}$. log. C*z* + C*m* + log. C*z* − C*m*.

Hence, the horary motion of the moon being known, we know the time of deſcribing *zm*, which *ſubtracted* from the time at *m*, gives the time of the beginning; *added*, gives the time of the end. In the ſame manner, in the right-angled triangle C*mv*, we know C*m* and C*v*, the difference of the ſemi-diameter of the earth's ſhadow and moon: hence, by logarithms, the. log of *mv* = $\frac{1}{2}$. log. C*v* + C*m* + log. C*v* − C*m*, from whence, as before, we know the time of deſcribing *mv*, which *ſubtracted* from the time at *m*, gives the time of the beginning of total darkneſs; and *added*, gives the end. The magnitude of the eclipſe at the middle is repreſented by *tr*, which is the greateſt diſtance of the moon within the earth's ſhadow; and this is meaſured in terms of the diameter of the moon conceived to be divided into 12 equal parts, called digits or parts deficient; to find which, we know C*m*, the difference between which and C*r* gives *mr*, which added to *mt*, or if *m* fall out of the ſhadow, take the difference between *mr* and *mt*, and we get *tr*. Hence, to find the number of digits eclipſed, ſay *mt* : *tr* :: 6 digits, or 360′ (it being uſual to divide a digit into 60 equal parts, and call them minutes) : the digits eclipſed. If the latitude of the moon be north, we uſe the upper ſemi-circle; if ſouth, we take the lower.

If the earth had no atmoſphere, when the moon was totally eclipſed, it would be inviſible; but we have ſhewn, that by the refraction of the atmoſphere, ſome rays will be brought to fall upon the earth's ſurface; upon which account, the moon will be viſible at that time, and appear of a duſky red colour. M. Maraldi has obſerved, that in general the earth's umbra at a certain diſtance is divided by a kind of penumbra, from the refraction of the atmoſphere.

This will account for the circumſtance of the moon being more viſible in ſome total eclipſes than in others. It is ſaid, that in the total eclipſes in 1601, 1620, and 1642, the moon entirely diſappeared. An eclipſe of the moon, ariſing from its real deprivation of light, it muſt appear to begin at the ſame inſtant of time to every place on that hemiſphere of the earth which is next the moon.

Hence it affords a very ready method of finding the difference of longitudes of places on the earth.

The moon enters the penumbra of the earth before it comes to the umbra, and therefore it gradually loſes its light; and the penumbra is ſo dark juſt at the umbra, that it is difficult to aſcertain the exact time when the moon's limb touches the umbra, or when the eclipſe begins.

When the moon has entered into the umbra, the ſhadow upon its diſc is tolerably well defined; and you may determine, to a conſiderable degree of accuracy, the time when any ſpot enters into the umbra. Hence, the beginning and end of a lunar eclipſe are not ſo proper to determine the longitude from, as the times at which the umbra touches any of theſe ſpots.

Example 1.—A computation of a partial eclipſe of the moon, on February 3. 1795. For the meridian of the Royal Obſervatory at Greenwich.

The time of the full moon is 3ᵈ 19ʰ 59′ 47″.6. It appears by the rule already given, that there will be an eclipſe.

By computation, the mean time of the ecliptic oppoſition is at 12ʰ 46′ 18″; from which ſubtract the equation of time, 14′ 20″, and we have 12ʰ 31′ 58″, the apparent time at Greenwich.

To this time compute the moon's place in the ecliptic, and it will be found 4ˢ 15° 15′ 57″, the oppoſite point to which is 10ˢ 15° 15′ 57″, the place of the ſun. Compute

alſo the moon's latitude C n, and it will be found 37′ 39″ N. aſcending.

By the tables, the horary motion of the moon in latitude is 2′ 57″, the horary motion of the ſun is 2′ 32″, and of the moon 32′ 9″ in longitude; hence the horary motion of the moon from the ſun in longitude is 29′ 37″, conſequently, the horary motion of the moon from the ſun on the relative orbit is 29′ 45″; alſo the inclination of the relative orbit is 5° 41′ 27″. The reduction $n\,m$ is 3′ 44″, reduce this into time by logiſtic logarithms, and the operation is thus:

3′ 44″	- - - -	1.2061
29 45	- - - -	0.3047
7 32 time of deſcribing $m\,n$.	-	0.9014

The neareſt approach C m of the centres is 37′ 28″. From 12ʰ 31′ 58″, ſubtract 7′ 32″, and it leaves 12ʰ 24′ 36″, the middle of the eclipſe.

By the tables, the horizontal parallax of the ſun is 0′ 9″, and of the moon 56′ 30″. Alſo, the apparent ſemi-diameter of the ſun is 16′ 16″, and of the moon 15′ 24″. Hence hor. par. ☉ + hor. par. ☾ − ſemi diam. ☉ + 50″ = 41′ 13″, the ſemi-diameter of the earth's ſhadow increaſed by 50″ for refraction.

Hence, ſemid. ☾ + ſemid. ⊖'s ſhadow	56′ 37″ = 3397″		
Neareſt approach of centres - -	37 28 = 2248		
Sum - - -	5645	− log.	3.751664
Diff. - - -	1149	− log.	3.060320
			2)6.811984
Log. of 2546″.8 = 42′ 26″.8 mot. of half duration - - - - - -			3.405992

Reduce this into time by the logiſtic logarithms.

29′ 45″	- - - -	0.3047
42 27	- - - -	0.1503
1ʰ 25′ 37″ half duration	- -	0.8456

Subtract this from and add it to 12ʰ 24′ 26″, and we get 10ʰ 58′ 49″ for the beginning, and 13ʰ 50′ 3″ for the end. From C r = 41′ 13″, ſubtract C m = 37′ 28″, and we get $m\,r$ = 3′ 45″; hence $m\,r + m\,t = r\,t$ = 19′ 9″ the parts deficient, conſequently 15′ 24″ : 19′ 9″ : : 6ᵈ, or 360′, : 7ᵈ 27′ 36″ the digits eclipſed.

By logiſtic logarithms the calculation is thus:

19′ 9″ log. + 1	- -	1.4960
15 24	- - - -	0.5906
7ᵈ 27′ 36″	- - - - -	0.9054

Hence the times of this eclipſe are Feb. 3, 1795.

The beginning at	10ʰ 58′ 49″	Apparent time at Greenwich.
Middle - -	12 24 26	
End - - -	13 50 3	
Duration - -	2 51 12	
Digits eclipſed -	7ᵈ 27′ 36″ on the moon's ſouth limb, as repreſented in *fig.* 80, which was conſtructed for this eclipſe.	

Example 2.—*A computation of a total eclipſe of the moon on December 3d, 1797, for the meridian of the Royal Obſervatory at Greenwich.*

It appears that there will be an eclipſe at this full moon. By computation, the mean time of the ecliptic oppoſition is 3ᵈ 16ʰ 16′ 46″, to which add 9′ 18″, the equation of time, and you get 3ᵈ 16ʰ 26′ 4″ for the apparent time.

To this time compute the moon's place in the ecliptic, and it will be found to be 2ˢ 12° 35′ 19″, conſequently the ſun's place is 8ˢ 12° 35′ 19″. Compute alſo the moon's latitude C n, and it will be found 4′ 55″ S. decreaſing.

By the tables the horary motion of the moon in latitude is 3′ 15″, the horary motion of the ſun is 2′ 32″, and of the moon 35′ 14″ in longitude, hence the horary motion of the moon from the ſun in longitude is 32′ 42″, conſequently, the horary motion of the moon from the ſun on the relative orbit is 32′ 50″; alſo, the inclination of the relative orbit is 5° 40′ 34″.

The reduction $n\,m$ is 0′ 29″; reduce this into time by the logiſtic logarithms, and the operation is thus:

32′ 50″	- - - -	0.2618
0 29	- - - -	2.0939
0 53 time of deſcribing $m\,n$	- -	1.8321

The neareſt approach C m of the centres is 4′ 54″.

To 16ʰ 26′ 4″ add 53″, and it gives 16ʰ 26′ 57″ for the middle of the eclipſe. By the tables, the horizontal parallax of the ſun is 0′ 9″, and of the moon 59′ 9″. Alſo the apparent ſemid. of the ſun is 16′ 17″, and of the moon 16′ 6″. Hence hor. par. ☉ + hor. par. ☽ − ſemid. ☉ + 50″ = 43′ 51″, the ſemi-diameter of the earth's ſhadow increaſed by 50″ for refraction. And as C r (= 43′ 51″) is greater than C $m + m\,s$ (= 21′) the eclipſe muſt be total.

Semid. ☾ + ſemid. ⊖'s ſhadow -	59′ 57″ = 3597		
Neareſt app. of centres	4 54 = 294		
Sum - - -	3891	+ log.	3.5900612
Difference - -	3303	− log.	3.5189086
			2)7.1089698
Log. of 3585″ = 59′ 45″ mot. of half duration			3.5544849

Reduce this into time by the logiſtic logarithms; but becauſe the fourth term, in this caſe, would come out a greater quantity than that to which the table extends, we will take the half of 59′ 45″, and then double the concluſion:

32′ 50″	-	0.2618
29 52.5	-	0.30285
54 34.5	-	0.04105

Hence 1ʰ 49′ 11″ is the half duration; which ſubtracted from and added to 16ʰ 26′ 57″, gives 14ʰ 37′ 46″ for the beginning, and 18ʰ 16′ 8″ for the end. We find the time of half the duration of total darkneſs thus:

Semid. ⊖'s ſhadow − ſemid. ☾	27′ 45″ = 1665″		
Neareſt app. of the centres -	4 54 = 294		
Sum - -	1959	− log.	3.2920344
Difference -	1371	− log.	3.1370375
			2)6.4290719
Log. of 1639″ = 27′ 19″ mot. of ½ dur. of total darkneſs - - - -			3.2145359

Reduce this into time by the logistic logarithms.

52′ 50″	- - - -	0.2618
27 19	- - -	0.3417
49 55	half duration of total darkness	0.0799

Subtract this from and add it to $16^h\ 26'\ 57''$, and it gives $15^h\ 37'\ 2''$ for the beginning of total darkness, and $17^h\ 16'\ 52''$ for the end.

From C $r = 43'\ 51''$, subtract C $m = 4'\ 54''$, and we get $m\,r = 38'\ 57''$, to which add $t\,m = 16'\ 6''$, and we get $t\,r = 55'\ 3''$ the parts deficient. Hence $16'\ 6'' : 55'\ 3''$ :: 6^d, or $360'$, : $20^d\ 31'$ the digits eclipsed.

The operation by logistic logarithms is thus:

55′ 3″	log. + 1 -	1.0374
16 6	- -	0.5713
20^d 31 0	- -	0.4661

Hence the times of this eclipse are December 3d, 1797.

The beginning at -	$14^h\ 37'\ 46''$	Apparent time at Greenwich.
Total darkness begins	15 37 2	
Middle - - -	16 26 57	
Total darkness ends -	17 16 52	
End of the eclipse -	18 16 8	
Duration of total darkness	$1^h\ 39'\ 50''$	
Duration of the whole eclipse	3 38 22	
Digits eclipsed -	$20^d\ 31'\ 0''$	

If the time corresponding to the difference between the meridian at Greenwich and that of any other place be applied to the times here found, it will give the times at that place.

In this present year, 1809, there occurs but one visible eclipse, and that is of the moon, 29th April. The computation of its elements is as follows.

To compute the partial eclipse of the moon, which will happen 29th April, 1809.

Ecliptic opposition happens $12^h\ 41'$. The moon's motion in longitude for the preceding 12 hours was $7°\ 29'\ 26''$, and for the succeeding 12 hours $7°\ 31'\ 47''$. The mean $7°\ 30'\ 36''$, which divided by 12, gives $37'\ 33''$ for the moon's horary motion in longitude. If we take from this the sun's horary motion, $2'\ 26''$, it will leave $35'\ 7''$ for the horary motion of the moon from the sun, and which augmented by $8''$ is $35'\ 15''$, which is the relative horary motion of the moon.

The horary motion of the moon in latitude is $3'\ 27''$. To find the inclination of the ☽'s orbit,

Log. $207''$ = hor. mot. ☽ in lat. = 2.3159703
Co. log. $2115''$ = hor. mot. ☽ in long. = 6.6746895

$5°\ 35'\ 20''$ = 8.9906598

And 84 24 40 = its complement = C $n\,m$.

To find the reduction $n\,m$. The latitude ☽ = $33'\ 50''$.
Rad. : cos. $84°\ 24'\ 40''$ :: $33'\ 50''$ = $20'\ 30''$: $m\,n$.

Log. 2030 = 3.3074960
Cos. $84°\ 24'\ 40''$ = 8.9885139

$197''$ = 2.2960099 = $3'\ 17''$.

This must be reduced into time by logistic logarithms thus:

3′ 17″	- - - -	1.2618
35 15	- - - -	0.2310
5 36	(time of describing $m\,n$)	1.0308

From -	$12^h\ 41'\ 00''$	
Take -	5 36	
	12 35 24	middle of the eclipse.

Hor. par. ☉	- - -	$0^h\ 00'\ 08''$
Hor. par. ☽	- - -	61 10
		61 18
Semi-diameter ☉	- -	15 54
		45 24
Add for refraction	- -	50
Semi-diameter shadow	- -	46 14

The nearest approach of the centres m C = $33'\ 35''$.
Semid. ☽ + semid. of ☾ shadow = $62'\ 54'' = 3774''$
Nearest approach of centres - 33 35 = 2015

Sum -	Log. 3.7626035 -	= 5789
Diff. -	Log. 3.2452658 - -	= 1759
	7.0078693	

$3191'' = 53'\ 11'' = 3.5039346$ = motion in half duration.

Logistic log.	$0^h\ 35'\ 15''$ -	0.2310
	1 53 11 -	.0524
	1 30 31 -	0.8214

Middle of eclipse being -		$12^h\ 35'\ 24''$
Half duration - -		1 30 31
Beginning - - -		11 4 53
End - - - -		14 5 55

From C r = C m + semid. ☽ = $33'\ 55''$
+ $16'\ 40''$ - - - - = $50'\ 35''$
Take C m = ☽'s shadow - - = 46 14

Remainder = the uneclipsed part - 4 21

$16'\ 40''$: dig. 6 :: $4'\ 21''$: digits uneclipsed.
Or, 16 40 : 6 ::

60	$12'\ 20'' = 16'\ 40'' - 4'\ 20''$
	60
1000	740
	6
	4,440
	60
	26,400

Digits eclipsed $10^d\ 26' = 6^d + 4^d\ 26'$.

Graphical Method of computing the above Eclipse for April 29, 1809.

With a convenient scale of minutes and seconds, (which, for practical purposes, may be taken from a common ruler, divided

divided into inches and tenths,) take A C = femi diameter of the umbra = 46′ 14″, and with this radius defcribe the circle A B D. Draw C *n* perpendicular to A B, and make it equal to the latitude of the moon = 33′ 50″. Make ∠ C *n* N = complement of the angle which the relative orbit of the moon makes with the ecliptic = 84° 24′ 40″, and produce N *n* to L. With a radius equal to the fum of the femi-diameters of the moon and the earth's fhadow = 62′ 54″, fet off C *z*, C *x*; and let fall the perpendicular C *n*; and with the centres *x*, *m*, *z*, and with a radius equal to the femi-diameter of the moon = 16′ 40″, defcribe the circles refpefenting the moon. To find the beginning, middle, and end, the point *n*, 12ʰ 41′, the time of the ecliptic conjunction muft be marked, and fet off from *n*, both ways, an extent equal to the horary motion of the moon upon N L. This interval fhould be divided into as many equal parts as it will conveniently admit of, and thefe divifions continued to *x* and *z*. The times correfponding to the points *x*, *m*, and *z*, fhew the beginning, middle, and end of the eclipfe. And if *t r* be meafured upon the fcale, it will fhew the digits eclipfed.

This method will give the time fufficiently near, if it is only required to predict the eclipfe, as the time may be depended on to a minute, if the radius C B is fix or feven inches. The fame method may be employed if the eclipfe is total.

The latter part of this method may be more eafily underftood, by referring to the plate where the whole operation is refpefented with its correfponding fcale. See *Pl.* XI. *fig.* 81.

To calculate an Eclipfe of the Sun.

The calculation of eclipfes of the fun, for any particular place, is much longer and more difficult than that of lunar eclipfes, on account of the confiderations of parallax which neceffarily enter into them. The parallax differs for every part of the earth; fo that an eclipfe of the fun would have a different appearance to different countries. An eclipfe of a minute of a degree, and continuing for 20′ of time, may occur at a fpot 60 miles diftant from a place where no eclipfe is vifible. On the contrary, an eclipfe of the moon would appear of the fame magnitude to all the places where it is vifible; for the moon, really lofing its light, is dark to the whole world.

If we were placed on a point at the furface of the moon, when it is eclipfed, and we wifhed to calculate the manner in which this eclipfe would appear in this point, determined from the moon, we fhould equally fall into the difficulty of parallax; for the eclipfe, which would then be an eclipfe of the fun, taking place fucceffively and differently at the different points of the lunar furface, the parallax muft be calculated for that part of the moon where the fpectator is fituated.

There is a great variety of methods that have been devifed by different aftronomers for calculating eclipfes of the fun; but as they all, more or lefs, involve the principle of projection, as a preparatory ftep, it will be neceffary to defcribe the method by which this projection is ufually effected. One of the beft projections devifed for this purpofe, was firft given by our great aftronomer, Flamftead, and is thus defcribed by Mr. Vince:

On the Projection for the Conftruction of Solar Eclipfes.

As the ecliptic is inclined to the equator, and cuts it in two oppofite points, the fun keeps continually approaching to one pole, and receding from the other by turns, and therefore to a fpectator at the fun, the poles muft appear and difappear by turns. When the fun is on the north fide of the equator, the north pole muft appear; and when on the fouth fide, the fouth pole. When the fun is in the equator, the plane of illumination is perpendicular to the equator, and, confequently, the poles will lie in the circumference of the circle of illumination; when the fun comes to the tropic, the pole will appear in the middle of its path over the circle of illumination; and when the fun comes to the next equinox, the pole will appear on the other fide of the circle of illumination. When the fun gets on the other fide of the equator, this pole will difappear, and the other will appear in like manner. Hence, to a fpectator at the fun, the apparent motion of the pole P (*fig.* 82.) is the fame as if the axis P *p* of the earth had an annual conical motion P *r* Q *s*, *p n q m*, about an axis G O F, perpendicular to the ecliptic E O C, the angle P O G being equal to the greateft declination of the fun. As thefe circles, P *r* Q *s*, *p n q m*, are parallel to the ecliptic, their planes will pafs through the fun, and therefore to a fpectator at the fun, the apparent motion of the poles will be in the ftraight lines P Q, *p q*; and as P moves as faft in the circle P *r* Q *s* as the fun does in the ecliptic, if P be the place of the pole at the equinox, and we take the arc P *v* equal to the fun's diftance from that equinox, and draw *v o* perpendicular to P Q, *o* will be the apparent place of the pole at that time. It is manifeft that P *v* may be fet off upon any circle defcribed on P Q. Hence, alfo, the angle which the axis *v* O *w* makes with the plane of illumination muft be equal to the declination of the fun. As this apparent motion of the pole over the enlightened difc of the earth is caufed by the motion of the earth in its orbit, the motion of the pole over the difc will be in a direction contrary to the diurnal motion of the difc; if, therefore, P be the pofition of the pole at the vernal equinox, and P *r* Q be its motion over the difc of the earth to the next equinox, the diurnal motion of the difc will be made in the contrary direction.

When the fun, and confequently the fpectator, who is fuppofed to be at the fun, is in the equator, the fpectator being in the plane of the equator, and, as to fenfe, in the plane of all the circles parallel to it, they will all appear to be projected upon the circle of illumination into right lines parallel to each other. But when the fun, and confequently the fpectator, is out of the equator, the equator, and all the circles parallel to it, being feen obliquely, will appear to be projected into ellipfes upon the plane of illumination, as the eye may be confidered at an infinite diftance; and as the eye has the fame relative fituation to all thefe circles, the ellipfes muft be all fimilar. When the fun is on the north fide of the equator, that part of the ellipfe which is the projection of that part of the circle which lies between the north pole and equator on the enlightened hemifphere will be concave to the pole; but when the fun is on the other fide of the equator, that part will be convex. That is, let P (*fig.* 83.) be the north pole on the enlightened hemifphere, the fun being on the north fide of the equator, and *v x y z*, *a m b n*, the ellipfes into which the equator and any parallel to it are projected; then *a m b* is that part of the ellipfe which the place on this parallel defcribes in the day, and the other part *b n a* is that which is defcribed in the night; and the place is at *m* at 12 at noon, and at *n* at 12 at midnight. In this cafe, the other pole *p* muft be confidered as being on the other, or dark fide of the earth. But if P be fuppofed on the dark fide, and confequently *p* on the light fide, or if the fun be on the fouth fide of the equator, *n* will be 12 at noon, and *m* will be 12 at midnight. For if P *p* (*fig.* 84.) be the axis, L N the plane upon which the circle *a b* is to be projected, E

the sun on that side next to the north pole; then, drawing E am, E nb, the point a answering to noon, the sun being on the meridian, is projected at m, and the point b, answering to midnight, is projected at n; but when the sun is on the other side of ab, as at c, a is projected to m' and b to m'; therefore m' represents noon and m' midnight. On account of the great distance of the sun, compared with the radius of the earth, the lines E a, E b, and E a, E b may be considered as parallel, and therefore the circle ab is orthographically projected upon the plane L N into an ellipse, whose minor axis is mn, or $m'n'$.

The next thing to be done is to determine the magnitude of the ellipse into which the circle ab is projected, and its position upon the plane of illumination. Let P p (*fig.* 85.) represent the axis of the earth, $asbt$ a circle of latitude to any place. L P N p the meridian passing through the sun, and L O N the plane upon which the projection is made; then the angle L O P is equal to the sun's declination; draw am, bn, vr, perpendicular to L O, and mn is the minor axis of the ellipse; let vs be that radius of the circle ab which is parallel to the plane of projection, and it will be projected into a line equal to itself, and consequently it will be the major axis: hence 2 vs, or 2 va, or 2 cos. lat. is the major axis of the ellipse; but mn (the projection of ab upon L N) : ab :: sin. mab, or P O L the dec. : radius; that is, the axis major : axis minor :: rad. : sin. declination. And to find the distance O r from the centre of projection to the centre of the ellipse, we have, rad. = 1 : cos. v O r the dec. :: v O : O r = v O × cos. dec. = sin. lat. × cos. dec. But the radius of the projection is the horizontal parallax of the moon, diminished by the horizontal parallax of the sun; the radius, therefore, thus expressed, being multiplied by the quantities, whose values are expressed when radius is supposed to be unity, give the value in terms of that radius; hence, if hor. par. ☽ — hor. par. ☉ = h, then h × cos. lat. = the semi-axis major of the ellipse; h × cos. lat. × sin. dec. = the semi-axis minor; and O r = h × sin. lat. × cos. dec. Thus we have gotten the dimensions and position of the ellipse in terms of the radius of projection. Hence we have the following construction for the apparent ellipse described by any place on the earth's surface to a spectator at the sun.

Let G C F E (*fig.* 86.) be that half of the earth which is illuminated, E C the plane of the ecliptic, G O F perpendicular to it; take G Q = G V equal to the sun's greatest declination, join Q V, and on it describe the semi-circle V K Q, and take V h equal to the sun's distance from the vernal equinox corresponding to the pole at V, and draw h P perpendicular to V Q, and P is the place of the pole, which we will suppose to be on the enlightened disc of the earth. Put c = cos. V h, n = sin. V G, m = its cosine, to radius unity; then

$$\begin{array}{l} \text{P}c : c\text{V} :: c : 1 \\ c\text{V} : \text{O G} :: n : 1 \\ \hline \therefore \text{P}c : \text{O G} \ (= h) :: c \times n : 1; \end{array}$$

hence P c = h × c × n.

Also, h × m = O c; hence h × m : h × c × n :: rad. : tan. P O c = $\frac{c \times n}{m}$ = c × tan. 23° 28′ = 0.4341208 × c. Draw P O p, and upon O P take O r = h × sin. lat. × cos. dec.; draw bra perpendicular to O P, and take ra = rb = h × cos. lat. and rm = rn = h × cos. lat × sin. dec. and describe an ellipse $ambn$, and it will represent the apparent diurnal path of the place to a spectator at the sun, for the given declination of the sun. If x and z be the points where the ellipse touches the circle G C F E, the part $xambz$ will be on the illuminated part of the earth, and therefore visible to a spectator at the sun, and the part znx on the dark part, P being the north pole, and the sun's declination north; but if the declination be south, xnz will be the part on the illuminated side of the earth, and $zbmax$ on the dark part. Let the declination be north, and a the west side of the disc; then, to find where the given place on the earth's surface, is at any time, we may observe, that the place describing the circle which is projected into the ellipse $ambn$ moves uniformly in that circle, from the uniform motion of the earth about its axis; let, therefore, ayb be a circle; then, if every ordinate de diminished in the ratio of yr : mr, the circle will be projected into the ellipse amb; this semi-circle may, therefore, represent the half of the diurnal motion of the given place, so far as it is necessary to obtain the corresponding positions of the place in the ellipse. For, divide the semi-circle ayb into 12 equal parts from a, at 7, 8, 9, 10, 11, 12, 1, 2, 3, 4, 5, 6, representing the positions of the given place from a at six o'clock in the morning, to b at six in the evening, and these figures will represent the positions of the given place at the respective hours denoted by the figures; and if the dotted lines be drawn perpendicular to ab, the corresponding points denoted by the same figures will represent the positions of the place in the ellipse. This ellipse may be very accurately described, by diminishing each ordinate of the circle perpendicular to ab in the ratio of yr to mr, by taking a proper number of ordinates, and then describing a curve through all the points; and if these lines be continued to the other half of the ellipse, the hours, as there marked, will correspond to the positions of the given place. If each division of the semi-circle be divided into 10 equal parts, and ordinates be drawn to ab, the ellipse will be divided into every six minutes; and if the scale be large enough, and these divisions on the ellipse be subdivided into six equal parts, the ellipse will be divided into minutes, for there will be no occasion to use the circle for this last subdivision. Thus, we can always find the apparent position of any place on the earth's surface to a spectator at the sun.

Draw 11 w and 11 d perpendicular to ry; then 11 w = 11 d is the sine of 15° to the radius ra; and, by the principles of projection, yr : mr :: yd : mw, therefore, as yd is the versed sine of 15° to the radius yr, mw must be the versed sine of 15° to the radius mr; hence, if we take the sine and versed sine of 15° to radius unity, and multiply them into ra and rm respectively, they will give the values of 11 w and mw; and if rm be multiplied into the cosine of 15°, it gives rw. The same for any other angle.

It has been proved above, that O r = h × sin. lat. × cos. dec. and ra = h × cos. lat.; hence, O r : ra :: sin. lat. × cos. dec. : cos. lat.; consequently, O r = ra × $\frac{\text{sin. lat.} \times \text{cos. dec.}}{\text{cos. lat.}}$ = ra × tan. lat. × cos. dec.; therefore, if ra and cos. dec. be constant, O r varies as tan. lat. Also, the radius of projection must vary inversely as the cosine of the latitude.

Having determined the situation of the ellipse for any one latitude, in respect to the centre of projection, as the ellipses for all latitudes are similar, if the declination be given, we may make use of the same ellipse for all latitudes, only by altering O r in a proper ratio; for, if ra and the declination remain constant, r O varies as the tangent of latitude. Hence, take r O : r O′ as the tangent of the latitude for which the projection was made: tangent of any other latitude, and O′ will be the centre of projection, whose radius is also known; and $ambn$ is the ellipse for that latitude.

Let e be any position of the given place, and join e O; then the angle under which E O appears at the sun is the sun's horizontal parallax; also the angle under which e O appears at the sun must be the parallax in altitude at the point e, for the sun being vertical to O, the arc corresponding to e O is the zenith distance of the sun at the given place, and e O is the sine of that arc from the nature of the projection: but the hor. parallax : parallax at any altitude :: rad. : sine of the zenith distance :: O E : O e; hence if O E represent the horizontal parallax, O e will represent the parallax in altitude at e. Also as e represents the zenith of the given place, e O represents the vertical circle passing through the sun. The use of this projection is to construct the phases and times of a solar eclipse, as we shall now proceed to explain.

Let S (*fig* 87.) be the centre of the sun, xw the enlightened hemisphere of the earth, which we must conceive to be perpendicular to S C; draw S D, S V, tangents to two opposite points of the earth, and let $a\,m\,b\,n$ be the apparent ellipse described by any point m on the earth's surface; let O C be the distance of the moon from the earth, and $v\,d$, $a'm'b'n'$ be the projection of V D, $a\,m\,b\,n$ upon a plane at the moon perpendicular to S O, to an eye at S, and $a'm'b'n'$ will be the apparent motion of the centre of the sun at S to the spectator describing $a\,m\,b\,n$. The curve $a'm'b'n'$ may be considered as an ellipse; for the angle D S C being only $8\frac{3}{4}''$, D S, C S may be reckoned as parallel, and therefore the projection of D V upon a plane parallel to it may be considered as an orthographic projection, and consequently the two figures may in all respects be considered as similar. Let L M be the orbit of the moon; then if we know at any time the point of the ellipse $a\,m\,b\,n$ where the spectator is, we know the corresponding point where the centre of the sun is in the ellipse $a'm'b'n'$; if therefore we determine at the same time the point where the moon is in its orbit L M, we shall know the apparent situation of the moon in respect to the sun. Hence if we find two points, one in the ellipse $a'm'b'n'$ where the centre of the sun is, and another in L M where the centre of the moon is at the same time, and about these centres, with radii equal to the apparent semi-diameters of the sun and moon, we describe two circles, they will represent the apparent situations of the two discs. If that of the moon fall upon the sun, it shews how much the sun is eclipsed at that instant. Now the angle O V v = C O V − O S V, that is, the radius of projection is equal to the difference of the horizontal parallaxes of the moon and sun. The projection O e' of C e is the parallax in altitude of the moon from the sun, supposing the moon to be at the same altitude as the sun; for the radius O v represents the difference of the horizontal parallaxes of the sun and moon, or the horizontal parallax of the moon from the sun; and as the parallax of each varies as the sine of the apparent zenith distance; the distance, the difference of the parallaxes must vary as the sine of their common apparent zenith distance; hence O v : O e' :: difference of the horizontal parallaxes : difference of the parallaxes at their common apparent altitude; therefore, if O v represent the third term, O e' will represent the fourth. In an eclipse of the sun, therefore, this will be nearly true, but not accurately so, except when the sun and moon are at the same altitude. The place of the pole of the earth is here supposed to be fixed during the time of the eclipse, and consequently the earth is supposed to be immoveable for that time; the sun's declination is also supposed to be constant for the same time; but as these circumstances do not take place, the projected path of the spectator will not be accurately an ellipse. M. de la Caille observes, that in this projection, all the errors arising from the finite distances of the sun and moon are supposed to be compensated, by making the semi-diameter of the projection equal to the difference of their horizontal parallaxes; whereas only a part of the lines should be diminished in that ratio. The sun also not being at an infinite distance, the projection will not be an accurate ellipse. The spheroidical figure of the earth is also here not considered. All these circumstances tend to render the method of determining the phases of an eclipse by this construction subject to a certain degree of inaccuracy; but if the construction be made upon a large scale, it will be sufficiently accurate, when we only want to predict an eclipse. If S be a fixed star, the same construction will give the time of its occultation by the moon. In this case, as the fixed star has no parallax, the radius of projection is equal to the horizontal parallax of the moon.

To calculate an Eclipse of the Sun for any particular Place.

Having determined that there will be an eclipse somewhere upon the earth, compute, by the astronomical tables, the true longitudes of the sun and moon, and the moon's true latitude, at the time of mean conjunction; find also the horary motions of the sun and moon in longitude, and the moon's horary motion in latitude; and compute the time of the ecliptic conjunction of the sun and moon, in the same manner as the time of the ecliptic opposition was computed. At the time of the ecliptic conjunction, compute the sun's and moon's longitude, and the moon's latitude; find also the equatorial horizontal parallax of the moon from the tables of the moon's motion, and reduce it to the horizontal parallax for the given latitude, from which subtract the sun's horizontal parallax, and you get the horizontal parallax of the moon from the sun; reduce also the apparent latitude of the place on the spheroid to the latitude on a sphere.

To this reduced latitude of the place, and the corresponding horizontal parallax of the moon from the sun, (which we here use instead of the horizontal parallax of the moon, as we want to find what effect the parallax has in altering their apparent relative situations,) at the time of the ecliptic conjunction, compute the moon's parallax in latitude and longitude from the sun; the parallax in latitude applied to the true latitude gives the apparent latitude (L) of the moon from the sun; and the parallax in longitude shews the apparent difference (D) of the longitudes of the sun and moon.

Let S be the sun, (*fig.* 88.) E C the ecliptic; take S M = D, draw M N perpendicular to M S, and take it = L, then N is the apparent place of the moon, and S N = $\sqrt{D^2 + L^2}$ is the apparent distance of the moon from the sun.

If the moon be to the east of the nonagesimal degree, the parallax increases the longitude; if to the west, it diminishes it, hence if the true longitudes of the sun and moon be equal, in the former case the apparent place will lie from S towards E, and in the latter towards C. To some time, as an hour, after the true conjunction if the apparent place be towards C, or if the moon be to the west of the nonagesimal degree; or before the true conjunction if the apparent place be towards E, or if the moon be to the east of the nonagesimal degree, find the sun's and moon's true longitude, and the moon's true latitude, from their horary motions; and at the same time compute the moon's parallax in latitude and longitude from the sun; apply the parallax in latitude to the true latitude, and it gives the apparent latitude (l) of the moon from the sun; take the difference of the sun's and moon's true longitude, and apply the parallax in longitude, and it gives the apparent distance (d) of the moon from the sun in longitude. From S set off S P = d, and to E C erect the perpendicular P Q equal to l, and Q is the apparent place of the moon at one hour from the true conjunction; and S Q = $\sqrt{d^2 + l^2}$ is the apparent distance of the moon

moon from the sun; draw the straight line NQ, and it will represent the relative apparent path of the moon, considered as a straight line, in general it being very nearly so; its value also represents the relative horary motion of the moon in the apparent orbit, the relative horary motion in longitude being MP.

The difference between the moon's apparent distance in longitude from the sun at the time of the true ecliptic conjunction, and at the interval of an hour, gives the apparent horary motion (r) in longitude of the moon from the sun; the difference (D) between the true longitude at the ecliptic conjunction, and the moon's apparent longitude is the apparent distance of the moon from the sun in longitude at the true time of the ecliptic conjunction; hence $r : D :: 1$ hour : the time from the true to the apparent conjunction, consequently we know the time of the apparent conjunction. To find whether this time is accurate, we may compute (from the horary motions of the sun and moon) their true longitudes, and the moon's parallax in longitude from the sun, and apply it to the true longitude and it gives the apparent longitude, and if this be the same as the sun's longitude, the time of the apparent conjunction is truly found; if they be not the same, find from thence the true time, as before. To the true time of the apparent conjunction, find the moon's true latitude from its horary motion, and compute the parallax in latitude, and you get the apparent latitude at the time of the apparent conjunction. Draw SA perpendicular to CE and equal to this apparent latitude; then the point A will probably not fall in NQ; first let it fall in QN, to which draw SB perpendicular, and NR parallel to PM. Then knowing NR (= PM), and QR (= QP ~ MN), we have

NR : RQ :: rad. : tan. QNR, or ASB
Sin. QNR : rad. :: QR : QN

The time of describing NQ in the apparent orbit being equal to the time from M to P in longitude, NQ is the horary motion in the apparent orbit.

Rad. : sin. ASB :: AS : AB.
Rad. : cos. ASB :: AS : SB.

At the apparent conjunction the moon appears at A, which time is known; when the moon appears at B, it is at its nearest distance from the sun, and consequently the time is that of the greatest obscuration, (usually called the time of the middle,) provided there is an eclipse, which will always be the case when SB is less than the sum of the apparent semi-diameters of the sun and moon. If therefore it appears that there will be an eclipse, we proceed thus to find its quantity, and the beginning and end. As we may consider the motion to be uniform, QN : AB :: the time of describing NQ : the time of describing AB, which added to or subtracted from the time at A, (according as the apparent latitude is decreasing or increasing,) gives the time of the greatest obscuration. Or instead of taking QN, and the time of describing it, we may take An and the corresponding time, which will be more accurate.

From the sum of the apparent semi-diameters of the sun and moon subtract BS, and the remainder shews how much of the sun is covered by the moon, or the parts deficient; hence, semid. ☉ : parts deficient :: 6 digits : the digits eclipsed. If SB be less than the *difference* of the semi-diameters of the sun and moon, and the moon's semi-diameter be the *greater*, the eclipse will be *total;* but if it be the *less*, the eclipse will be *annular*, the sun appearing all round the moon; if B and S coincide, the eclipse will be *central*.

Let A fall out of QN; and to increase the accuracy, near to the apparent conjunction, that is, within 10 or 15 minutes, calculate the apparent longitude mS of the moon from the sun, and the apparent latitude mn; draw nr parallel to Sm; and in the triangle Anr, find the angle Anr which is equal to ASB, and compute SB, AB as before. But except in cases where very great accuracy is required, this is unnecessary. If NQ were a perfect straight line, the first operation would give the correct values of AB, BS. Kepler, in an eclipse in 1598, found a curvature of more than 3′ in three hours, because the moon was very near the nonagesimal. In the eclipse in 1764, M. de la Lande found a curvature of 26″, but he does not say in what time. It is owing to this circumstance, that is, the curvature of NQ, that it is necessary to find another point near to A, in order to determine accurately the values of AB, SB. Having determined the value of SB, and the time of the greatest obscuration, we thus find the beginning and end.

Produce, if necessary, QN, and take SV, SW equal to the sum of the apparent semi-diameters of the sun and moon, at the beginning and end respectively; then $BV = \sqrt{SV^2 - SB^2}$ (B being now supposed in QN), and $BW = \sqrt{SW^2 - SB^2}$; then to find the times of describing these spaces, say, as the hourly motion of the moon in the apparent orbit, or NQ : BV :: 1 hour : the time of describing VB; and NQ : BW :: 1 hour : the time of describing BW, which times respectively subtracted from and added to the time of the greatest obscuration, give nearly the times of the beginning and end. But if accuracy be required, this method will not do; for it supposes VW to be a straight line, which supposition will cause errors, too considerable in general to be neglected, and will never do where great accuracy is required. It may, however, always serve as a rule to assume the time of the beginning and end. Hence it follows, that the time of the greatest obscuration at B, is not necessarily equi-distant from the beginning and end.

If the eclipse be total, take Sv, Sw equal to the difference of the semi-diameters of the sun and moon, and then $Bv = Bw = \sqrt{Sv^2 - SB^2}$, from whence we may find the times of describing Bv, Bw, as before, which we may consider as equal, and which applied to the time of the greatest obscuration at B, give the time of the beginning and end of the total darkness.

To find more accurately the time of the beginning and end of the eclipse, we must proceed thus (*fig.* 89.) At the estimated time of the beginning, find, from the horary motions, and the computed parallaxes, the apparent latitude MN of the moon, and its apparent longitude MS from the sun, and we have $SN = \sqrt{SM^2 + MN^2}$, and if this be equal to the apparent semid. ☾ + semid. ☉ (which sum call S) the estimated time is the time of the beginning; but if SN be not equal to S, assume (as the error directs) another time at a small interval from it, *before*, if SN be *less* than S, but *after*, if it be *greater;* to that time compute again the moon's apparent latitude mn, and apparent longitude Sm from the sun, and find $Sn = \sqrt{Sm^2 + mn^2}$; and if this be not equal to S, proceed thus; as the difference of Sn and SN : the difference of Sn and SL (= S) :: the above assumed interval of time, or time of the motion through Nn, : the time through nL, which added to or subtracted from the time at n, according as Sn is greater or less than SL, gives the time of the beginning. The reason of this operation is, that as Nn, nL are very small, they will be very nearly proportional to the differences of SN, Sn, and Sn, SL. But as the variation of the apparent distance of the sun from the moon is not exactly in proportion to the variation of the differences of the apparent longitudes and latitudes, in cases where the utmost

utmoſt accuracy is required, the time of the beginning thus found (if it appear to be not correct) may be corrected, by aſſuming it for a third time, and proceeding as before. This correction, however, will never be neceſſary, except where extreme accuracy is required in order to deduce ſome conſequences from it. But the time thus found is to be conſidered as accurate, only ſo far as the tables of the ſun and moon can be depended upon for their accuracy; and the beſt lunar tables are ſubject to an error of 30″ in longitude, which, in this eclipſe, would make an error of about a minute an half in the time of the beginning and end. Hence accurate obſervations of an eclipſe, compared with the computed time, furniſhes the means of correcting the lunar tables, as will be afterwards explained. In the ſame manner, the end of the eclipſe may be computed.

Example.—To compute the Times of the Solar Eclipſe on April 3, 1791; for the Royal Obſervatory at Greenwich.

The time of the mean conjunction is April 3, $2^h\ 58'\ 15''$ mean time, at which time we find

Mean long. of the ſun -	$0^s\ 11^\circ\ 51'\ 16''$
Long. of the the moon's deſc. node	$0\ 22\ 14\ 44$
Mean long. of ☉ from ☾'s node	$0\ 10\ 23\ 28$

Hence there muſt be an eclipſe ſomewhere upon the earth.

To the mean time of the new moon, compute the ſun's and moon's true longitudes, and they will be found to be $0^s\ 13^\circ\ 47'\ 43''$, and $0^s\ 14^\circ\ 49'\ 24''$; compute alſo the moon's true latitude, and it will be found to be $38'\ 49''$ N. deſcending. At the ſame time, the ſun's horary motion is found to be $2'\ 28''$, the moon's horary motion in longitude is $30'\ 12''$, and in latitude $2'\ 46''$ decreaſing; hence the moon's horary motion in longitude from the ſun is $27'\ 44''$.

By proceeding as before directed, we find the mean time of the ecliptic conjunction of the ſun and moon to be $3^d\ 0^h\ 44'\ 48''$, from which ſubtract $3'\ 18''$ the equation of time, and it gives the apparent time $3^d\ 0^h\ 41'\ 30''$; at which time, the ſun's and moon's longitude in the ecliptic is $0^s\ 13^\circ\ 42'\ 14''$; and the moon's true latitude is $44'\ 59''$ N. deſcending. The horizontal parallax of the moon is $54'\ 46''$, and of the ſun, $9''$; hence the horizontal parallax of the moon from the ſun is $54'\ 37''$; therefore the moon's parallax in longitude from the ſun is $-\ 20'\ 56''$, and its parallax in latitude from the ſun is $-\ 33'\ 44''$; hence $-\ 20'\ 56''$ is the apparent diſtance of the moon from the ſun in longitude; alſo the apparent latitude from the ſun is $11'\ 15''$ north.

As the moon is to the weſt of the nonageſimal degree, aſſume 1 hour after, or $3^d\ 1^h\ 41'\ 30''$, at which time (from the horary motions of the ſun and moon) the ſun's true longitude is found to be $0^s\ 13^\circ\ 44'\ 42''$, the moon's true longitude on the ecliptic $0^s\ 14^\circ\ 12'\ 26''$, and true latitude $42'\ 13''$ north deſcending. The moon's parallax in latitude is $-\ 30'\ 41''$; hence the moon's apparent latitude is $11'\ 32''$; alſo its parallax in longitude from the ſun is $-\ 28'\ 50''$; but the moon's true longitude exceeds the ſun's by $0^\circ\ 27'\ 44''$; therefore the apparent diſtance of the moon from the ſun in longitude is $-\ 1'\ 6''$. Hence,

Moon's apparent diſt. in long. at $0^h\ 41'\ 30''$	$= -\ 20'\ 56''$
at $1\ 41\ 30$	$= -\ 1\ \ 6$
Apparent hor. mot. ☾ from ☉ in long.	$19\ 50 =$ MP.

Hence $19'\ 50'' : 20'\ 56'' ::$ 1 hour : $1^h\ 3'\ 20''$, which added to the time of the true conjunction $0^h\ 41'\ 30''$, gives $1^h\ 44'\ 50''$, the time of the apparent conjunction. Alſo the apparent horary motion in latitude is $17'' =$ RQ; hence QN is very nearly equal to MP.

At this time (from the horary motions) the ſun's true longitude is found to be $0^s\ 13^\circ\ 44'\ 50''$, the moon's $0^s\ 14^\circ\ 14'\ 7''$, and the moon's true latitude $42'\ 4''$; hence the moon's true longitude is greater than the ſun's by $29'\ 17''$. The moon's parallax in latitude from the ſun is $-\ 30'\ 32''$, and in longitude $-\ 29'\ 15''$; hence the moon's apparent latitude is $11'\ 32''$ north; alſo the apparent longitude from the ſun is $29'\ 17'' - 29'\ 15'' = 2''$, which is what the moon's apparent longitude exceeds the ſun's true longitude.

This difference ſhews the apparent conjunction, found above, to be very nearly true; and to get it accurate, ſay, $19'\ 50'' : 2'' ::$ 1 hour : $6''$, which (as the moon's apparent longitude is the greater) ſubtracted from $1^h\ 44'\ 50''$ gives $1^h\ 44'\ 44''$, the true time of the apparent conjunction, at which time the moon's apparent longitude is $0^s\ 13^\circ\ 44'\ 50''$, the ſame as the ſun's true longitude, that not having ſenſibly varied in $6''$ of time. The apparent latitude is $11'\ 32''.25$. Now at $1^h\ 41'\ 30''$ the moon's apparent diſtance in longitude from the ſun has been ſhewn to be $1'\ 6''$; and at $1^h\ 44'\ 44''$ the longitude of the ſun, and the moon's apparent longitude are equal; therefore in $3'\ 14''$ the apparent motion of the moon from the ſun was $1'\ 6'' = 66''$; let this $= Sm$, or nr; alſo at $1^h\ 41'\ 30''$, the apparent latitude $mn = 11'\ 32''$, and at $1^h\ 44'\ 44''$ it was $11'\ 32''.25 =$ SA; therefore $Ar = 0''.25$. Hence,

$$66'' : 0''.25 :: \text{rad.} : \text{tan. } Anr, \text{ or SAB} = 13'\ 1''.$$

As the angle Anr is ſo very ſmall, we may take $An = rn = 66''$ without any ſenſible error; and for the ſame reaſon SB may be taken $=$ SA $= 11'\ 32''$.

$$\text{Rad.} : \text{ſin. } 13'\ 1'' :: 11'\ 32'' : \text{AB} = 2''.6$$

Hence $An = 66'' :$ AB $= 2''.6 ::$ $3'\ 14'' : 8''$ the time through BA, which taken from $1^h\ 44'\ 44''$ gives $1^h\ 44'\ 36''$ the time of the greateſt obſcuration at B.

The moon's horizontal ſemi-diameter is $14'\ 56''$, and its altitude at the time of the greateſt obſcuration (determined by a globe, which is ſufficiently near for this purpoſe) is about 38°; hence the augmentation of the diameter is $9''$, conſequently the apparent ſemi-diameter of the moon is $15'\ 5''$, which added to $15'\ 59''$ the ſun's ſemi-diamer, gives $31'\ 4''$, from which ſubtract SB $= 11'\ 32''$, and the remainder is $19'\ 32''$ the parts deficient; hence $15'\ 59'' : 19'\ 31'' ::$ 6 digits : $7^d\ 19'\ 57''$ the digits eclipſed at the time of the greateſt obſcuration.

To find the time of the beginning, we muſt firſt get the time nearly. The value of SB $= 11'\ 32'' = 692''$; and as the apparent ſemi-diameter of the moon is now $15'\ 6''$, we have SV $= 31'\ 5'' = 1865''$; hence BV $= 1732''$. Now as MP is, in this caſe, nearly equal to QN, we may, for the purpoſe we here want it, aſſume the apparent horary motion of the moon from the ſun in the apparent orbit equal to that in longitude, which is $19'\ 50'' = 1190''$; hence $1190'' : 1732'' ::$ 1 hour : $1^h\ 27'\ 20''$, which ſubtracted from $1^h\ 44'\ 36''$ (the time at B) gives $0^h\ 17'\ 16''$ the time of the beginning, nearly. Let us therefore aſſume the beginning at $0^h\ 17'$, at which time we find (from the horary motions of the ſun and moon) the ſun's true longitude to be $0^s\ 13^\circ\ 41'\ 15''$, and the moon's $0^s\ 13^\circ\ 39'\ 55''$, whoſe difference is $11'\ 20''$ their true diſtance in longitude; but the moon's parallax in longitude is $-\ 17'\ 45''$; hence their apparent diſtance in longitude is $29'\ 5'' = 1745''$. At the ſame time the moon's true latitude is $46'\ 7''$, and its parallax in latitude $-\ 35'\ 10''$; hence the apparent latitude of the moon from the ſun is $10'\ 57''$; therefore SN $= \sqrt{1745^2 + 657^2} = 1864'' = 31'\ 4''$, which being leſs than $31'\ 5''$ ſhews that the eclipſe is begun.

Let us next aſſume $0^h\ 16'$; and by proceeding in the ſame manner, we find $Sn = 1883'' = 31'\ 23''$; therefore the eclipſe is not begun.

Hence

Hence $31' 23'' - 31' 4'' = 19'' : 31' 5'' - 31' 4'' = 1''$ :: 1 minute : 3″, which subtracted from $0^h 17'$, gives $0^h 16' 57''$ for the beginning of the eclipse.

If to $1^h 44' 36''$ we add $1^h 27' 20''$, we have $3^h 11' 56''$; we will therefore assume $3^h 12'$ for the end; and by proceeding as before, we find the apparent distance of the moon from the sun in longitude to be $30' 37''$, and the moon's apparent latitude $10' 48''$; hence the moon's apparent distance from the sun is $\sqrt{1837^2 + 648^2} = 1948'' = 32' 28''$; but the sum of the apparent semi-diameters of the sun and moon is now $31' 2''$; consequently the eclipse is ended.

Let us next assume the time $3^h 6'$, and the apparent distance of the moon from the sun in longitude is $28' 28''$, and in latitude $10' 55''$; hence the moon's apparent distance from the sun is $\sqrt{1708^2 + 655^2} = 1829'' = 30' 29''$, therefore the eclipse is not ended.

Hence $32' 28'' - 30' 29'' = 1' 59'' : 31' 2'' - 30' 29'' = 33''$ :: 6′ : 1′ 39″, which added to $3^h 6'$, gives $3^h 7' 39''$ for the end.

Hence at the Royal Observatory at Greenwich, the tables give the time of the eclipse on April 3, 1791,

Beginning -	$0^h 16' 57''$	apparent time.
Greatest obscuration	1 44 36	
End -	3 7 39	
Digits eclipsed -	$7^d 19' 57''$	

If it be required to compute the eclipse for any other place, instead of the latitude of Greenwich, use the latitude of the place; and reduce the apparent time at Greenwich to the apparent time at the place, according to the difference of the meridians.

To find what point of the sun's limb will first be touched by the moon, let P (*fig.* 90.) be the pole of the ecliptic ES, Z the zenith, S, M, the centres of the sun and moon when their limbs are in contact at *a*, and draw MD perpendicular to ES. PZ is the altitude of the nonagesimal degree, and SPZ is the sun's distance from that point, both which are found in the computation of the parallax; also MD is the apparent latitude of the moon; hence,

Rad. : tan. PZ :: sin. SPZ : tan. PSZ
Tan. SM : rad. :: tan. DS : cos. DSM

If L be the longitude of the nonagesimal degree, then $ZSD = 90° - PSZ$; when the sun's longitude is between L and $L + 180°$; otherwise, $ZSD = 90° + PSZ$; and $ZSD \pm MSD$ (according as the moon's visible latitude is south or north) gives ZSM, the distance of the point of the limb of the sun first touched by the moon from the highest point of the sun's disc.

In this eclipse, $PZ = 50° 7'$, and $SPZ = 25° 16'$; hence $PSZ = 27° 3'$, which, in this case, added to 90°, gives $117° 3' = ZSD$; also $DSM = 20° 42'$, which, (as the moon's apparent latitude is north) subtracted from $117° 3'$, gives $ZSM = 96° 21'$, the moon's distance from the zenith of the sun at the beginning of the eclipse. In like manner, the distance at the middle and end of the eclipse may be found, and thence the apparent path of the moon over the sun's disc in respect to the horizon may be described.

In the computation of this eclipse, the moon's true latitude and longitude was at first computed from the tables, and afterwards determined from the horary motions; but as the horary motions may be subject to a small variation in the duration of an eclipse, in cases where the utmost accuracy is required, the true latitude and longitude should be computed every time from the tables; in such cases, the decimals of the seconds should also be taken into consideration, which in this example were omitted. When we want only to predict an eclipse, the method here practised will always be sufficiently accurate, the error being always very small, compared with the error to which the tables are subject, which may, at its maximum, be 30″ in longitude. We have followed the same method in computing the occultation of a fixed star by the moon; that computation, therefore, may, if necessary, be rendered more correct in the same manner.

To construct a Solar Eclipse by the Principles of Projection.

According to this projection, the apparent ellipse described by any point on the earth's surface, to any eye at the centre of the sun, is projected upon a plane at the moon perpendicular to a line joining the earth and sun; and the point of the ellipse of projection, corresponding to any point of the other ellipse where the spectator is, is the point where the centre of the sun appears to the spectator. The centre of projection is in the ecliptic. If the lunar orbit be properly laid down and divided, shewing where the centre of the moon is at any time, we shall then have the relative situation of the centres of the sun and moon at any time seen from the given place of the spectator. From these principles of projection, we thus construct the solar eclipse which we have here calculated; assuming such elements as are necessary, from that calculation.

Take a radius OE (*fig.* 91.) equal to $54' 37''$, the difference of the sun's and moon's horizontal parallaxes, and divide it into minutes, and describe the semi-circle E G C representing half the circle of projection, E O C representing the ecliptic, to which draw OG perpendicular. Find P, the projected north pole; from the scale OE, take $Or = 54' 37'' \times$ sin. lat. × cos. dec. and in a line perpendicular to O*r* set off both ways $r6 = h \times$ cos. lat. and $rm = rn = h \times$ cos. lat. × sin. dec. and describe the ellipse *m*6*n*6, and divide it into hours; and then subdivide these hours which you will want to make use of, as far as you conveniently can for the size of the figure. From the scale take O*v* equal $44' 59''$, the moon's true latitude north descending at the time of the ecliptic conjunction, and draw L*v*M, making an angle with O*v* equal to 84° 18′, the complement of the angle which the relative orbit makes with the ecliptic, on the *left* side, if the latitude be north or south *decreasing*, and on the *right*, if *increasing;* in this example it is on the left side; and L*v*M will represent the moon's relative orbit. Mark upon the moon's orbit, at the point *v*, $41' 30''$, that being the time after 12 o'clock at which the true ecliptic conjunction happens; and with an extent $= 27' 52''$, the horary motion of the moon from the sun in its relative orbit, set off the hours each way from *v*, and subdivide them into minutes, or as far as the size of the figure will permit. Now to find the time of the middle of the eclipse, take the compass, and find, by trial, what two corresponding times, as at *z* and *x*, upon the ellipse and moon's orbit, are nearest together, which will give the time of the *greatest obscuration*, because the centres of the sun and moon are then at the least distance. To find the time of the beginning, take, with the compass, from the scale, an extent equal to $31' 5''$, the sum of the semi-diameters of the sun and moon, and by trial find two corresponding times, as at *s* and *t*, at that distance, and it gives the time of the *beginning;* and if you find two corresponding times, as at *y* and *w*, at the distance $31' 2''$, the sum of the semi-diameters at the end, it gives the time of the *end;* or you may omit the variation of the diameter of the moon in the interval. For the beginning must be when the centres of the sun and moon arrive at the distance of the sum of their semi-diameters; and the end must be when they have receded till they have got to that distance. To find the digits eclipsed at the greatest obscuration, take *eu* from the scale, and say, *ze* : *eu* :: 6 digits : the digits eclipsed. To find the digits eclipsed at any other time, take, with the compass, the interval at that time on the ellipse and on the moon's orbit, and

and apply it to the scale, and then say, ze : that distance :: 6 digits : the digits eclipsed.

If by taking the interval of two corresponding times, it appears that it is always greater than the sum of the semi-diameters of the sun and moon, it shews that there will be no eclipse at that place.

From this construction, the position of the moon in respect to the zenith of the sun's disc may be found, and thence the apparent path of the moon over the sun in respect to the horizon. For a line drawn from O (*fig.* 92.) to any point of the ellipse, where the spectator is, being vertical, from the principles of the projection, the angles O ts, O zx, O wy, shew the angular distance about the centre of the sun from its vertex, to the centre of the moon at the beginning, middle, and end of the eclipse. Hence, let C be the centre of the sun Z bda, Z its zenith; and make the angles Z C P, Z C Q d, Z C R = O ts, O zx, O wy respectively; take C P, C R equal to the sum of the semi-diameters of the sun and moon, dC s = the digits eclipsed, and S Q = a P, and with the centres P, Q, R, and radii P a = Q s = R b equal to the semi-diameter of the moon describe three circles, and they will represent the situation of the moon at the beginning, middle, and end of the eclipse, in respect to the vertex Z of the sun, and consequently in respect to the horizon; hence, if we describe a circle through P, Q, R, and with the same radius describe rst parallel to it, it must very nearly represent the boundary of the eclipse, or of the extreme part of the moon's limb as it passes over the sun, in respect to the horizon.

The eclipse may also be thus calculated from the projection. Assume the time at t of beginning, as determined by the construction; draw tc perpendicular to O P, and join O t, O s. The time from t to m being given, convert it into degrees a°; then sin. $a^{\circ} \times rb = tc$, and cos. $a^{\circ} \times rm = rc$, but O r is known, hence O c is known; therefore, in the right-angled triangle O c t, we know O c, c t, to find cO t, and O t; but P O v is given, therefore, cO t + P O v = tO v is known; also O v and the angle O vs are known by the construction; and the time from s to v being given, and also the moon's relative horary motion in L M, we know vs; hence, in the triangle O vs, we know O v, vs and the angle O vs, to find O s, and the angle vO s; hence, we find tO s = tO v + vO s; and lastly, in the triangle tO s, we know tO, O s and the angle tO s, to find ts, and if this be equal to the sum of the semi-diameters of the sun and moon, the assumed time is true; if it be not equal to the sum, assume another time for the beginning, and find another value of ts. In like manner we may find the end. But this method is not subject to the same accuracy as the method of calculation which we have already given.

Sir I. Newton supposes that the aberration of rays in the focus of a telescope makes the image appear greater than it ought; and hence different telescopes will give different measures of the sun's diameter, and consequently make the eclipse appear to begin at different times. That telescope which gives the diameter the least, is the most perfect instrument. The excellent transit telescope at Greenwich makes the diameter of the sun less by 6″ than that given by Mayer in his tables, as Dr. Maskelyne has found by his observations. The diameter of the sun assumed in these calculations has, therefore, been taken 6″ less than that which Mayer determined. M. du Sejour supposes that the rays of light coming from the sun are inflected as they pass by the moon, which he attributes to the refraction which they suffer in passing through the moon's atmosphere; on this account the apparent contact of the limbs will not take place so soon as it otherwise would; this would be the same as a diminution of the moon's diameter: which of these hypotheses ought to be admitted, M. du S jour endeavoured to determine from the observations of Mr. Short, on the solar eclipse, April 1, 1764, upon the distance of the horns of the moon, but he could deduce nothing satisfactory from thence. He supposed the inflection 3″.291, and the diameter of the moon to be diminished by the same quantity, and calculated upon each supposition a great many distances of the horns, and compared them with the observed distances; but he could not decide between the two hypotheses. An inflection of 1″.8 and a diminution of 1″.5 of the semi-diameter, he found would satisfy some observations, and he seemed to think this conclusion most likely to be nearest the truth; but he came at last to no determination upon the subject. All the requisite observations seem not to be capable of being made to that degree of accuracy which is necessary to settle so nice a matter. M. du Sejour, therefore, proposed the following method to determine whether the rays of light passing by the limb of the moon suffer any deviation. Take a telescope mounted upon a polar axis, with a wire micrometer annexed to it. When two stars come into the field of view together, and one of them is to be eclipsed by the moon, open the wires and bring one star upon one of the wires, and the other star upon the other, and thus follow the stars until one of them be eclipsed, and at the instant before it disappears, observe whether its distance from the other star is changed, that is, whether it be off the wire, the other star remaining upon its wire; if this be found to be the case, the rays must have suffered a deviation. (Traité Analytique, p. 420.) We do not find that an observation of this kind has been ever made.

To trace out the Path on the Surface of the Earth, where the Eclipse will be central, or for any Number of Digits.

Let E A C D (*fig.* 93.) be the enlightened hemisphere of the earth, O the centre of the disc, or that point to which the sun is vertical; E O C the plane of the ecliptic, O G perpendicular to it; P the north pole; join P O, and let L M represent the path of the centre of the penumbra, conceived to be upon the plane into which the disc would be orthographically projected; then, from the nature of that projection, the angles at O upon the surface will be equal to the angles into which they are projected. Now, the place upon which the centre of the moon is projected, is manifestly that point on the earth where the eclipse is central, because the projection is made by lines drawn to the centre of the sun. Let Z be the projected centre of the moon at any time, or the real centre of the penumbra, and P B any given meridian. Now, we know O v the moon's latitude at the time of conjunction, and the angle O vZ; and as the time, when the centre of the penumbra is at Z, is given, the time through Z v is known, and the relative horary motion of the moon being known, vZ will be known; hence we can find Z O, and the angle Z O v; find the angle P O v, and we shall have the angle P O Z. Now consider P O and Z O as two circles upon the earth's surface, then the angle P O Z between them is equal to the angle P O Z of projection, and therefore known; also the arc P O is the complement of the sun's declination; and to find the arc Z O, we must consider Z O in the projection to be the sign of the arc projected; hence the arc Z O is that whose sine is to radius as O Z to O A, therefore we know the sine of the arc Z O, and consequently we get Z O itself; hence, in the spherical triangle O P Z, we know P O, O Z, and the angle P O Z, to find P Z the complement of the latitude of the place where the eclipse is central. Find also the angle O P Z;

O P Z; then the time at the meridian P B being known, the angle O P B (the sun's distance from the meridian) is known; hence we know the angle B P Z, the longitude of the point Z from the meridian P B; therefore the latitude and longitude of Z being known, the point Z is determined where the eclipse was central at the given time. Make this calculation for every quarter or half hour, for all the time the penumbra is describing *d e*, and you will trace out upon the surface of the earth the path of the centre of the penumbra, or that tract where the eclipse is central. If we bring Z to *d*, we get the place where the sun rises centrally eclipsed; and if Z be brought to *e*, we shall find where the sun sets centrally eclipsed. If Z coincide with *r*, we get the place where the sun is centrally eclipsed upon the meridian. Let *y* be the centre of the penumbra when it first touches the earth, and *x* the centre when it leaves the earth, and draw O *w* perpendicular to L M. Then, knowing O *v* and the angle O *v w*, we can find O *w* and *v* O *w*; also O *y* = semid. ⊖ + semid. penumb. known; hence, in the right-angled triangle *y* O *w*, we get the angle *y* O *w*, and therefore we know *y* O *v*; and P O *v* being already found, we know *b* O P; hence, in the triangle *b* O P, we know *b* O (= 90°). P O, and the angle P O *b*; hence we find P *b* the complement of the latitude of *b*; find also O P *b*, and we get *b* P B the longitude of *b*, from the given meridian P B; thus we get the place *b* where the eclipse first begins at the sun rising. In like manner we get the place *a* where the eclipse last ends at sun setting.

Example.—In the solar eclipse, which we have here computed, let it be required to find that place upon the earth's surface where the sun is centrally eclipsed at one o'clock, apparent time at Greenwich. In this case, O *v* = 44′ 59″, and the angle O *v* Z = 5° 42′, and as the time at *v* is 41′ 30″, and the centre of the penumbra is at Z at one o'clock, the time through *v* Z = 19′ 30″, which gives *v* Z = 9′ 3″; hence Z O = 35′ 59″, the angle O Z *v* = 81° 22′, and Z O *v* = 13° 56′. Now, the radius O G = 54′ 56″; hence the arc O Z upon the surface (corresponding to its projection = 35′ 59″) = 41° 4′; also P O = 84° 30′, and P O *v* = 23° 22′; hence P O Z = 9° 26′; consequently P Z = 45° 43′, the complement of which is 44° 17′, the latitude of the place; also Z P O = 8° 51′; but at one o'clock, apparent time at Greenwich, its meridian B P makes an angle of 15° with P O, Greenwich being upon that meridian at 12 o'clock; hence B P Z = 23° 51′ the longitude of the place, west from Greenwich. In like manner may any of the other phenomena be calculated.

Draw O W (*fig.* 94.) perpendicular to L M, and take *v c* = *v e* equal to the sum of the semi-diameters of the sun and moon, and draw *d c f*, *x e y* parallel to L M; then *d f* and *x y* will mark out the boundaries of the eclipse, or the places where the limbs of the sun and moon just appear in contact. So that if we take the moon at any place Z, and draw Z *r* perpendicular to *d f*, and compute the latitude and longitude of the point *r* in the same manner as we did that of Z in the last article, it will give the place where the limbs of the sun and moon appear in contact outwardly. If we take Z *r* on the other side of L M, we shall, on that side, get the place where they appear in contact. If we do this for every quarter or half hour, we shall trace the path over the surface of the earth where the limbs of the sun and moon appear in contact, or the boundaries of the eclipse; thus, we can lay down upon the earth's surface that tract over which the penumbra passes. If *c v* be divided into twelve equal parts, and *c k* be taken equal to three of them, for instance, and *k s* be drawn parallel to L M, and the place of *r′* be computed, it gives the place where the sun will be three digits eclipsed; and in like manner as before may the tract on the earth's surface be marked out where the sun will appear three digits eclipsed; in the same manner, we may trace out the path for any number of digits. If *v a* = *v b*, and *a b* be the difference between the apparent diameters of the sun and moon, and *w a z*, *g b h* be drawn parallel to L M; then, if the diameter of the moon be greater than that of the sun, the space between *w z* and *g h* is the limit for the total eclipse; but if the diameter of the sun be the greater, it will be the limit of the annular eclipse. This method of delineating the lines of the phases upon the earth's surface supposes that the apparent nearest distance of the centres of the sun and moon, or of the corresponding horns upon the relative orbit of the moon and upon the eclipse, is in a line perpendicular to the moon's relative orbit; but this is not accurately true, and therefore the delineation cannot be accurate. This line will have different positions at different places for the same phase. M. du Sejour proposes, therefore, to take the mean angle. He found an error of 3° 33′.5 in longitude, and of 35′ 49″ in time of the contact, for the latitude of 16° 57′, by supposing it to happen upon a perpendicular to the relative orbit.

M. de la Lande has given the following graphical method. Draw L M on a separate piece of paper, and divide it, so that by moving it you may bring any hour to *v*. Then if, for instance, the orbit be moved to the right till the time of falling on *v* be one hour later than that for which the construction was first made, it is in a proper position for a place 15° to the east of that place. Let *p q* be any parallel of latitude, and divide it into hours, &c. then move the orbit L M until, with an extent of compass equal to the sum of the semi-diameters of the sun and moon, you can make the points fall on the same hour both on *p q* and L M, and at the same time that it shall be the shortest distance between any two corresponding hours on *p q* and L M; then the difference of the hours shewn at *v* in consequence of the removing of the orbit shews the longitude of the place from that for which the projection was made, and the parallel *p q* shews the latitude; therefore the place on the earth's surface is determined where the limbs just come into contact, and also the time. This we may repeat for as many parallels of latitude as we please, and thus trace out the curve on the surface of the earth where the limbs just come into contact. In like manner, if we take an extent of compass $\frac{1}{12}$th of the sun's diameter less, we may trace out the path where the sun is one digit eclipsed; and so for any other phase.

But the general phenomena may be much more easily, and with sufficient accuracy, determined by a common globe thus. Bring the sun's place S to the brazen meridian P V, (*fig.* 95.) set the hour index to 12, and bring the sun to the zenith; and from that point on the globe, extend a thread S W perpendicular to the ecliptic E C. Upon a small straight rod L M let there be a moveable circle *a d b m*, whose centre *r* is in the middle of the rod, and let its radius be to the radius of the globe as the semi-diameter of the penumbra is to the horizontal parallax of the moon. Let there be two moveable upright pieces attached to the horizon of the globe, and capable of being fixed at any two points; at a distance S *v* equal to the moon's latitude at the time of the ecliptic conjunction, let the rod L M cut the thread in a plane touching the globe at S, and making an angle M *v* S equal to the angle which the relative orbit makes with a perpendicular to the ecliptic, as before directed; and in this situation let the rod be fixed to the above-mentioned pieces, attached to the horizon; let also L M be divided into time, the time at the point *v* being that of the ecliptic conjunction; and let the horizon of the globe be fixed exactly parallel

rallel to the horizon; and upon a fine thread *a b* suspend a small conical weight, with an acute vertex; every thing being thus prepared, we proceed thus; first premising, that the circle T E V C (coinciding with the horizon of the globe) contains all the places where the sun is in the horizon, the western hemisphere containing those where the sun is rising, and the eastern where the sun is setting.

Carry the centre of the penumbra to *r* where you find, by suspending the line from its periphery, that its projection would just touch the earth at *t*; then turn the globe till the index shews the same hour as the point *r*, and the point *t* at that time is the place first touched by the penumbra, and the eclipse there begins at sun-rise. Carry the centre of the penumbra to *s*, a quarter of an hour forwards, for instance, and set the globe again to that time; and with the line find the points *x*, *w*, where the projection of the circumference of the penumbra would intersect the circle T C V E, and *x*, *w*, are two other points where the eclipse begins at sun-rise. By proceeding thus through the western part, we may find as many points as we please, where the eclipse begins at sun-rise, and by drawing a curve through them, we get the tract on the earth's surface, where the eclipse begins at the rising of the sun. But when *x* comes into the eastern part, we get the places where the eclipse begins at sun-set; consequently the curve passing through them is a continuation of the curve which passes through all the places where the eclipse begins at sun-rising, provided the whole of the penumbra does not fall upon the earth at the middle of the eclipse; that is, if O be the middle of the general eclipse, and O T be perpendicular to L M in the projection, when O T is less than the radius (R) of the penumbra. If O T = R, the curves touch, and if O T be greater than R, they are separated; because the penumbra then passes over a part of the earth after it leaves the western side before it comes to the eastern, and therefore in that interval the sun is not eclipsed to any part of the circumference T E V C.

Draw *b r a* perpendicular to L M, and *a c* parallel to it; and when *w* comes to *e*, the intersection manifestly begins to go back, and the part *a d b* will then cut T C V, and therefore the intersections will shew the points in the horizon where the eclipse ends at sun-set; for the velocity of the penumbra being greater than that of the earth about its axis, the penumbra must leave the point which it then touches. And for this reason the eclipse begins where *b t a* cuts T C V. Hence, as *c* is a point where the eclipse ceases to begin at sun-rise and begins to end at sun-set, the curve shewing the places when the eclipse begins at sun-rising is continued into the curve, which shews the places where the eclipse ends at sun-rising; and as *x* and *w* meet again on the eastern side of the earth, the curves there meet again. When, therefore, O T is less than R. (*fig.* 96.) we have a curve. The velocity of the parts of the earth, from its rotation, being greatest towards the equator, the ovals will be more open towards A and B than towards C.

If O T = R, (*fig.* 97.) the two ovals touch; but that nearest the pole is double.

If O T be greater than R, (*fig.* 98.) the two ovals will be detached; but if the perpendicular D *z*, on L M (in the projection,) be less than R, the oval nearest the pole will be double. Two curves A B, C D, touching the ovals, and formed by the projection of *a* and *b*, will shew where the limbs of the sun and moon were in contact.

If L M fall beyond the earth, or if O lie on the other side of T, the curve will be like *fig.* 95, until D *z* be greater than R, in which case the curve becomes a simple oval; and when O T = R, the oval vanishes. These circumstances, which were given by M. Delambre, appear from this method of delineation.

The projection of *b a* will give the middle of the eclipse. The western part of T C V, which is cut by *b a* in the projection, is the point where the eclipse is in the middle at sun-rise; and where the eastern part of the horizon is cut by it, it shews the point where the middle of the eclipse is at sun-set. When *a* comes to *c*, the globe being adjusted to that time, *c* is a point of the former kind, but here the eclipse is only for a moment, or rather there is no eclipse, the moon's limb only touching that of the sun. As the umbra advances, *a b* will cut T C V at some other point, as *w*; to the time denoted by the centre *r*, adjust the globe, and *w* is the place upon the earth where the middle of the eclipse is at sun rising. And thus we may find any number of such places, and draw a curve, as B D A. (*fig.* 96.) passing through all the places where the middle of the eclipse is at the rising of the sun. As the line, in this case, must be suspended from *b a*, it will be more convenient to have the penumbra divided into two parts through *a b*, so that they may be separated.

To trace out the centre of the penumbra over the earth, bring, by the line, the centre to coincide in the projection with T C V at *e*, (*fig.* 95.) and adjust the globe to that time, and *e* will be the place where the centre of the umbra first touches the earth. Carry on the penumbra, a quarter of an hour for instance, and adjust the globe to the time, and project the centre upon the earth, and it gives the point where the eclipse is central at that time. Find thus as many points as you please, and draw a curve through them all, and you get the path of the centre of the penumbra over the earth, shewing all those places where the eclipse was central.

If the penumbra be formed by 12 equi-distant concentric wires, the phenomena of any one of the digits may be traced out in the same manner; that is, we can find, for instance, all the places where the sun is three digits eclipsed at its rising and setting, and the tract where the sun is three digits for the time of the eclipse. The globe here used should be one which has the hours marked on the equator.

The method of tracing out the different curves was, we believe, first given by M. de la Caille in his Astronomy. M. du Sejour has given an analytical method of laying down the curves in his Traité Analytique. But these are matters rather of curiosity than of any real use in astronomy. If we place the circle E T C V perpendicular to the horizon, and vertical to S, a strong lamp be fixed in the principal focus of a double convex lens, so that the rays may be thrown parallel upon the globe and perpendicular to E T C V, the shadow of the penumbra will give the points of projection required, instead of the plumb line. Thus we make a common globe answer the purpose of an ecliptareon, invented by Mr. Ferguson, and described in his Astronomy. See ECLIPSAREON.

As the analytic method of making astronomical calculations is by many preferred to any other, we subjoin the following formula, which will be found one of the most convenient that has been yet invented.

Let all the points to be considered be referred to three axes, perpendicular to each other, according to the method in use among modern geometricians.

Let a line, passing from the centre of the earth to that of the eclipsed planet, be taken for the axis of the *y*'s; a line perpendicular to the first, in the plane of the ecliptic, for the axis of the *x*'s, and a third line perpendicular to the two others for that of the *z*'s. The positive *y*'s will be directed towards the planet, the positive *x*'s to the left, following the order of the signs, and the positive *z*'s, above the plane of the ecliptic, towards the north pole.

Following the example of Dionis du Sejour, a plane perpendicular to the axis of *y*, should be made to pass through

the centre of the moon. This may be called the plane of projection, and the apparent situation of the centre of the planet, as seen from the place of the observer, is to be determined upon it. This being done, nothing can be more easy than to calculate the apparent distance of the centres, which is the last result of the problem.

1st. Let φ be the longitude of the planet, ψ its latitude, φ' the longitude of the moon, ψ' its latitude; X, Y, and Z, the co-ordinates. Taking the distance of the earth for unity, these equations will be easily found by a simple transformation of the co-ordinates.

$$X = \text{sin.}\ (\varphi' - \varphi')\ \text{cos.}\ \psi'.$$
$$Y = \text{sin.}\ \psi',\ \text{sin.}\ \psi + \text{cos.}\ \psi',\ \text{cos.}\ \psi\ \text{cos.}\ (\varphi' - \varphi.)$$
$$Z = \text{sin.}\ \psi',\ \text{cos.}\ \psi - \text{cos.}\ \psi',\ \text{sin.}\ \psi\ \text{cos.}\ (\varphi' - \varphi.)$$

It will be seen hereafter, that the value of Y is not required. With regard to the values of X and Z, they will assume this form:

$$X = \text{sin.}\ (\varphi' - \varphi) - 2\ \text{sin.}\ (\varphi' - \varphi)\ \text{sin.}^2\ \tfrac{1}{2}\ \psi'.$$
$$Z = \text{sin.}^2\ (\psi' - \psi) + 2\ \text{sin.}^2 \left(\frac{\varphi' - \varphi}{2}\right) \text{sin.}\ \psi\ \text{cos.}\ \psi';$$

which may be afterwards reduced to this form, which will be found sufficiently approximate:

$$X = (\varphi' - \varphi) - 2\ (\varphi' - \varphi)\ \text{sin.}^2\ \tfrac{1}{2}\ \psi.$$
$$Z = (\psi' - \psi) + 2\ \text{sin.}^2 \left(\frac{\varphi' - \varphi}{2}\right) \text{sin.}\ \psi.$$

And as the terms of the second order will be always very small, they may be taken by inspection in small tables of equations, which are easily calculated. Those which compose table 95, of the collection inserted at the end of the first volume of De La Lande's Astronomy, and which are here given, may be employed; thus these quantities may be obtained by a very simple calculation, or almost without calculation.

2d. If we call ρ that radius of the earth which passes through the place of the observer, α, the angle which it makes with the plane of $x\,z$. β, the angle which its projection in the same plane makes with z; x, y, and z, the co-ordinates of the place of the observer, we shall have, by formulas well known,

$$x = \rho\ \text{cos.}\ \alpha\ \text{sin.}\ \beta.$$
$$z = \rho\ \text{cos.}\ \alpha\ \text{cos.}\ \beta.$$
$$y = \rho\ \text{sin.}\ \alpha.$$

And it is not difficult to imagine, that of these two angles, α and β, the first expresses the height of the planet above the horizon, and the second the parallactic angle made by the vertical and the circle of latitude.

3d. If we imagine a visual ray passing from the eye of the observer to the centre of the planet, expressing by ξ and ζ the co ordinates of the point where it meets the plane of projection, respectively parallel to the axes of the x's and z's, and by R the distance from the planet to the earth, we shall easily find,

$$\xi = \frac{R - Y}{R - y}\ x.$$
$$\zeta = \frac{R - Y}{R - y}\ z.$$

But calling the horizontal parallax of the moon p, that of the planet π, it will be evident that

$$\rho = p$$
$$R = \frac{1}{\pi}.$$

Then substituting these values, as well as those of x, y, and z, supposing afterwards Y = 1, and neglecting in the denominator the term π sin. α as very small, compared to unity, we shall find

$$\xi = (p - \pi)\ \text{cos.}\ \alpha,\ \text{sin.}\ \beta.$$
$$\zeta = (p - \pi)\ \text{cos.}\ \alpha,\ \text{cos.}\ \beta,$$ very simple expressions. If then the line, which joins the centre of the moon, and the apparent place of the centre of the planet upon the plane of projection, be called l, we shall have $l = \sqrt{[(X - \xi)^2 + (Z - \zeta)^2]}$.

Now this line may be considered as perpendicular to the visual ray of the observer. On the other hand, the distance of the latter from the plane of projection is equal to $Y - y$. The expression for the apparent distance of the centres then will be $\frac{l}{Y - y}$. Moreover, let D be the horizontal semi-diameter of the moon; $\frac{D}{Y - y}$ will be this semi-diameter, augmented for its altitude. Let Δ be the semi-diameter of the planet; the sum of the apparent semi-diameter will be $\frac{D}{Y - y} + \Delta$.

But when this sum becomes equal to the apparent distance, the eclipse will be either at its beginning or end. At each of these two moments $\frac{l}{Y - y}$ will be equal $\frac{D}{Y - y} + \Delta$, or multiplying the whole by the denominator $Y - y$, supposing Y = 1, and substituting the value of y, we shall get $l = D + \Delta - p\ \Delta$ sin. α. Now the term $p\ \Delta$ sin. α never will exceed 15″; it may therefore be taken by inspection of a table. Thus the whole is reduced to the calculation of the quantity L, which expresses the apparent distance of the centres measured on the plane of projection.

To explain better the advantage of this method, it is reduced to a species of table, which may be compared with that given by M. Cagnoli in his Trigonometry.

Let it be required whether at a given moment the eclipse is commenced. Find for this moment

The longitude of the planet - - -	φ
Its latitude - - - - - -	ψ
Its right ascension - - - - -	e
Its declination - - - - - -	n
Its angle of position - - - - -	θ
Its horizontal parallax - - - -	π
Its horizontal semi diameter - - -	Δ
The longitude of the moon - - -	φ'
Its latitude - - - - - -	ψ'
Its horizontal parallax - - - -	p
Its horizontal semi-diameter - - -	D
The geocentric latitude of the observer's place	λ
The right ascension of the middle of the heavens	m

Make sin. α = sin. λ sin. n + cos. λ cos. n cos. $(m - e)$

$$\text{sin.}\ S = \frac{\text{cos.}\ \lambda\ \text{sin.}\ (m - e)}{\text{cos.}\ \alpha.}$$
$$\beta = S - \theta$$
$$\zeta = (p - \pi)\ \text{cos.}\ \alpha\ \text{cos.}\ \beta$$
$$\xi = \zeta\ \text{tang.}\ \beta$$
$$X = \varphi' - \varphi - 2\ (\varphi' - \varphi)\ \text{sin.}^2\ \tfrac{1}{2}\ \psi'$$
$$Z = \psi' - \psi + 2\ \text{sin.}^2\ \tfrac{1}{2}\ (\varphi' - \varphi)\ \text{sin.}\ \psi.$$

(Terms of the second order become equal to nothing in eclipses of the sun, and in other cases may be taken by inspection of the little tables.)

$$\text{Tang.}\ M = \frac{Z - \zeta}{X - \xi}$$
$$l = \frac{X - \zeta}{\text{cos.}\ M}.$$ Let the sum of the horizontal diameters be D + Δ. In eclipses of the sun, subtract the small quantity $p\Delta$ sin. α, which we take by inspection of a table, the remainder compared with the value of L will shew whether or not the eclipse is already commenced.

Table to be used in calculating Solar Eclipses.

Reduction to a great Circle which is to be subtracted from the Difference of Longitude of the Moon and the Sun, or a Star.

Diff. of Long.	Latitude of the Star which is in Conjunction.																
	0½°	1°	1½°	2°	2¼°	2½°	2¾°	3°	3¼°	3½°	3¾°	4°	4¼°	4½°	4¾°	5°	5¼°
′	″	″	″	″	″	″	″	″	″	″	″	″	″	″	″	″	″
2	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.4	0.5	0.5
4	0.0	0.0	0.1	0.1	0.2	0.2	0.3	0.3	0.4	0.4	0.5	0.6	0.7	0.7	0.8	0.9	1.0
6	0.0	0.1	0.1	0.2	0.3	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.4	1.5
8	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.2	1.3	1.5	1.6	1.8	2.0
10	0.0	0.1	0.2	0.4	0.5	0.6	0.7	0.8	1.0	1.1	1.3	1.5	1.7	1.8	2.1	2.3	2.5
12	0.0	0.1	0.2	0.4	0.6	0.7	0.8	1.0	1.2	1.3	1.5	1.8	2.0	2.2	2.5	2.7	3.0
14	0.0	0.2	0.3	0.5	0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0	2.3	2.6	2.9	3.2	3.5
16	0.0	0.2	0.3	0.6	0.7	0.9	1.1	1.3	1.5	1.8	2.1	2.3	2.6	3.0	3.3	3.6	4.0
18	0.0	0.2	0.4	0.7	0.8	1.0	1.2	1.5	1.7	2.0	2.3	2.6	3.0	3.3	3.7	4.1	4.5
20	0.0	0.2	0.4	0.7	0.9	1.1	1.4	1.6	1.9	2.2	2.6	2.9	3.3	3.7	4.1	4.6	5.0
22	0.0	0.3	0.5	0.8	1.0	1.3	1.5	1.8	2.1	2.5	2.8	3.2	3.6	4.1	4.5	5.0	5.5
24	0.1	0.3	0.5	0.9	1.1	1.4	1.7	2.0	2.3	2.7	3.1	3.5	4.0	4.4	5.0	5.5	6.0
26	0.1	0.3	0.5	0.9	1.2	1.5	1.8	2.1	2.5	2.9	3.3	3.8	4.3	4.8	5.4	5.9	6.5
28	0.1	0.3	0.6	1.0	1.3	1.6	1.9	2.3	2.7	3.1	3.6	4.1	4.6	5.2	5.8	6.4	7.0
30	0.1	0.3	0.6	1.1	1.4	1.7	2.1	2.5	2.9	3.4	3.9	4.4	5.0	5.5	6.2	6.8	7.5
32	0.1	0.4	0.7	1.2	1.5	1.8	2.2	2.6	3.1	3.6	4.1	4.7	5.3	5.9	6.6	7.3	8.0
34	0.1	0.4	0.7	1.2	1.6	1.9	2.3	2.8	3.3	3.8	4.4	5.0	5.6	6.3	7.0	7.8	8.6
36	0.1	0.4	0.7	1.3	1.7	2.1	2.5	3.0	3.5	4.0	4.6	5.3	5.9	6.7	7.4	8.2	9.1
38	0.1	0.4	0.8	1.4	1.8	2.2	2.6	3.1	3.7	4.3	4.9	5.6	6.3	7.0	7.8	8.7	9.6
40	0.1	0.5	0.8	1.4	1.9	2.3	2.8	3.3	3.9	4.5	5.1	5.8	6.6	7.4	8.2	9.1	10.1
42	0.1	0.5	0.9	1.5	1.9	2.4	2.9	3.5	4.1	4.7	5.4	6.1	6.9	7.8	8.7	9.6	10.6
44	0.1	0.5	0.9	1.6	2.0	2.5	3.0	3.6	4.2	4.9	5.7	6.4	7.3	8.1	9.1	10.0	11.1
46	0.1	0.5	0.9	1.7	2.1	2.6	3.2	3.8	4.4	5.1	5.9	6.7	7.6	8.5	9.5	10.5	11.6
48	0.1	0.6	1.0	1.7	2.2	2.7	3.3	4.0	4.6	5.4	6.2	7.0	7.9	8.9	9.9	11.0	12.1
50	0.1	0.6	1.0	1.8	2.3	2.9	3.5	4.1	4.8	5.6	6.4	7.3	8.3	9.2	10.3	11.4	12.6
52	0.1	0.6	1.1	1.9	2.4	3.0	3.6	4.2	5.0	5.8	6.7	7.6	8.6	9.6	10.7	11.9	13.1
54	0.1	0.6	1.1	2.0	2.5	3.1	3.7	4.4	5.2	6.0	6.9	7.9	8.9	10.0	11.1	12.3	13.6
56	0.1	0.6	1.1	2.0	2.6	3.2	3.9	4.6	5.4	6.3	7.2	8.2	9.2	10.4	11.5	12.8	14.1
58	0.1	0.6	1.2	2.1	2.7	3.3	4.0	4.8	5.6	6.5	7.5	8.5	9.6	10.7	11.9	13.2	14.6
60	0.1	0.6	1.2	2.2	2.8	3.4	4.1	4.9	5.8	6.7	7.7	8.8	9.9	11.1	12.4	13.7	15.1

Quantities to be added to the true Latitude of the Moon in Eclipses of the Sun or Stars.

True Lat.	Difference of Longitude between the Sun, and Moon, or Star.																
	10′	14′	18′	22′	26′	30′	34′	38′	42′	46′	50′	54′	58′	62′	66′	70′	74′
D.	″	″	″	″	″	″	″	″	″	″	″	″	″	″	″	″	″
1	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.2	0.3	0.3	0.4	0.4	0.5	0.6	0.7	0.7	0.8
2	0.0	0.1	0.1	0.1	0.2	0.3	0.4	0.4	0.5	0.7	0.8	0.9	1.0	1.2	1.3	1.5	1.7
3	0.1	0.1	0.2	0.3	0.4	0.5	0.7	0.9	1.1	1.3	1.5	1.8	2.0	2.3	2.7	3.0	3.3
4	0.1	0.2	0.2	0.4	0.5	0.7	0.9	1.1	1.3	1.6	1.9	2.2	2.6	2.9	3.3	3.7	4.2

The

The greatest number of eclipses that can happen in one year is seven; in which case five are of the sun and two of the moon, as in the year 1787: the least number that can happen is two, and then they are each solar: this happened in 1767, 1781, 1785, and 1792: generally in the space of 18 years there are 70 eclipses, 29 of the moon, and 41 of the sun. According to Cassini no lunar eclipse can happen farther than $14\frac{1}{2}^{\circ}$ from the node, and there will be an eclipse if the distance is less that $7\frac{1}{2}^{\circ}$. Delambre makes the limit 13° 21′ and 7° 47′.

The obscurity during a total eclipse of the sun is not quite equal to a very dark night, the stars of the second magnitude, and a few perhaps of the third only appear, if the sun is near the meridian, Venus and Mercury are seen near him in great splendour.

According to M. Sejour, the greatest duration of a total eclipse of the sun is 7′ 58″, and 12′ 24″ of an annular eclipse, but it is not in the places where the eclipse is central that the duration is the longest.

A total eclipse of the sun is a very rare occurrence in a given place. Louis XV. was desirous of knowing how many eclipses would happen in a certain number of years, and it appeared that at Paris, between 1769 and 1900, there would be 59 visible eclipses, without one being total; and one only annular on the 9th Oct. 1847. Very considerable eclipses will happen in England on Oct. 9. 1847; March 15, 1858; Aug. 19. 1887; April 17, 1912; April 8, 1921; Feb. 15, 1961; Aug. 11, 1999.

Since eclipses depend on the position of the sun and moon with respect to the nodes, it is obvious that when they are in the syzygies, and have the same situation with respect to the nodes, the eclipses will return and appear as before. The space of time after which the same eclipses return again is called the period of eclipses. Now as the nodes have a retrograde motion of $19\frac{1}{2}^{\circ}$ every year, they would pass through all the points of the ecliptic in eighteen years and 225 days, and this would be the regular period of the return of eclipses, if any complete number of lunations were performed in it without a fraction, but this is not the case. However, in 223 mean lunations after the sun, moon, and nodes have been once in a line of conjunction, they return so nearly to the same state again, that the same node which was in conjunction with the sun and moon at the beginning of these lunations will be within 28′ 12″ of the line of conjunction, when the last of these lunations is completed; and in this period there will be a regular return of eclipses, till it be repeated about 40 times, or about 720 years, when the time of the nodes will be 28′ × 40′ from the conjunction, and will consequently be beyond the ecliptic limits; this is called the Plinean period, or Chaldæan era. It contains, according to Dr. Halley, 18 Julian years, 11 days, 7 hours, 43 minutes, 20 seconds; or, according to Mr. Ferguson, 18ʸ 11ᵈ 7ʰ 42′ 44″. In an interval of 557ʸ 21ᵈ 18ʰ 11′ 51″, in which there are exactly 6890 mean lunations, the conjunction or opposition coincides so nearly with the node, as not to be distant more than 11″. If, therefore, to the mean time of any solar or lunar eclipse, we add this period, and make the proper allowance for the intercalary days, we shall have the mean time of the return of the same eclipse. This period is so very near, that in 6000 years it will vary no more from the truth, as to the restitution of eclipses, than $8\frac{1}{2}$ minutes of a degree.

The curiosity of astronomers has been exceedingly gratified within these few years, by a number of very interesting communications that have been given to the world relative to the state of the Hindu astronomy, and particularly as to their methods of calculating eclipses: it has been observed in the introductory part of this article, how entirely Bailly seems to have been mistaken in his opinions on this subject.

Some difference of opinion still exists among the learned as to the precise date of the Hindu tables, but all agree that they are very far from being founded on antediluvian tradition.

We are indebted to Mr. Davis for a most intelligent account of the method of calculating eclipses. As it contains much novelty, and throws great light on the system of that very singular race of mankind; we shall conclude this article by subjoining his account of it.

Hindu Computation of an Eclipse.

Let it be premised that the position of the sun, moon, and nodes, by calculation, will on the first of next Vaisac'h be as here represented in the Hindu manner, excepting the characters of the signs.

By inspection of the figure, (*Plate* XII. *fig.* 99.) and by considering the motion of the sun, moon, and nodes, it appears that, when the sun comes to the sign Tula (Libra) corresponding with the month of Cartic, the descending node will have gone back to Aries; and that consequently a *lunar* eclipse may be expected to happen at the end of the *purnima tit'hi* or time of full moon, in that month.

First operation.—To find the number of mean solar days from the creation to some part of the *purnima tit'hi* in Cartic, of the 4891st year of the Cali Yug.

Years expired of the Calpa to the end of the Satya Yug, - - -	1970784000
Deduct the term of Brahma's employment in the creation, - - - -	17064000
From the creation, when the planetary motions began, to the end of the Satya Yug, - - - - -	1953720000
Add the Treta Yug, - - -	1296000
Dwaper Yug, - - -	864000
Present year of the Cali Yug, -	4890
From the creation to the next approaching Bengal year, - - -	1955884890
Or solar months, (× 12) - -	23470618680
Add seven months, - - -	72
	23470618680

As the solar months in a Yug, 51840000, are to the intercalary lunar months in that cycle, 1593336, so are the solar months 23470618687, to their corresponding intercalary lunar months 721384677; which added together, give 24192003764 lunations. This number multiplied by thirty, produces 725760100920 *tit'his*, or lunar days, from the creation to the new moon in Cartic; to which add fourteen *tit'his* for the same, to the *purnima tit'his* in that month 725760100934. Then, as the number of *tit'his* in a Yug, 16030000080, is to their difference exceeding the mean solar days in that cycle (called *eschaya tit'his*) 25082252, so are 725760100934 *tit'his* to their excess in number over the solar days 113562179 87, which subtracted, leaves 714404082947, as the number of mean solar days from the creation, or when the planetary motions began, to a point of time which will be midnight under the first meridian of Lanca, and near the time of full moon in Cartic. In the year of the Cali Yug 4891, corresponding with 1196 Bengal style, and with the month of October or November (hereafter to be determined) in the year of Christ 1789. The first day after the creation being

being *Ravi-var*, or Sunday, divide the number of days by seven for the day of the week, the remainder after the division being two, marks the day *Soma-var*, or Monday.

Second operation.—For the mean longitude of the sun, moon, and the ascending node. Say, as the number of mean solar days in a Maha Yug is to the revolutions of any planet in that cycle, so are the days from the creation to even revolutions, which reject, and the fraction, if any, turned into sines, &c. is the mean longitude required.

1st. *Of the Sun.*

Revolutions. Sines. ° ′ ″ ‴

$$\frac{71440408294 7 \times 4320000}{1577917828} = (195584890)\ 6\ 22\ 44\ 2\ 12$$

2d. *Of the Moon.*

$$\frac{71440408294 7 \times 57753336}{1577917828} = (261478882 55)\ 0\ 21\ 21\ 58\ 56$$

3d. *Of the Moon's Apogee.*

$$\frac{71440408294 7 \times 488203}{1577917828} = (22103446 0)\ 11\ 5\ 31\ 13\ 35$$

Correction of the Bija add.

$$\frac{71440408294 7 \times 4}{1577917828} = (---)\ 0\ 37\ 37\ 52\ 28$$

$$11\ 7\ 9\ 6\ 3$$

4th. *Of the Moon's Ascending Node.*

$$\frac{71440408294 7 \times 232238}{1577917828} = (105147017)\ 4\ 27\ 49\ 48 -$$

Correction of the Bija add.

$$\frac{71440408294 7 \times 4}{1577917828} = (---)\ 0\ 1\ 37\ 52\ 28$$

$$4\ 29\ 27\ 40\ 28$$

5th. *Of the Sun's Apogee.*

$$\frac{71440408294 7 \times 387}{1577917828} \quad (-175-)\ 2\ 17\ 17\ 15 -$$

	Mean longitude for midnight under the meridian of Lanca.	Deduct for the longitude of Bhagalpur as * 80° 50′ of equator east.	Mean longitude for midnight at Bhagalpur.
	° ′ ″ ‴	′ ″	° ′ ″ ‴
Of the Sun,	6 21 44 2 12	1 27	6 21 42 35 12
Moon,	— 21 21 58 56	19 34	— 21 2 25 —
Node,	4 29 27 40 28	— 4	4 29 27 36 —
Sun's Apogee,	2 17 17 15 —	inconsiderable	2 17 17 16 —
Moon's Apogee,	11 7 9 6 3	— 9	11 7 8 57 —

* This longitude, assigned to Bhagalpur, is erroneous; but the error does not in the least affect the main object of the paper.

Third operation.—For the equated longitude of the sun and moon, &c.

1st. *Of the Sun.*

The mean longitude of the sun is 6ˢ 21° 42′ 35″ 12‴; of the apogee 2 17 17 15, the difference, or mean anamoly, 4ˢ 4° 25′ 20″; its complement to 6 sines or distance from the perigee 1ˢ 25° 34′ 40″, the equation for which is required. This may either be taken from the foregoing table, translated from Macaranda, or calculated in the manner explained as follows:

The sine of 1ˢ 25° 34′ 40″ is 2835′ 31″ and $\frac{2825' 31'' \times 20'}{3438}$ = 14′ 30″ to be subtracted from the paridhi degrees in sama; 14°—14′ 30″=13° 53′ 30″, the circumference of epicycle in this point of anomaly; and $\frac{13° 43' 30'' \times 2835' 31''}{360°}$ = 108′ 61″ the sine of the angle of equation, considered as equal to its arc, or 1° 48′ 6″, to be deducted from the mean, for the true longitude; 6ˢ 21° 42′ 35″—1° 48′ 6″ = 6ˢ 19° 54′ 29″ for midnight agreeing with mean time; but as, in this point of anomaly, the true or apparent midnight precedes that estimated for mean time, for which the computation has been made, a proportionable quantity must be deducted from the sun's place, which is thus found: say, as the minutes contained in the ecliptic are to the sun's mean motion in one day 59′ 8″, so is the equation of his mean to his true place 180′ 6″, to the equation of time required, 0′ 18″ $\left(=\frac{59' 8'' \times 108' 6''}{21600}\right)$ and 6ˢ 19° 54′ 29″—29″—18″= 6ˢ 19° 54′ 11″ the sun's true longitude for the apparent midnight.

For the sun's true motion. The co-sine of the sun's distance from the perigee is 1941′ 0″ 1‴, and $\frac{1941' 0'' 1''' \times 13433°}{360°}$ = 74′ the cosine of the epicycle, and $\frac{59' 8'' \times 74}{3438}$ = 1′ 16″ equation, to be added to the mean for the true motion, 59′ 8″ + 1′ 16″ = 60″ 24″ *per* day, or 60″ 23‴ *per* danda.

2d. *Of the Moon.*

The moon's mean longitude for the mean midnight is 0ˢ 20° 2′ 25″, which exceeds her mean longitude for the true midnight, but $\frac{108 \times 790\ 1\ 35}{21600}$ = 3′ 57″, her motion in the difference of time between the mean and true midnight 0ˢ 21° 2′ 25″—3′ 57″ = 0 20 58 28 mean longitude, for which the anomalitic equation is to be found. Place of the apogee 11ˢ 7° 8′ 55″ and the moon's distance from it 1ˢ 13° 49′ 33″. The sine of the latter, 2379′ 39″. By the rule before explained $\frac{2379' 39'' \times 20'}{3438}$ = 13′ 51″, and $\frac{32° - 13' 51'' \times 2379' 39''}{360}$ = 210′ the sine of the angle of equation equal to its arc, or 3° 30″ to be subtracted, 0° 20′ 58″ 28‴—3° 30′= 0° 17′ 28″ 28‴ the moon's true place, agreeing with the true apparent midnight.

For the moon's true motion. The co-sine of her distance from the apogee 2479 13. Circumference of the epicycle 31° 46′ 9″, and $\frac{31° 46' 9'' \times 2479' 13''}{360°}$ = 218″ 47″ co-sine in the epicycle. The moon's mean motion from her apogee is 790′ 35″—6′ 41″=783′ 54″, and $\frac{783' 54'' \times 218' 47''}{3838'}$ = 49′ 53″ the equation of her mean to her true motion, to be subtracted, 790 35—49 53 = 740 42 the moon's true motion *per* day, or 740″ 42‴ *per* danda.

For the place of the moon's apogee reduced to the apparent midnight. The motion of the apogee is 6′ 41″ *per* day, $\frac{108' 6'' \times 6' 11''}{21600'}$ = 2″, 11ˢ 7° 8′ 57″ — 2″ = 11ˢ 7° 8′ 55″ its place.

For

For the same of the node. Its motion *per* day is 3′ 11″, and $\frac{108' 6'' \times 3' 11''}{21600} = 1''$, and 4ˢ 29° 27′ 36″ − 1″ = 4ˢ 29° 27′ 35″ its place.

The true longitude and motion, therefore, for the apparent time of midnight at Bhagalpur, 714404082947 solar days after the creation, or commencement of the planetary motions, will be

	Longitude.	Motion per day.
	s ° ′ ″	′ ″
Of the Sun,	6 19 54 11	60 24
Moon,	— 17 28 28	740 42
Sun's Apogee,	2 17 17 15	inconsiderable
Moon's Apogee,	11 7 8 55	6 41
Moon's Node,	4 29 27 35	3 11

Second operation.—Having the longitude and motion as above, to determine the *tit'hi* and time remaining unexpired to the instant of opposition, or full moon.

The moon's longitude subtracted from the sun's, leaves 5ˢ 27° 34′ 17″, or 10654′ 17″, which, divided by 720′ the minutes in a mean *tit'hi*, quotes fourteen even *tit'his* expired, and the fraction, or remainder 574′ 17″, is the portion expired of the 15th, or *purnima tit'hi*, which subtracted from 720′, leaves 145′ 43″ remaining unexpired of the same; which, divided by the moon's motion *per* danda from the sun, will give the time remaining unexpired from midnight to the instant of the full moon with as much precision as the Hindu astronomy requires. Deduct the sun's motion 60″ 24‴ *per* danda from the moon's 740″ 42‴, the remainder 680″ 8‴, is the moon's motion from the sun; by this divide the part remaining unexpired of the *purnima tit'hi* 145′ 43″.

$$\frac{145' 43'' = 5245 80''}{680'' 8''' = 40818'''} \quad \begin{matrix} \text{D.} & \text{P.} \\ 12 & 51 \end{matrix}$$

therefore 12 dandas, 51 palas after midnight will be the end of the *purnima tit'hi*, or instant of opposition of the sun and moon.

Fifth operation.—Having the instant of opposition as above, to find the true longitude and motion of the sun and moon, the latitude of the latter and the place of the node.

Add the mean motion of each for 12ᵈ 51ᵖ to the mean place, found before for the true midnight; and for the mean places so found, compute again the anomalistic equations. This being but a repetition of operation the third is unnecessary to be detailed. The several particulars are as follows:

	Mean longitude for midnight.	Mean longitude at full moon.	Equation.	True longitude at full moon.
	s ° ′ ″	s ° ′ ″	′ ″	s ° ′ ″
Of the Sun,	6 21 42 17	6 21 51 17	1 47 50	6 20 7 7
Moon,	— 20 58 28	— 23 47 47	3 40 20	— 20 7 27
Moon's Apogee,	11 7 8 55	11 7 10 21		
Moon's Node,	4 29 27 35	4 29 28 16		

	Mean motion.	Equation.	True motion at full moon.
	′ ″	′ ″	′ ″
Of the Sun,	5 8	× 1 16	60 21
Moon,	760 35	− 47 28	744 7

Hence it appears that, at the opposition, the moon will be near her descending node; for, 4ˢ 29° 28′ 17″ × 6ˢ = 10ˢ 29° 28′ 16″, the place of the descending node in antecedentia, and 12ˢ − 10ˢ 29° 28′ 16″ = 1ˢ 0° 31′ 44″ its longitude according to the order of the signs, and 1ˢ 0° 31′ 44″ − 20° 7′ 27″ = 10° 24′ 17″ the moon's distance from her descending node, which, being within the limit of a lunar eclipse, shews that the moon will be then eclipsed. For her latitude at this time, say, as radius is to the inclination of her orbit to the ecliptic, 4ˢ 30′ or 270′, so is the sine of her distance from the node 620′ 57″, to her latitude of 48′ 47″ $\left(= \frac{279'' \times 620' 57''}{3438'}\right)$.

Sixth operation.—From the elements now found, to compute the diameter of the moon and shadow, and the duration of the eclipse.

	Yojan.
The Sun's mean diameter is -	6500
Moon's - - -	480
Earth's - - -	1600
Sun's mean motion, -	59′ 8″
Moon's, - - -	790 35
Sun's true motion, -	60 24
Moon's, - - -	743 7
Moon's latitude, -	48 45

As the moon's mean motion is to her mean diameter, so is her true motion to her true diameter for the time of opposition $\frac{743' 7'' \times 480}{790 35} = 451$ 11 Yojan, which, divided by 15 quotes 30′ 5″ of a great circle.

As the sun's mean motion is to his mean diameter, so is his true motion to his diameter at the instant of opposition

$$\frac{60' 24'' \times 6500}{59' 8''} = 6639 \ 14 \text{ Yojan.}$$

As the moon's mean motion is to the earth's diameter, so is the moon's equated motion to the Suchi, or a fourth number, which must be taken as the earth's diameter, for the purpose of proportioning its shadow to the moon's distance and apparent diameter $\frac{1600 \times 743' 7''}{79 35''} = 1503$ 56 Yojan, the Suchi.

Equated diameter of the sun,	6639 14
Of the earth, - - -	1503 56
Difference,	5039 14

As the sun's mean diameter is to the moon's diameter, so is the difference above 5039 14, to a fourth number, which, deducted from the Suchi, or equated diameter of the earth, leaves the diameter of the earth's shadow at the moon,

$$\frac{480 \times 5039 \ 14}{6500} \ 372 \ 7 \text{ and } 1503 \ 56 - 372 \ 7 = 1131 \ 49$$

Yojan, which divided by fifteen, quotes 75′ 27″ of a great circle for the same.

From the half sum of the diameters of the moon and shadow $\frac{75' 27'' \times 30' 5''}{2} = 52' 46''$ subtract the moon's latitude 48″ 45″, the remainder is the Chch'anna, or portion of the moon's diameter eclipsed, 4′ 1″ of a great circle, and by the nature of a right-angled triangle the square root of the difference of the squares of the moon's latitude, and the half sum of the diameters of the shadow and moon, will be the path

path of the moon's centre, from the beginning to the middle of the eclipse.

The diameter of the shadow is,	75	27
Of the moon, - - -	30	5
Sum, -	105	32
Half sum,	52	46
The moon's latitude is, -	48	45

$\frac{52\ 46^2 \times 48\ 45'}{} = 20'\ 11''$, which divided by the moon's motion from the sun, quotes the half duration of the eclipse in dandas and palas, or Hindu mean solar hours,

$\frac{20'\ 11'' = 1211''}{682''\ 43'''} = \overset{D\ P\ V}{1\ 46\ 25}$; which doubled, is $\overset{D\ P\ V}{3\ 32\ 50}$, the whole duration of the eclipse; which will be partial, the moon's latitude being greater than the difference between the semi-diameters of the moon's disc and the earth's shadow.

Seventh operation.—To find the position of the equinoctial colures, and thence the declination of the sun, the length of day and night, and the time counted from sun-rise, or hour of the civil day when the eclipse will happen.

1st. For the ayananfa or distance of the vernal equinox from the 1st of Mesha. $\frac{714404082947 \times 600}{1577917828} = \overset{\text{Periods.}}{(271650)}\ 8^s\ 4^\circ\ 31'\ 30''\ 52'''$ of which take the bhuja $8^s\ 4^\circ\ 31'\ 30''\ 52''' - 6^s$ or $2^s\ 4^\circ\ 31'\ 30''\ 52'''$ which multiply by three and divide by ten, $\frac{64^\circ\ 31'\ 30''\ 52''' \times 3}{10} = 19^\circ\ 21'\ 27''$ the ayananfa, which in the present age is added to the sun's longitude, to find his distance from the vernal equinox. The sun's equated longitude is $6^s\ 19^\circ\ 54''\ 11'''$, and $6^s\ 19^\circ\ 54'\ 11'' + 19^\circ\ 21'\ 27'' = 7^s\ 9^\circ\ 15'\ 38''$ his distance from the vernal equinox.

2d. For the declination, right ascension, and ascensional difference. The sun's place is $7^s\ 9^\circ\ 15'\ 38''$, and $1^s\ 9^\circ\ 15'\ 38''$, his distance from the autumnal equinox; the sine of which is $2174'\ 41''$, and as radius is to the sine of the greatest declination 24°, termed the *paramapacramajya* 1397', so is $2174'\ 41$ to the sine of his declination $883'\ 40''$, the arc corresponding with which, in the canon of sines, is 14° 53', $\left(\frac{1397' \times 2174'\ 48''}{3438} = 883'\ 40''\right)$. The equinoctial shadow at Bhagalpur is $\overset{A\ V}{5,\ 30}$, and, as the Gnomon of twelves angalas is to the equinoctial shadow, so is the sine of the declination 883, 40, to the cshitijya, $\frac{\overset{A\ V}{5\ 30} \times 883'\ 40''}{3438} = 405'\ 1''$. And as the co-sine of the declination is to the radius, so is the cshitijya to the sine of the chara, or ascensional difference, $\frac{405'\ 1 \times 3438}{3322\ 36} = 419'\ 4''$: its arc is 4:9' 56'' the ascensional difference.

3d. For the length of the day and night.

The modern Hindus make their computations in mean solar time; the Surya Siddhanta directs, that they should be made in sidereal time. A sidereal day contains sixty dandas; each danda, sixty viculas; and each vicula six respirations, in all 21600 respirations, answering to the minutes of the equator. A nacshatra day is exceeded in length by the savan, or solar day, by reason of the sun's proper motion in the ecliptic, the former measures time equably, but the latter varies in its length from the inequality of the sun's motion, and the obliquity of the ecliptic. The sun's equated motion for the middle of the eclipse was found 60' 24''; and the oblique ascension for the eighth sign from the vernal equinox, in which he will be found at that time, is taken from the foregoing table 543 palas, or 2085 respirations. As the number of minutes contained in one sine 1800, is to the number of respirations, or the arc of the equator in minutes answering to the oblique ascension of the sine, the sun is in 2085, as above, so is the equated motion 60' 24'', to the excess in respirations of the savan or solar day over the nacshatra or sidereal day $\frac{2058' \times 60'\ 24''}{1800} = 69'\ 3''$, which, added to 21600' gives the length of the solar day by civil account from sun-rise to sun-rise, sidereal time 21669 3 respirations. From one fourth of this deduct the ascensional difference, the sun being declined towards the south pole, for the semi-diurnal arc; and add it for the seminocturnal arc: the former is 4997' 19'', and the latter 5837' 11''; which may be reduced to dandas, or Hindu hours, by a division of 360. Hence half the day is $\overset{D\ P\ V}{13\ 52\ 53}$, and half the night $\overset{D\ P\ V}{16\ 12\ 52}$. The whole day added to half the night shews the hour counted from the preceding sun-rise to midnight $\overset{D\ P\ V}{43\ 58\ 38}$, to which add the time at midnight unexpired of the *purnima tit'hi*, for the hour of the civil day corresponding with the middle of the eclipse. The hour from midnight to the end of the *purnima tit'hi* is already found $\overset{D\ P}{12\ 51}$ in mean solar time, and to reduce it to sidereal time, say, as 21600' is to 21600' $\times\ \overset{D\ P}{59'\ 8''}$, so is $\overset{D\ P}{12\ 51}$, to sidereal hours $\overset{D\ P}{12\ 53}$, equal to $\overset{D\ P}{2\ 51}$ solar hours.

	D	V	P
From the preceding sun-rise to midnight is	43	59	—
At midnight will remain of the *purnima tit'hi*,	12	53	—
Hour of the civil day at the middle of the eclipse, - - - - -	56	52	—
Deduct the half duration, - - -	1	46	25
Beginning of the eclipse, - - -	55	5	35
Add the whole duration, - - -	3	32	50
End of the eclipse, - - - -	58	38	25

And the day and night containing together $\overset{D\ P\ V}{60\ 11\ 30}$, the eclipse should end $\overset{D\ P\ V}{1\ 33\ 5}$ before sun rise, according to this calculation.

The first day of the creation, according to the Hindus, was *Ravi-var*, or Sunday: the number of days for which the above calculation has been made, is 714404082947, which, divided by seven, the number of days in a week, are 102057726135 weeks and two days; the astronomical day therefore of *Soma-var*, or Monday, will end at midnight preceding the eclipse; but the *Soma-var* by civil computation will continue to the next ensuing sun rise; and this *Soma-var*, by calculating the number of days elapsed from the instant the sun entered the sign Tula, to his advance of 19° 54' on that sign, will be found to fall on the 19th of the month Cartic, answering to the third of November.

The time of the full moon and the duration of the eclipse, found by this computation, differ considerably from the Nautical Almanac. The Siddhanta Rahasya and Grabalaghava, comparatively modern treatises, are nearer the truth, yet far from correct. The Hindus, in determining these phenomena, are satisfied when within a few minutes of the true time.

A comparative Statement of this Eclipse as predicted in the Nautical Almanac, with computations of it made by different Hindu books. Those marked (*) are made for different meridians, the last we believe for Tirhut.

Names.	Equated longitude for midnight at Bhagalpur, supposed in 8° 50′ E. from Lanca, and 88° E. from Greenwich.		
	The Sun.	The Moon.	The Node.
	° ′ ″	s ° ′ ″	°
Surya Siddhanta	6 19 54 11	— 17 28 28	1 — 31 44
Tables of Macaranda	6 19 55 9	— 17 30 9	1 — 32 7
* Grahalaghava, Siddhanta Rahasya	6 19 54 29	— 17 16 25	1 — 27 35
	Add to each the aynananfa 19° 21′ 27″ for the longitude counted according to European astronomers from the equinoctial colure.		
	s ° ′ ″	s ° ′ ″	s ° ′ ″
Surya Siddhanta	7 9 15 38	1 6 49 55	1 19 53 11
Tables of Macaranda	7 9 16 36	1 6 51 36	1 19 53 54
* Grahalaghava. Siddhanta Rahasya	7 9 15 56	1 6 37 52	1 19 49 2
Nautical Almanac	7 14 7 8	1 7 50 58	1 19 45 30

	From midnight to the middle of the Eclipse.		Duration of the Eclipse.	
	Hindu time.	English time.	Hindu time.	English time.
	D. V. P.	H. M. S.	D. P. V.	H. M. S.
Surya Siddhanta	12 53 —	5 9 12	3 13 50	1 17 8
Tables of Macaranda			4 50 —	1 43 20
* Grahalaghava	*14 50 —	5 56 —	5 18 —	1 56 36
Siddhanta Rahasya	13 53 —	5 33 —	4 58 —	1 49 16
* Grahana Mala, a Catalogue of Eclipses	16 6 —	6 26 24	5 26 —	2 10 24
Nautical Almanac	16 — 37	6 24 5	5 22 2½	2 9 —

STRUYK's CATALOGUE OF ECLIPSES.

Bef. Chr.	Eclipses of the Sun and Moon seen at		M. & D.	Middle H. M	Digits eclipsed
721	Babylon	☽	March 19	10 34	Total
720	Babylon	☽	March 8	11 56	1 5
720	Babylon	☽	Sept. 1	10 18	5 4
621	Babylon	☽	April 21	18 22	2 36
523	Babylon	☽	July 16	12 47	7 24
502	Babylon	☽	Nov. 19	12 21	1 52
491	Babylon	☽	April 25	12 1	1 4[illegible]
431	Athens	☉	August 3	6 3[illegible]	11 0
425	Athens	☽	October 9	6 45	Total
424	Athens	☉	March 20	20 17	9 0
413	Athens	☽	August 27	10 15	Total
406	Athens	☽	April 15	8 50	Total
404	Athens	☉	Sept. 2	21 12	8 4[illegible]
403	Pekin	☉	August 28	5 53	10 40
394	Guide	☉	August 13	22 17	11 0
383	Athens	☽	Dec. 22	19 6	2 1
382	Athens	☽	June 18	8 54	6 15
382	Athens	☽	Dec. 12	10 21	Total
364	Thebes	☽	July 12	23 51	6 10
357	Syracuse	☉	Feb. 28	22 —	3 33
357	Zant	☽	August 26	7 29	4 21
340	Zant	☉	Sept. 14	18 —	9 0
331	Arbela	☽	Sept. 20	10 9	Total
310	Sicily Island	☉	August 14	20 5	10 22
219	Mesia	☽	March 19	14 5	Total
218	Pergamos	☽	Sept. 1	rising	Total
217	Sardinia	☉	Feb. 11	1 57	9 6
203	Frusini	☉	May 6	2 52	5 40
202	Cumis	☉	October 18	22 24	1 0
201	Athens	☽	Sept. 22	7 14	8 58
200	Athens	☽	March 19	13 9	Total
200	Athens	☽	Sept. 11	14 48	Total
198	Rome	☉	August 6	——	——
190	Rome	☉	March 13	18 —	11 0
188	Rome	☉	July 16	20 38	10 4[illegible]
174	Athens	☽	April 30	14 33	7 1
168	Macedonia	☽	June 21	8 2	Total
141	Rhodes	☽	Jan. 27	10 8	3 26
104	Rome	☉	July 18	22 0	11 52
63	Rome	☽	October 27	6 22	Total
60	Gibraltar	☉	March 16	setting	Central
54	Canton	☉	May 9	3 41	Total
51	Rome	☉	March 7	2 12	9 0
48	Rome	☽	Jan. 18	10 0	Total
45	Rome	☽	Nov. 6	14 —	Total
36	Rome	☉	May 19	3 52	6 47
31	Rome	☉	August 20	setting	Gr. Ecl
29	Canton	☉	Jan. 5	4 2	11 0
28	Pekin	☉	June 18	23 48	Total
26	Canton	☉	October 23	4 16	11 15
24	Pekin	☉	April 7	4 11	2 0
16	Pekin	☉	Nov. 1	5 13	2 8
2	Canton	☉	Feb. 1	20 8	11 42
Aft. Chr.					
1	Pekin	☉	June 10	1 10	11 43
5	Rome	☉	March 28	4 13	4 4[illegible]
14	Panonia	☽	Sept. 26	17 15	Total
27	Canton	☉	July 22	8 56	Total
30	Canton	☉	Nov. 13	19 20	10 30
40	Pekin	☉	April 30	5 50	7 34

Aft. Chr.	Eclipses of the Sun and Moon seen at		M. & D.	Middle H. M.	Digits eclipsed
45	Rome	☉	July 31	22 1	5 17
46	Pekin	☉	July 21	22 25	2 1[illegible]
46	Rome	☽	Dec. 31	9 52	Total
49	Pekin	☉	May 20	7 10	10 8
53	Canton	☉	March 8	20 42	1 0
55	Pekin	☉	July 12	21 50	6 40
56	Canton	☉	Dec. 25	0 28	9 20
59	Rome	☉	April 30	3 8	10 38
60	Canton	☉	October 15	3 31	10 30
65	Canton	☉	Dec. 15	21 50	10 23
69	Rome	☽	October 18	10 43	10 49
70	Canton	☉	Sept. 22	21 13	8 20
71	Rome	☽	March 4	8 32	6 0
95	Ephesus	☉	May 21	——	1 0
125	Alexandria	☽	April 5	9 16	1 44
133	Alexandria	☽	May 6	11 44	Total
134	Alexandria	☽	October 20	11 5	10 19
136	Alexandria	☽	March 5	15 56	5 17
237	Bologna	☉	April 12	——	Total
238	Rome	☉	April 1	20 20	8 45
290	Carthage	☉	May 15	3 20	11 20
304	Rome	☽	August 31	9 36	Total
316	Constantinople	☉	Dec. 30	19 53	2 18
334	Toledo	☾	July 17	at noon	Central
348	Constantinople	☉	October 8	19 24	8 0
360	Ispahan	☉	August 27	18 10	Central
364	Alexandria	☽	Nov. 25	15 22	Total
401	Rome	☽	June 11	——	Total
401	Rome	☽	Dec. 6	12 15	Total
402	Rome	☽	June 1	8 45	10 2
402	Rome	☾	Nov. 10	20 33	10 30
447	Compostello	☉	Dec. 23	0 46	1 —
451	Compostello	☽	April 1	16 34	19 52
451	Compostello	☽	Sept. 26	6 30	0 2
458	Chaves	☉	May 27	23 16	18 53
461	Compostello	☽	March 1	13 2	11 11
464	Chaves	☾	July 19	19 1	10 15
484	Constantinople	☉	Jan. 13	19 53	10 0
486	Constantinople	☉	May 19	1 10	5 15
497	Constantinople	☾	April 18	6 5	17 57
512	Constantinople	☉	June 28	23 8	1 50
538	England	☉	Feb. 14	19 —	8 23
540	London	☉	June 19	20 15	8 —
577	Tours	☽	Dec. 10	17 28	6 46
581	Paris	☽	April 4	13 33	6 42
582	Paris	☽	Sept. 17	12 41	Total
590	Paris	☽	October 18	6 30	9 25
592	Constantinople	☉	March 18	22 0	10 0
603	Paris	☉	August 12	3 3	11 20
622	Constantinople	☽	Feb. 1	11 28	Total
644	Paris	☉	Nov. 5	0 30	9 53
680	Paris	☽	June 17	12 30	Total
683	Paris	☽	April 16	11 30	Total
693	Constantinople	☉	October 4	23 54	11 54
716	Constantinople	☽	Jan. 13	7 —	Total
718	Constantinople	☉	June 3	1 15	Total
733	England	☉	August 15	20 —	11 1
734	England	☽	Jan. 2[illegible]	4 —	Total
752	England	☽	July 30	13 —	Total
753	England	☉	June 8	22 —	10 55
758	England	☽	Jan. 23	13 —	Total.

STRUYK's CATALOGUE OF ECLIPSES.

Aft. Chr.	Eclipses of the Sun and Moon seen at		M. & D.	Middle H.	M.	Digits eclipsed
760	England	☉	August 15	4	—	8 15
760	London	☽	August 30	5	50	10 40
764	England	☉	June 4	at noon		7 15
770	London	☽	Feb. 14	7	12	Total
774	Rome	☽	Nov. 22	14	37	11 58
784	London	☽	Nov. 1	14	2	Total
787	Constantinople	☉	Sept. 12	20	43	9 47
796	Constantinople	☽	March 2	16	22	Total
800	Rome	☽	Jan. 15	9	0	10 17
807	Angoulesme	☉	Feb. 10	21	24	9 43
807	Paris	☽	Feb. 25	13	43	Total
807	Paris	☽	August 21	10	2[illegible]	Total
809	Paris	☉	July 15	21	3[illegible]	8 8
809	Paris	☽	Dec. 25	8	—	Total
810	Paris	☽	June 22	8	—	Total
810	Paris	☉	Nov. 3[illegible]	0	12	Total
810	Paris	☽	Dec. 14	8	—	Total
812	Constantinople	☉	May 14	2	13	9 —
813	Cappadocia	☉	May 3	17	5	10 35
817	Paris	☽	Feb. 5	5	4	Total
818	Paris	☉	July 6	18	—	6 55
82[illegible]	Paris	☽	Nov. 2[illegible]	6	26	Total
824	Paris	☽	March 18	7	55	Total
828	Paris	☽	June 30	15	—	Total
828	Paris	☽	Dec. 24	13	45	Total
831	Paris	☽	April 30	6	19	11 8
831	Paris	☉	May 15	23	—	4 24
831	Paris	☽	October 24	11	18	Total
832	Fulda	☽	April 18	9	0	Total
840	Paris	☉	May 4	23	22	9 20
841	Paris	☉	October 17	18	58	5 24
842	Paris	☽	March 29	14	38	Total
843	Paris	☽	March 19	7	1	Total
861	Paris	☽	March 29	15	7	Total
878	Paris	☽	October 14	16	—	Total
878	Paris	☉	October 29	1	—	11 14
883	Arracta	☽	July 23	7	44	11 —
889	Constantinople	☉	April 3	17	52	9 23
891	Constantinople	☉	August 7	23	48	10 30
901	Arracta	☽	August 2	15	7	Total
904	London	☽	May 31	11	47	Total
904	London	☽	Nov. 25	9	0	Total
912	London	☽	Jan. 6	15	12	Total
926	Paris	☽	March 31	15	17	Total
934	Paris	☉	April 16	4	30	11 36
939	Paris	☉	July 18	19	45	10 7
955	Paris	☽	Sept. 4	11	18	Total
961	Rhemes	☉	May 16	20	13	9 18
970	Constantinople	☉	May 7	18	38	11 22
976	London	☽	July 13	15	7	Total
985	Messina	☉	July 20	3	52	4 10
989	Constantinople	☉	May 28	6	54	8 40
990	Fulda	☽	April 12	10	22	9 5
990	Fulda	☽	October 6	15	4	11 10
990	Constantinople	☉	October 21	0	45	10 5
995	Augsburgh	☽	July 14	11	27	Total
1009	Ferrara	☽	October 6	11	38	Total
1010	Messina	☉	March 18	5	41	9 12
1016	Nimeguen	☽	Nov. 16	16	39	Total
1017	Nimeguen	☉	October 22	2	8	6 —
1020	Cologne	☽	Sept. 4	11	38	Total

Aft. Chr.	Eclipses of the Sun and Moon seen at		M. & D.	Middle H.	M.	Digits eclipsed
1023	London	☉	Jan. 23	23	29	11 —
1030	Rome	☽	Feb. 20	11	43	Total
1031	Paris	☽	Feb. 9	11	51	Total
1033	Paris	☽	Dec. 8	11	11	9 17
1034	Milan	☽	June 4	9	8	Total
1037	Paris	☉	April 17	20	45	10 45
1039	Auxerre	☉	August 21	23	4[illegible]	11 5
1042	Rome	☽	Jan. 8	16	39	Total
1044	Auxerre	☽	Nov. 7	16	12	10 1
1044	Cluny	☉	Nov. 21	22	12	11 —
1056	Nuremburg	☽	April 2	12	9	Total
1063	Rome	☽	Nov. 8	12	1[illegible]	Total
1073	Augsburgh	☽	October 7	10	13	Total
1080	Constantinople	☽	Nov. 23	11	12	9 36
1082	London	☽	May 14	10	32	10 2
1086	Constantinople	☉	Feb. 16	4	7	Total
1089	Naples	☽	June 25	6	6	Total
1093	Augsburgh	☉	Sept. 22	22	35	10 12
1096	Gembluors	☽	Feb. 10	16	4	Total
1096	Augsburgh	☽	August 6	8	21	Total
1098	Augsburgh	☉	Dec. 25	1	25	10 12
1099	Naples	☽	Nov. 30	4	58	Total
1103	Rome	☽	Sept. 17	10	18	Total
1106	Erfurd	☽	July 17	11	28	11 54
1107	Naples	☽	Jan. 10	13	16	Total
1109	Erfurd	☉	May 31	1	30	10 2[illegible]
1110	London	☽	May 5	10	51	Total
1113	Jerusalem	☉	March 18	19	0	9 12
1114	London	☽	August 17	15	5	Total
1117	Trier	☽	June 15	13	26	Total
1117	Trier	☽	Dec. 10	12	51	Total
1118	Naples	☽	Nov. 29	15	46	4 11
1121	Triers	☽	Sept. 27	16	47	Total
1122	Prague	☽	March 24	11	2[illegible]	3 49
1124	Erfurd	☽	Feb. 1	6	43	8 39
1124	London	☉	August 10	23	29	9 58
1132	Erfurd	☽	March 3	8	14	Total
1133	Prague	☽	Feb. 20	16	41	3 23
1135	London	☽	Dec. 22	20	11	Total
1142	Rome	☽	Feb. 11	14	17	8 30
1143	Rome	☽	Feb. 1	6	36	Total
1147	Auranches	☉	October 25	22	38	7 20
1149	Bary	☽	March 25	13	54	5 29
1151	Eimbeck	☽	August 28	12	4	4 29
1152	Augsburgh	☉	Jan. 26	0	42	11 —
1154	Paris	☽	June 20	16	1	Total
1154	Paris	☽	Dec. 21	8	30	4 42
1155	Auranches	☽	June 16	8	45	0 53
1160	Rome	☽	August 18	7	53	6 49
1161	Rome	☽	August 7	8	15	Total
1162	Erfurd	☽	Feb. 1	6	40	5 50
1162	Erfurd	☽	July 27	12	30	4 11
1163	Mont Caffin	☉	July 3	7	40	2 0
1164	Milan	☽	June 6	10	0	Total
1168	London	☽	Sept. 18	14	0	Total
1172	Cologne	☽	Jan. 11	13	31	Total
1176	Auranches	☽	April 25	7	2	8 6
1176	Auranches	☽	October 19	11	20	8 53
1178	Cologne	☽	March 5	setting		7 52
1178	Auranches	☽	August 29	13	52	5 31
1178	Cologne	☉	Sept. 12	—	—	10 51

STRUYK's CATALOGUE OF ECLIPSES.

Aft. Chr.	Eclipses of the Sun and Moon seen at		M. & D.	Middle H.	M	Digits eclipsed
1179	Cologne	☽	August 18	14	28	Total
1180	Auranches	☉	Jan. 28	4	14	10 34
1181	Auranches	☉	July 13	3	15	3 48
1181	Auranches	☽	Dec. 22	8	58	4 40
1185	Rhemes	☉	May 1	1	53	9 0
1186	Cologne	☽	April 5	6	—	Total
1186	Franckfort	☉	April 20	7	19	4 0
1187	Paris	☽	March 25	16	17	8 42
1187	England	☉	Sept. 3	21	54	8 6
1189	England	☽	Feb. 2	10	—	9 —
1191	England	☉	June 23	0	20	11 32
1192	France	☽	Nov. 20	14	—	6 —
1193	France	☽	Nov. 10	5	27	Total
1194	London	☉	April 22	2	15	6 49
1200	London	☽	Jan. 2	17	2	4 35
1201	London	☽	June 17	15	4	Total
1204	England	☽	April 15	12	39	Total
1204	Saltzburg	☽	October 10	6	32	Total
1207	Rhemes	☉	Feb. 27	10	50	10 20
1208	Rhemes	☽	Feb. 2	5	10	Total
1211	Vienna	☽	Nov. 21	13	57	Total
1215	Cologne	☽	March 16	15	35	Total
1216	Acre	☉	Feb. 18	21	15	11 36
1216	Acre	☽	March 5	9	38	7 4
1218	Damiétta	☽	July 9	9	46	11 31
1222	Rome	☽	October 22	14	28	Total
1223	Colmar	☽	April 16	8	13	11 0
1228	Naples	☉	Dec. 27	9	55	9 19
1230	Naples	☉	May 13	17	—	Total
1230	London	☽	Nov. 12	13	21	9 34
1232	Rhemes	☉	October 15	4	29	4 25
1245	Rhemes	☉	July 24	17	47	6 —
1248	London	☽	June 7	8	49	Total
1255	London	☽	July 20	9	47	Total
1155	Constantinople	☉	Dec. 30	2	52	Annul.
1258	Augsburgh	☽	May 18	11	17	Total
1261	Vienna	☉	March 31	22	40	9 8
1262	Vienna	☽	March 7	5	50	Total
1262	Vienna	☽	August 30	14	39	Total
1263	Vienna	☽	Feb. 24	6	52	6 29
1263	Augsburgh	☉	August 5	3	24	11 17
1263	Vienna	☽	August 20	7	35	9 7
1265	Vienna	☽	Dec. 23	16	25	Total
1267	Constantinople	☉	May 24	23	11	11 40
1270	Vienna	☉	March 22	18	47	10 40
1272	Vienna	☽	August 10	7	27	8 53
1274	Vienna	☽	Jan. 23	10	39	9 25
1275	Lauben	☽	Dec. 4	6	20	4 29
1276	Vienna	☽	Nov. 22	15	—	Total
1277	Vienna	☽	May 18		—	Total
1279	Franckfort	☉	April 12	6	55	10 6
1280	London	☽	March 17	12	12	Total
1284	Reggio	☽	Dec. 23	16	11	9 13
1290	Wittemburg	☉	Sept. 4	19	37	10 30
1291	London	☽	Feb. 14	10	2	Total
1302	Constantinople	☽	Jan. 14	10	25	Total
1307	Ferrara	☉	April 2	22	18	0 54
1309	London	☽	Feb. 24	17	44	Total
1309	Lucca	☽	August 21	10	32	Total
1310	Wittemburg	☉	Jan. 31	2	2	10 10
1310	Torcello	☽	Feb. 14	4	8	10 20

Aft. Chr.	Eclipses of the Sun and Moon seen at		M. & D.	Middle H.	M.	Digits eclipsed
1310	Torcello	☽	August 10	5	33	7 16
1312	Wittemburg	☉	July 4	9	49	3 23
1312	Plaisance	☽	Dec. 14	7	19	Total
1313	Torcello	☽	Dec. 3	8	58	9 34
1316	Modena	☽	October 1	14	55	Total
1321	Wittemburg	☉	June 25	18	1	11 17
1323	Florence	☽	May 20	15	24	Total
1324	Florence	☽	May 9	6	3	Total
1324	Wittemburg	☉	April 25	6	35	8 8
1327	Constantinople	☽	August 31	18	26	Total
1328	Constantinople	☽	Feb. 25	13	47	11 —
1330	Florence	☽	June 30	15	10	7 34
1330	Constantinople	☉	July 16	4	5	10 43
1330	Prague	☽	Dec. 25	15	49	Total
1331	Prague	☉	Nov. 29	20	26	7 41
1331	Prague	☽	Dec. 14	18	—	11 —
1333	Wittemburg	☉	May 14	3	—	10 18
1334	Cesena	☽	April 19	10	33	Total
1341	Constantinople	☽	Nov. 23	12	23	Total
1341	Constantinople	☉	Dec. 8	22	15	6 30
1342	Constantinople	☽	May 20	14	27	Total
1344	Alexandria	☉	October 6	18	40	8 55
1349	Wittemburg	☽	June 30	12	20	Total
1354	Wittemburg	☉	Sept. 16	20	45	8 43
1356	Florence	☽	Feb. 16	11	43	Total
1361	Constantinople	☉	May 4	22	15	8 54
1367	Sienna	☽	Jan. 16	8	27	Total
1389	Eugibio	☽	Nov. 3	17	5	Total
1396	Augsburgh	☉	Jan. 11	0	16	6 22
1396	Augsburgh	☽	June 21	11	10	Total
1399	Forli	☉	October 29	0	43	9 —
1406	Constantinople	☽	June 1	13	—	10 31
1406	Constantinople	☉	June 15	18	1	11 38
1408	Forli	☉	October 18	21	47	9 32
1409	Constantinople	☉	April 15	3	1	10 48
1410	Vienna	☽	March 20	13	13	Total
1415	Wittemburg	☉	June 6	6	43	Total
1419	Franckfort	☉	March 25	22	5	1 45
1421	Forli	☽	Feb. 17	8	2	Total
1422	Forli	☽	Feb. 6	8	26	11 7
1424	Wittemburg	☉	June 26	3	57	11 20
1431	Forli	☉	Feb. 12	2	4	1 39
1433	Wittemburg	☉	June 17	5	—	Total
1438	Wittemburg	☉	Sept. 18	20	59	8 7
1442	Rome	☽	Dec. 17	3	56	Total
1448	Tubing	☉	August 28	22	23	8 53
1450	Constantinople	☽	July 24	7	19	Total
1457	Vienna	☽	Sept. 3	11	17	Total
1460	Austria	☽	July 3	7	31	5 23
1460	Austria	☉	July 17	17	32	11 19
1460	Vienna	☽	Dec. 27	13	30	Total
1461	Vienna	☽	June 22	11	50	Total
1461	Rome	☽	Dec. 17		—	Total
1462	Viterbo	☽	June 11	15	—	7 38
1462	Viterbo	☉	Nov. 21	0	10	2 0
1464	Padua	☽	April 21	12	43	Total
1465	Rome	☉	Sept. 20	5	15	8 46
1465	Rome	☽	October 4	5	12	Total
1469	Rome	☽	Jan. 27	7	9	Total
1485	Norimburg	☉	March 16	3	53	11 —

Various machines have been contrived to explain and illustrate the doctrine of eclipses. In all the mathematical shops are to be found tellurium's and lunarium's, which are said to be made for this purpose; for which, in fact, they are utterly unfit. For those conversant on the subject, machines are unnecessary; for those who are not, particularly young people, these machines are only calculated to give them erroneous notions. What little difficulty there is in the general principle, that requires this kind of illustration, is not to shew how there is an eclipse, but how it happens that most often there is not: now, in the above-mentioned instruments, the moon is in eclipse for nearly one-half of the month, and the sun during the remainder. This great defect arises from the impropriety of attempting to introduce the sun, moon, and earth, on one machine, intended to illustrate appearances in astronomy, the particular modifications of which depend altogether on the relative magnitudes and distances of the bodies which produce the phenomena.

In the lectures which were given this year at the Royal Institution by Mr. Pond, a machine was exhibited, which was entirely free from these objections. The sun was altogether omitted, and supposed to be at a great distance, for instance, a mile: by this means, the magnitudes of the earth and moon, and the proportionate dimensions of the lunar orbit, were preserved. The machine being adjusted for the present year, the moon revolved round the earth at her proper distance, and became, in the course of the year, twice eclipsed on the days marked in the ephemeris. An index, pointing to the sun, carried a small circle of card, representing the solar ecliptic limit: twice in the course of the year the moon came within the circumference of this card, indicating that there would be a solar eclipse. The machine is extremely simple in its construction: it was made under the direction of Mr. D. Adams of Fleet-street, by Mr. R. Newman, a very intelligent and ingenious workman, who is very well known in his profession.

The following description, illustrated with a plate, will give the reader a perfect idea of the nature of it.

Description of the Machine, to illustrate the Phenomena of Eclipses.

This instrument has the earth in the centre, half an inch in diameter, on which is fixed a piece of black wood, about 15 inches long, to represent the shadow of the earth from the sun: this earth, with the shadow, has a revolution on its axis in 365 days 6 hours. Underneath the earth, on the same centre, is a socket going round in 27 days 8 hours, on which is fixed an arm for carrying a small ball, to represent the moon, 15 inches in length, that the moon may pass clear of the end of the earth's shadow. This ball, which represents the moon, is about one-third the diameter of the earth.

Underneath the socket that carries the moon is another socket, going round retrograde, or contrary to the signs in the ecliptic, in 18 years 225 days, on which is fixed a circle with the moon's nodes, and latitude for every part of her orbit. This circle inclines to the ecliptic in an angle of 5° 18′, giving the moon's orbit an angle of 5° 18′ with the ecliptic.

Underneath the socket that carries the moon's orbit, and near the large plate on which is engraven the signs and degrees of the ecliptic, and the months and days of the month answering thereto, is a socket carrying round an index, to shew the sun's place in the ecliptic, in 365 days 6 hours. This index points to the day of the month and sun's place in the ecliptic through the year.

On the arm that carries the above index is fixed a circle, divided into $29\frac{1}{2}$ for shewing the moon's age in any part of her orbit.

On the ecliptic plate is a circle, divided into twice 12 hours, for shewing the hour of the day or night, by an index that moves round by the machine in 24 hours.

This instrument is constructed for shewing the mean time of all the new and full moons, and solar and lunar eclipses, for any given year.

The above being the particulars of the different parts of the machine, we shall now shew that the machine, so constructed, will exactly answer the intended purposes.

In the first place, the earth being half an inch in diameter, and the moon nearly one-third the diameter of the earth, the true proportional distance of the moon from the earth will be about 30 times the diameter of the earth, equal to 15 inches.

The moon moves round the earth, from any particular meridian to the same meridian again, in 27 days 8 hours, (the moon's orbit inclining to the ecliptic 5° 18′;) but from the sun to the sun again, in 29 days 12 hours; the sun having gone about 28° in the ecliptic, while the moon makes one revolut on round the earth, and overtakes the sun again in about 2 days 4 hours after passing the same meridian on the earth it set out from: the sun, with the annual index moving round in the exact time with the earth's shadow, throws the earth's shadow always in its true place.

To find the time that the new and full moons and eclipses will happen, on any given year, by the machine.—First, by an ephemeris, find the exact time of the first new or full moon in January; set the annual index to the day of the month in the ecliptic; bring the earth's shadow opposite the sun; if for new moon, bring the moon by turning the winder exactly between the sun and earth; but if for full moon, bring the moon opposite the sun, with the earth between the sun and moon; set the hour-index to the time in the hour-circle; then find the place in the ecliptic of the ascending or descending node, and set to its place in the ecliptic. This done, the instrument is rectified for use.

We will now suppose the instrument set to the first new moon in January: turn the winder, until the moon comes opposite where it set out from, which will be about the 15th day of the moon's age, in the circle of 29½; the annual index will point out the day of the month of the full moon; and the hour-index, the hour the moon is full; turn the winder, until the moon comes exactly between the sun and the earth, and you will have the exact time of new moon; and so on, for every new and full moon throughout the year.

As no solar eclipse can happen but at new moon, nor lunar eclipse can happen but at full moon, continue turning the winder, until you see the moon enter the end of the earth's shadow, and the annual index will shew the day, and the hour-index will shew the hour, the first lunar eclipse will happen on that year, for then the moon will be in the node of her orbit; and when the moon comes between the sun and earth in her node, it will be the first solar eclipse; and so on for every eclipse through the year. At new or full moon, when there is no eclipse, the moon will pass either above or below the earth's shadow, according to the moon's latitude at the time.

In the figure (*fig.* 100.) in which this machine is represented, E *s* represents the earth's shadow, E *x* a fine wire or index in the same straight line as the shadow, which always points to the same place. The arm carrying the moon has a hinge, by which means it always falls, and runs upon a small wheel on the inclined plane, which represents the moon's orbit; the plane of the dial-plate represents the plane of the ecliptic. The rest will easily be understood by inspection.

ECLIPTA, in *Botany*, from εκλειπω, *to be deficient*, alluding, as it should seem, to the want of a crown, or wing, to the seeds, one of the chief characters that distinguish it from *Verbesina*, with which it had formerly been confounded by Linnæus himself. Linn. Mant. 2. 157. Schreb. 569. Willd. Sp. Pl. v. 3. 2217. Juss. 187. Mart. Mill. Dict. v. 2. Gærtn. t. 169. (Eupatoriophalacron, Vaillant Mem. de l'Acad. des Sc. for 1720. Dill. Elth. 138. t. 113.) Class and order, *Syngenesia Polygamia-superflua*. Nat. Ord. *Compositæ, oppositifoliæ*, Linn. *Corymbiferæ*, Juss.

Gen. Ch. *Common Calyx* of many lanceolate nearly equal leaves, in a double row. *Cor.* compound, radiated; florets of the radius very numerous; female strap-shaped, extremely narrow; those of the disk hermaphrodite, tubular, four-cleft, erect, nearly on the outside. *Stam.* (in the latter.) Filaments four, very short; anthers forming a cylinder. *Pist.* (in the same.) Germen oblong; style moderately long; stigma of two spreading lobes. Germen in the female florets triangular; style and stigma as in the others. *Peric.* none, except the permanent calyx. *Seed* of the disk oblong, compressed, crenulated, obtuse, naked; of the radius triangular, oblong, crenulated, obtuse, naked. *Recept.* flattish, clothed with very narrow upright scales.

Obs. It differs from *Verbesina* in having the florets of the disk four-cleft, and naked seeds; and from *Cotula* in its scaly receptacle.

Ess. Ch. Receptacle chaffy. Seed-down none. Florets of the disk four-cleft.

The number of species in Willdenow is seven, annuals of a very mean aspect, growing on waste, or cultivated ground, in the East Indies, or warmer parts of America. Their stem is branched. Leaves opposite, lanceolate, or ovate, acute, serrated, rough, more or less stalked. Flowers small and inelegant, whitish, or yellowish, on long, simple, slender, lateral, axillary, or terminal, stalks. Scales of the calyx broad and hairy. Michaux describes one species, his E. *brachypoda*, Fl. Boreal. Amer. v. 2. 130, as having the florets five-cleft. E. *erecta*, from South America, and E. *prostrata*, from the East Indies, have been introduced into our stoves, certainly rather for curiosity than ornament. E. *punctata* is said to afford a juice which turns black, when exposed to the air, and is used by the negroes in the West Indies to deepen the colour of their skin.

ECLIPTIC, Ecliptic us, something belonging to eclipses. All new and full moons are not ecliptic, *i. e.* eclipses do not happen every new and full moon, though there be then an interposition, either of the earth between the sun and moon, or of the moon between the sun and earth. The reason is, that the interposition is only as to longitude, and not as to latitude. The sun is always in the ecliptic, but the moon is not; she deviates from it above five degrees, and ⅔, sometimes on the north side, and sometimes on the south. But every five months, or thereabouts, she cuts the ecliptic; and it is only about those times, that there can be eclipses either of the moon or sun. The places wherein she cuts the ecliptic, are called the nodes of the moon. See Eclipse.

Ecliptic *bounds*, or *limits*, are the greatest distances from the nodes at which the sun and moon can be eclipsed. See Eclipse.

Ecliptic *digits*, *digiti ecliptici*. See Digits.

Ecliptic, in *Astronomy* a great circle of the sphere in which the sun describes its annual course.

It is sometimes defined the projection in the heavens of the line described by the centre of gravity of the earth and moon, as seen from the centre of the sun.

To have determined the exact path described by the apparent motion of the sun, must have required the continued observations of many centuries. The path of the sun, resulting from the combination of its annual and diurnal motion, is, in fact, a spiral, and may be represented by winding a thread round that part of the celestial globe which comprehends the annual motion of the sun, beginning at either solstice, and making as many turns between it and the equator, as the sun employs days to traverse that part of his annual path. But the distance between the consecutive threads would not be equal; they would almost coincide with each other near the solstices, and would gradually widen as they approached the equator. An observer at the pole, if it were habitable, would see the whole of this spiral; and it is easy to conceive how familiar he might be with this phenomenon, without any idea of such a circle as the ecliptic ever suggesting itself to his imagination.

This spiral motion of the sun may be conceived as produced by a motion nearly uniform, combined with a rectilinear motion extremely unequal. It may be represented by drawing a line on the celestial globe from the equator to the solstice, the globe being, at the same time, supposed to be in motion round its axis; but the line must not be drawn with a uniform motion, but gradually retarded as the tracing point approaches the solstice.

This may seem a very complicated way of arriving at a knowledge of the ecliptic; but we must recollect, that the problem is really represented to us in this form by nature. The Greeks were acquainted with the irregular spiral above described long before they had any conception of the existance of such a curve as the ecliptic. With them the difficulty of the problem consisted in reconciling this irregular motion of the sun, from north to south, with that simplicity they were accustomed to attribute to the operations of nature; and they were at a loss to conceive what impediment the sun met with in his path that could thus retard his progress, and compel him to return. Their philosophers, who had more imagination than judgment, explained this phenomenon something in this manner. They supposed that the sun, as he approached the north, was impeded in his course by the increasing thickness of the atmosphere, which, by continually increasing the difficulty of his progress, at length induced him to alter his course; that when, on his progress back again towards the south, he crossed the equator, finding there the climate more congenial to his nature, he proceeded with vivacity; but on again approaching the more intemperate regions, he found the climate so contrary to his nature, that he was again compelled to return.

Though the explanation of the phenomena, arising from the sun's annual and diurnal motion, was known to the Eastern nations at a very early period of antiquity; yet the merit of the discovery has by some writers been attributed to Anaximander, an astronomer of the Ionian school, who flourished about 600 years before the Christian era. He was a disciple of Thales, who seems to have acquired his knowledge from the astronomers of Egypt. Both Thales and his successors explained the motion of the sun as we do at the present day. They appear distinctly to have understood how the above-mentioned spiral arose from the simple combination of two circular motions.

The nature of the ecliptic being once understood, the next object was to determine its inclination to the equator. The most ancient instrument for this purpose was, no doubt, the gnomon, or upright pillar to cast a shadow of the sun: the length of this shadow was observed throughout the year, particularly at the solstices, by which means the sun's greatest and least altitude was obtained: half of this difference, namely, half the difference between the altitude at the longest, and the

the altitude of the ſhorteſt day, was evidently the obliquity of the ecliptic. This being once determined, it became requiſite to deviſe ſome method of placing this circle in its poſition on the celeſtial ſphere; for, we ſhou'd obſerve, that none of the preceding obſervations give us any inſight into the true ſituation of the equinoctial points in the heavens. It was eaſy to determine, by the foregoing methods, the ſituation of the ſun at any moment, with reſpect to the equinoctial points; but to place the ecliptic on the ſphere, it was requiſite to know, at the ſame moment, the ſituation of the ſun, with reſpect to ſome given ſtar.

Before the invention of the pendulum this was an operation of great difficulty; for the ſun never being viſible, at the ſame moment, with any of the fixed ſtars, it was not eaſy to meaſure his diſtance from any of them. The ancient aſtronomers had recourſe to the moon as an intermediate object of compariſon. The moon is often viſible at the ſame time with the ſun; it was, therefore, practicable to meaſure the diſtance from the ſun to the moon; they then waited till the ſun deſcended below the horizon, and then meaſured the diſtance between the moon and any remarkable ſtar, and, by allowing for the motion of the moon in its orbit during this ſhort interval, they thus accompliſhed their purpoſe. Modern aſtronomers effect this by comparing the meridian tranſit of the ſun with that of the principal fixed ſtars, and thus determine the right aſcenſion of each. See TRANSIT and RIGHT ASCENSION.

This great circle of the ſphere being once placed in its proper poſition among the conſtellations of the fixed ſtars, according to the method above deſcribed, it was natural to ſuppoſe it would retain its poſition conſtantly the ſame; but, when practical aſtronomy had attained to ſome conſiderable degree of perfection under the aſtronomers of the Alexandrine ſchool, Hipparchus, by comparing his obſervations with thoſe of his predeceſſors, obſerved, that the ecliptic had certainly changed its ſituation relative to the equator. If this diſcovery of Hipparchus appeared to him entirely new, (and there is no reaſon to doubt it,) it is a proof of the great decline of aſtronomy in Egypt in his time; for certainly this phenomenon, now called the preceſſion of the equinoxes, muſt have been known, in ſome form or other, to the more early aſtronomers, as the effect of it is to render inaccurate the rules laid down by ancient authors for the regulation of the ſeaſons. Ancient zodiacs, likewiſe, prove that the ecliptic and equator were known to interſect each other, in points very different from thoſe determined by the predeceſſors of Hipparchus. There is, however, ſome obſcurity in theſe zodiacs; the equator and ecliptic are not laid down in the diſtinct manner they are on our globes, but often in a rude and unintelligible manner. One of thoſe, however, lately found in Upper Egypt, ſeems to refer to a period about 2000 years before the Chriſtian era. The writings of Heſiod, from ſimilar conſiderations, appear to refer to the year 900 A. C.; therefore, the effects of this phenomenon muſt have been known: but, perhaps, before the time of Hipparchus, they had never been attributed diſtinctly to their proper cauſe. The ecliptic, being divided into four equal parts by the equinoctial and ſolſticial points, the ſun was naturally ſuppoſed to deſcribe them in four equal portions of time; for the ecliptic, being a great circle, and every part of a circle bearing the ſame relation to its centre, what reaſon could be given why the ſun ſhould deſcribe equal portions of the ecliptic in unequal periods of time? Yet Hipparchus, when he came to examine more attentively, than had been done before, the circumſtances of the ſun's motion, found, that the ſun took above eight days more to perform the ſummer half than the winter half of the ecliptic: the time of his paſſing through the two equinoxes was likewiſe unequally divided by the ſolſtices. This unexpected phenomenon led to a more mathematical inveſtigation of the nature of the ſun's orbit. Hipparchus, and ſucceeding aſtronomers, explained this phenomenon, by ſuppoſing it was only an optical illuſion, cauſed by the earth's being placed in an eccentric poſition relative to the orbit of the ſun, which they imagined to be a perfect circle, deſcribed with a motion, likewiſe, perfectly uniform: this theory continued, till the beautiful diſcovery of Kepler demonſtrated the ſun's apparent orbit to be an ellipſe, and that the centre of motion was in one of the foci. In this ellipſe, the ſun deſcribes equal areas in equal times. But in either hypotheſis, there are two points of the apparent orbit of the ſun, in which he is at his leaſt and greateſt diſtance from the earth; theſe points are called the *perigee* and *apogee*. To complete, therefore, the theory of the ecliptic, it was neceſſary to determine the ſituation of theſe two points. This was done by Hipparchus, who determined the poſition of the perigee, about 150 A. C. to precede the winter ſolſtice.

Theſe points, like the equinoctial points, do not remain at reſt, but their motion is in an oppoſite direction. It was Abategnius, an Arabian aſtronomer, who flouriſhed in the middle ages, who firſt diſcovered the motion of the perigee; it advances 15″ with reſpect to a given fixed ſtar, and 63″ with reſpect to the equinoxes.

The great circle in the heavens then, which we call the ecliptic, is the perſpective repreſentation of the apparent orbit of the ſun, and neceſſarily partakes of all the irregularity of the original, in whatever relates to the ſun's motion. We thus ſee the reaſon why the ſeaſons are divided unequally, for the winter and ſummer half year can never be equal, but in the rare occurrence of the coincidence of the perigee with the vernal or autumnal equinox. It is a very curious circumſtance, that this coincidence did actually take place at the period in which chronologiſts place the creation of the world, that is, about the year 4000 A.C. Each hemiſphere of the earth had then an equal portion of the light and heat of the ſun, but as the perigee continued to advance on the ecliptic, the northern hemiſphere gradually obtained the greateſt ſhare, and about the year 1250 it attained its maximum of advantage; ſince that time the advantage in favour of the northern hemiſphere, though ſtill very conſiderable, continues to diminiſh, and will do ſo till the year 6470, when the perigee will coincide with the vernal equinox, and produce again a perfect equality between the two hemiſpheres. After this period, the ſouthern hemiſphere will obtain the advantage, and preſerve it in the ſame manner during another period of upwards of ten thouſand years.

But theſe are far from being the only irregularities to which the ſolar orbit is ſubject, and which find their correſponding ones in the ecliptic.

It not only continually changes its obliquity with reſpect to the equator, but alſo its poſition relatively to the fixed ſtars. Its poſition has varied ſlowly in the courſe of many ages, ſo that its moſt northern point is now more remote from the pole ſtar than it was in the time of Eratoſthenes, who obſerved its place 230 years before the birth of Chriſt. It appears from La Grange's calculations, that the limit of its greateſt variation among the fixed ſtars is about 10° or 12°, but the obliquity of the ecliptic to the equator never can differ more than two or three degrees, ſince the equator will follow, in ſome meaſure, the motion of the ecliptic.

On

On the Obliquity of the Ecliptic.

Sufficient proofs may be drawn from ancient obſervations of the diminution of the obliquity of the ecliptic; but whether the fact was known to the ancient aſtronomers, from a compariſon of ſtill more ancient obſervations, may admit of ſome doubt. Herodotus relates that the Egyptians had a tradition that the ecliptic was once perpendicular to the equator; this we know could not be true, but it indicates a theory of continued diminution, which might eaſily have aſſumed the form of a tradition; but conſidering what exact obſervations muſt have been neceſſary to have eſtabliſhed this theory, it is not impoſſible that it was only a fortunate conjecture.

Ptolemy expreſsly ſays (Almag. l. 11.) that he found, during many years, the diſtance of the tropics 47°, with two-thirds of a major portion, (or of a degree,) and three-quarters of a minor portion, (or of a minute,) that is to ſay, 47° 40′ 45″, the half of which is 23° 50′ 22″.

This, he adds, is nearly the ſame reſult which was found by Eratoſthenes, and of which Hipparchus has made uſe; for the diſtance of the ſolſtitial points is according to them $\frac{11}{83}$ of the circumference of the meridian; which makes it 23° 51′ 20″, about 250 years before our era.

Ptolemy gives, at the end of his book, a table of ſhadows under different parallels; it is there ſhewn that the height of the gnomon being 60 parts, the length of the ſhadow at Marſeilles was $20\frac{5}{6}$. This determination is attributed to Pytheas. Theſe ancient obſervations agree very nearly in giving the obliquity of the ecliptic 23° 51′, 200 years before our era. If this obliquity be compared with that which is actually obſerved, 23° 28′, a diminution of 69″ every century is diſcovered.

Riccioli endeavours to prove that the obliquity of the ecliptic was then only $23\frac{1}{2}$″; but he could not poſſeſs proofs ſufficiently demonſtrative to contradict four ancient obſervations, which could be eaſily made at leaſt within an error of 10′.

It is true, that conſulting Pappus of Alexandria, who lived 200 years after Ptolemy, the obliquity of the ecliptic is found nearly the ſame as it is at preſent; but it is by admitting the interpretation of Commandinus, which Vindelinus thought ſhould not be relied on. Beſides, Pappus was not ſo correct an obſerver as Eratoſthenes, Hipparchus, and Ptolemy, and his object was not to give an aſtronomical determination of the obliquity of the ecliptic.

From the year 106 before our era, the Chineſe aſtronomers give as a known principle, the obliquity of the ecliptic 24 Chineſe degrees, which is 23° 39′ 18″; this quantity is leſs than that of the Greeks; but it proves, nevertheleſs, a diminution in the obliquity of the ecliptic, which even agrees with many modern obſervations, and gives a diminution of 35″ every century.

Albategnius, who lived about the year 880, ſays that he obſerved the zenith diſtance of the ſun on the meridian, at Aracte, to be 59° 36′ in winter, and that the leaſt was 12° 26′, from which he concludes the obliquity of the ecliptic 23° 35′. This obſervation was made with a very long and accurate ſtaff: 40″ muſt be added to it for the effect of refraction, minus the parallax, and we ſhall get 23° 35$\frac{3}{4}$′ for the obliquity of the ecliptic about the year 900; we ſhould infer from this a diminution of 50″ every century. This obſervation differs but little from that of Almamoun; the diminution which it gives is a medium between thoſe which are deduced from more ancient obſervations. Edward Bernard has produced many other obſervations from the Arabians on the obliquity of the ecliptic, in the Philoſophical Tranſactions of 1684. They may be found likewiſe in a long memoir given by M. De la Lande on this ſubject, in the Mem. de l'Academie, 1780.

By the obſervations of Co-cheou-King it is found to be 23° 32′ 12″, for 1278.

By thoſe of Waltherus, made at Nuremberg, La Caille finds it 2° 29′ 47″ for 1490. (Mem. Ac. 1757.) There reſults from hence a diminution of 34″ in a century.

According to Tycho Brahe, the obliquity of the ecliptic, in 1587, was 23° 31′ 30″; but calculating all his obſervations more correctly, it is found to be 23° 29′ 30″, which gives the diminution 44″.

The obſervations of Hevelius give for 1660, 23° 29′ 0″, a diminution of 46″ in a century. P. Ximenes, by means of the gnomon at Florence, conſtructed about 1480, found 34″. (Mem. 1780.) The younger Caſſini, by the obſervations of Richer, made at Cayenne in 1672, found the obliquity 23° 28′ 54″; and by thoſe made by his father, made with the gnomon, at St. Petronii, 23° 29′ 0″. This is what he employs himſelf in his tables. The obſervations of Richer have been diſcuſſed by M. Le Monnier. (Mem. Ac. 1769 and 1774.) They ſeem to give a diminution of 33″ in a century.

Flamſteed alſo, in 1689 and 1690, found by repeated obſervations, the obliquity of the ecliptic 23° 28′ 56″; 8″ muſt be taken from it, and we ſhall obtain the mean obliquity for 1690, 23° 28′ 48″, a quantity greater by 32″ than that given by all modern obſervations, and which gives the diminution 47″. He examined the obſervations of Waltherus, Tycho Riccioli, Hevelius, Mouton, Richer, De la Hire, and Margraf, and he always found the ſame reſult from thoſe neareſt to each other as well as from thoſe moſt diſtant: but the ſyſtem which Flamſteed had embraced, made him, perhaps, give the preference to thoſe obſervations which were favourable to it.

Bianchini, in 1703, found the obliquity of the ecliptic 23° 28′ 32″. Horrebow, by the obſervations of Reaumur, made in 1709, finds 23° 28′ 47″.

The younger Caſſini, by obſervations made in the laſt century, at the obſervatory of Paris, finds the diminution $63\frac{1}{2}$″. (Mem. l'Acad. 1778. Connoiſſ. des Temps. 1781.) M. Mechain, by a great number of compariſons, found it 39″ in 1780. M. De La Lande conſiders that 33″ reconciles the greateſt number of obſervations. Mem. l'Acad. 1780.

Dr. Maſkelyne, by the obſervation of many ſolſtices, with excellent inſtruments, from 1765 to 1772, find the mean obliquity for the 1ſt of January 1769, to be 23° [illegible]′ 5″ (Phil. Tranſ. 1787.) If this be compared with that found by Bradley for 1750, 23° 28′ 19″, a diminution of 55″ or 54″ in a century is found. M. Hornſby finds 38″ ſince 1774. The obſervations of Almamoun, Albategnius, Co-cheou King, and Hevelius, give 50″. The theory likewiſe gives 50″, when the maſs of Venus is taken according to M. De la Lande.

The new ſolar tables publiſhed by the Board of Longitude, at Paris, ſuppoſe the obliquity 23° 27′ 57″ for the year 1800. According to Piazzi it is 23° 27′ 56″.3; and Dr. Maſkelyne found 23° 27′ 56″.6, by obſervations of the three ſolſtices of 1800, 1802, and 1803. Mr. Pond, by ſome obſervations made with an aſtronomical circle, by Troughton, at Weſtbury, found the obliquity, in 1800, to be 23° 27′ 56″.5.

Delambre's obſervations were made with the repeating circle of Borda, for twelve different ſolſtices, and from his determination the French tables were conſtructed.

It is, then, proved by obſervations made on the obliquity of the ecliptic at every period, as well as by the latitudes of ſtars

ſtars mentioned by Ptolemy, that the ecliptic approaches the equator, as may be ſeen by the following table, in which the obſervations of aſtronomers of all ages have been collected together.

Author's Names.	Years before Chriſt.	Obliquity
Pytheas	324	23° 49′ 23″
Eratoſthenes and Hipparchus	230 and 140 after Chriſt	23 51 20
Ptolemy	140	23 48 45
Almamoun	832	23 35
Albategnius	880	23 35
Thebat	911	23 33 30
Abul Wafi and Hamed	999	23 35
Perſian Tables in Chryſococca	1004	23 35
Albatrunius	1007	23 35
Arzachel	1104	23 33 30
Almæon	1140	23 33 30
Choja Naſſir Oddin	1290	23 30
Prophatius the Jew	1300	23 32
Ebn Shattir	1363	23 31
Purbachius and Regiomontanus	1460	23 30
Ulugh Beigh	1463	23 30 17
Waltherus	1476	23 30
Corrected by refraction, &c.	——	23 29 8
Wernerus	1510	23 28 30
Copernicus	1525	23 28 24
Egnatio Danti	1570	23 29
Prince of Heſſe	1570	23 31
Rothmanus and Byrgius	1570	23 30 20
Tycho Brahe	1584	23 31 30
Corrected	——	23 29
Wright	1594	23 30
Kepler	1627	23 30 30
Gaſſendus	1630	23 31
Ricciolus	1646	23 30
Corrected	1655	23 29
Hevelius	1653	23 30 20
Corrected	1661	23 28 51½
Caſſini	1655	23 29 15
Mouton's, corrected, &c.	1660	23 29 3
Richer, corrected	1672	23 28 51½
De la Hire	1686	23 29
Corrected	——	23 29 28
Flamſteed	1690	23 29
Bianchini	1703	23 28 25
Roemer	1706	23 28 41
Louville	1715	23 28 24
Godin	1730	23 28 20
Bradley	1750	23 28 18
Meyer	1756	23 28 16
Horſſby	1772	23 28 8
Nautical Almanac	1779	23 28 7
Ditto	1800	23 27 50
Dr. Maſkelyne's obſervations	1800	23 27 56.6
Piazzi	1800	23 27 56.3
Mr. Pond	1800	23 27 56.5
Delambre with repeating circle of Borda, mean of many hundred obſervations	1800	23 27 57

It remains now to give a phyſical explanation of this phenomenon, agreeable to the principles of attraction.

Euler was the firſt perſon who demonſtrated that the attraction of the planets upon the earth ought to produce this effect. Inegalites de Saturn. Memoires de Berlin, 1754. Pieces de Prix, vol. vii.

M. De la Lande has given the demonſtrations and calculations at full length in the Mem. de l'Acad. 1758, 1761, and 1780. M. De la Grange has given others in the Mem. de l'Acad. 1774.

Whenever two planets move round the ſame centre in the ſame direction, but in different planes, each of theſe planets makes the node of the other retrograde upon its orbit. Let us ſee what ought to take place upon the earth in conſequence of this derangement, and let us take, for example, the attraction of Venus on the earth. Let E D Q (*Plate* XII. *Aſtronomy*, *fig.* 101.) be the equator, E G N the ecliptic, N V Q the orbit of Venus, ſo that the earth advances from E to N along the ecliptic, and Venus from Q to N in its orbit. The attraction of Venus on the globe of the earth cauſes the point N to retrograde to V, that is to ſay, that the node of the ecliptic on the orbit of Venus advances in a contrary direction to the motion of the earth.

The ecliptic will then change its ſituation, and will paſs from N to D V, without the inclination being affected, that is to ſay, ſo that the angle V may be ſtill equal to the angle N, but that the retrogradation of the node of the ecliptic upon the orbit of Venus may be equal to the quantity N V in a year. Now the equator E Q does not change its ſituation by the influence of which we are ſpeaking, becauſe the rotation of the earth is independent of its annual motion, and that the attraction of the planets is not ſenſible on the axis of our ſpheroid. Thus the ecliptic E N, inſtead of cutting the equator at the point E will, the ſucceeding year, biſect it in D. The equinoctial point E will advance the quantity E D along the equator, or the quantity E C along the ecliptic. And this alteration in the ſituation of the ecliptic will, in time, change the longitudes and latitudes of all the fixed ſtars, and the inclinations of the planetary orbits to the ecliptic.

In a triangle E N Q, in which the angles Q and N are conſtant, and in which the ſide N Q varies; for example, 2″.39, as that ſeems indicated by the obſerved diminution in the obliquity of the ecliptic of half a ſecond a-year; the change E D, which will reſult to the other ſide E Q, is equal $\frac{2'' \text{ ſin. N, coſ. E N}}{\text{ſin. E}}$. If a perpendicular D G be let fall on the ecliptic E G N, the ſmall quantity E G will be equal E D, coſ. E, therefore multiplying the preceding value of E D by coſ. E, we ſhall get 2″ ſin. N, coſ. E N, cotang. E, for the quantity E G, by which the equinoctial point has moved along the ecliptic by the action of Venus. As to the change which the arc of the ecliptic D V undergoes at its other extremity V, it is uſeleſs to pay attention to it; it only affects the longitude of the node V of Venus on the ecliptic, but does not change the longitudes of the other ſtars which are reckoned from the equinoctial point E or D. Theſe longitudes are only changed becauſe the equinox and the ſtar do not vary their poſition equally, with reſpect to this node, reckoning along the ecliptic; beſides the quantity required is much ſmaller than the total change of poſition of the ecliptic.

The ſame reſult may be found by conſidering the poles of the three circles, the circumferences of which have been inveſtigated. Let E be the pole of the ecliptic (*fig.* 102.); P the pole of the equator, or of the earth; V the pole of the orbit of Venus. The motion of the ecliptic on the orbit of Venus produces a motion of the pole of the ecliptic round the pole of the orbit of Venus, and it is the ſame thing to ſay, that

that ecliptic has a retrograde motion of 5″ on the orbit of Venus, or that the pole of the ecliptic retrogrades round the pole of the orbit a quantity E M, the value of which is 5″ of the circumference of the ſmall circle E M N, the radius of which is the diſtance between the poles of the ecliptic and of the orbit of Venus.

In the ſpherical triangle P V E, the two ſides P V and V E are conſtant, while the remainder varies by the motion of the pole E, in the circumference E M N, from hence it follows that the variation of the angle P, or the ſmall angle E P M, is $= \frac{M X}{\text{ſin. } p E} = \frac{E M \text{ ſin. } X E M}{\text{ſin. } P E} = \frac{2'' \text{ ſin. } E V, \text{ ſin. } X E M}{\text{ſin. } P E} = \frac{2'' \text{ ſin. } E V, \text{ coſ. } P E V}{\text{ſin. } P E}$, but in the triangle P B E the variation of P is to that of E as radius is to the coſine of P E. Therefore the variation of the angle P E B, which is the ſame as that of the angle P E V, is = 5″ ſin. E V, coſ. P E V, cotang. P E, which is the ſame as the preceding formula; for E V is equal to the inclination of the orbit of Venus; P E is equal to the obliquity of the ecliptic, and the angle P E V is equal to the longitude of the node of Venus, becauſe it is the angle formed at the pole of the ecliptic E, by the colure of the ſolſtices E P, which is 90° diſtant from the equinoxes, and the circle E V, which paſſes through the poles of the orbit of Venus, and which is 70° from its node. This change of the angle P E B is the quantity by which the colure of the ſolſtices E P changes its place in taking the new ſituation M P, and conſequently the change of the colure of the equinoxes, which is always at right angles with that of the ſolſtices: it is therefore the quantity by which the equinoctial point departs from the line E M B C, which is ſuppoſed to be fixed during the time which the pole takes to traverſe the ſmall ſpace E M. This equinoctial point being always at the extremity of an arc of 90°, or of a circle of latitude perpendicular to E P, and the poſition of which changes as well as the poſition of the colure E P, all the celeſtial longitudes which are reckoned from the equinoctial colure, will change by this quantity, which will be, conſequently, a part of the preceſſion of the equinoxes.

In the triangle P E V the variation of the ſide P E is equal to 2″ ſin. E V, ſin. P E V; this is the quantity by which the obliquity of the ecliptic varies every year by the action of Venus.

Subſtituting for V E its value 3° 23′ 35″, and for the angle E 74° 26′, the longitude of the node of Venus in 1750, and multiplying by 100, we ſhall find 30″.88 for the quantity by which the obliquity diminiſhes in a century from the action of Venus alone.

Making the ſame ſubſtitution in the other formula, which expreſſes the change in the angle E, we ſhall get 2″ ſin. 3° coſ. 74°, cot. 23½° = 0″.0887 for the quantity which the angle E (*fig.* 102.) or the point D (*fig.* 101.) varies every year, by the action of Venus, that is to ſay, that the preceſſion of the equinoxes diminiſhes 8″.87 every century by the action of Venus.

The quantity by which the longitudes and latitudes of the fixed ſtars vary from this alteration in the poſition of the ecliptic, may be calculated in the ſame manner. It may be demonſtrated, that if the pole of the equator revolves round the pole of the ecliptic, the inequality of the poſitions of the ſtars along the ecliptic is equal to L ſin. 23°, ſin. R A, tang. declin. in which expreſſion L repreſents the preceſſion in longitude, that is to ſay, that in general the inequality of the poſitions reckoned upon the revolving circle is equal to the motion of the revolving pole, multiplied by the ſine of the diſtance of the two poles, by the ſine of the diſtance of the ſtar from the node of the two circles, meaſured along the revolving circle, and by the tangent of the diſtance of the revolving circle. If we apply this theorem to the motion of the pole of the ecliptic round the pole of Venus, we ſhall get for the change of longitude, which reſults to a fixed ſtar every year, 5″ multiplied by the ſine of the inclination of Venus, by the ſine of the diſtance of the ſtar from the node of Venus, meaſured along the ecliptic, and by the tangent of the latitude of the ſtar.

The change in the declination of the fixed ſtars is equal L ſin. 23°, coſ. R A. Hence it appears, that where the pole of the equator revolves round the pole of the ecliptic, the change in the diſtance of a ſtar from the equator, or from the revolving pole, is equal to the motion of this pole, multiplied by the ſine of the diſtance of the two poles, and by the co-ſine of the diſtance of the ſtar from the interſection of the two circles meaſured along the revolving circle. This expreſſion, applied to the preſent caſe, ſhews, that if the pole of the ecliptic turns round the pole of the orbit of Venus, the change in the diſtance of a ſtar from the ecliptic, or its latitude, is equal to the motion of the ecliptic, multiplied by the ſine of the inclination of the orbit of Venus, and by the co-ſine of the diſtance of a ſtar from the node of Venus, meaſured along the ecliptic.

Let us call D the diſtance of a ſtar from the aſcending node of a planet, or the longitude of a ſtar minus that of the planet's aſcending node, I the inclination of the planet's orbit, L the latitude of the ſtar, M the motion of the pole of the ecliptic round the pole of the planet, or the change N V (*fig.* 100.) of the planet's node along its orbit; we ſhall get M ſin. I, ſin. D, tang. L, for the change of the ſtar in longitude, and M ſin. I, coſ. D, for the change in latitude.

The formula for the motion of the nodes (ſee NODE,) being applied to each planet, gives the actual motion of the node of the ecliptic on the orbit of each planet: this is the value of M in the preceding expreſſions.

The quantity D, or the diſtance of a ſtar from the node of it, is variable, on account of the motion of the nodes of each planet, and that of the ſtars in longitude, but from the ſlowneſs of theſe motions, and the ſmallneſs of the quantities that are to be determined, the diſtance D may be conſidered as invariable for one century.

To obtain D, the place of the node of each planet for 1750 muſt be taken, and it muſt be taken from the longitude of the ſtar; the inclination muſt be taken equal to I, the value of M is given by the motion of the node of the ecliptic on each orbit; thus, knowing the latitude of the ſtar, we have all the data required for finding the value of theſe two formulas.

For example, we find 6″.983 for the action of Jupiter for one year. This is the value of M; its inclination is 1° 18′ 50″ = I; then M ſin. I = 0″.1601; its node is at 3ˢ 7° 56′ of longitude; therefore the change of latitude M, ſin. I, coſ. D = 0″.16 coſ. (longit. − 98°.)

This expreſſion may be put in a more commodious form, by conſidering that the co-ſine of the difference of the two arcs is equal to the product of the co-ſines, added to that of the ſines; now the co-ſine of 98°, is equal to that of 82° taken negatively; we ſhall therefore get 0″.16 coſ. (longit. − 98°) = − 0″.16, coſ. 82°, coſ. long. + 0″.16, ſin. 82°, ſin. long. = 0″.1586, ſin. long. − 0″.0211, coſ. longit.

Employing the motions of the nodes, and the inclinations of each of the other planets in the ſame manner to obtain the value of this formula M, ſin. I, coſ. D, and multiplying the

the annual motion by 100, we get the fecular motion of the northern ftars, in latitude, from the action of each planet, fuch as they have been given by M. de la Lande, in the Mem. de l'Acad. for 1758. 1761, 1780, according to different fuppofitions for the mafs of each planet. The fellowing numbers are thofe which he has given, and are the fame as thofe of M. de la Grange (Mem. de Berlin, 1782), with the exception of Venus, the mafs of which M. de la Lande has diminifhed about one quarter, in order to find the fecular diminution in the obliquity of the ecliptic 50″ in round numbers.

Saturn	1″.39	fin long.	− 0″.53 cof. long. of the ftar.
Jupiter	15.86		− 2.11
Mars	1.03		+ 0.95
Venus	30.88		+ 8.87
Mercury	0.84		+ 0.83
Total	+ 50″.00	fin. long.	+ 8″.03 cof. long.

The figns change for the ftars which have fouthern latitudes. The change of fines muft alfo be obferved.

This expreffion is the fame as 50″.64 fin. (longit. + 9° 7′,) becaufe $\frac{8''.03}{50''.00}$ = tang. 9° 7′ 26″; for, if we call this quantity of 9°, y, and the co-efficient required, x, we fhall get for 0° of longitude 8″.0 = x fin. y, and for 90° 50″ = x cof. y; therefore, $x = \frac{8''}{\text{fin. } y} = \frac{50''}{\text{cof. } y}$; therefore, $\frac{\text{fin. } y}{\text{cof. } y} = \frac{8''}{50''}$ = tang. 9° 7′ 26″, and $x = \frac{50''.0}{\text{cof. } 9° 7'} = 50''.64$.

Example — Sirius had 3ˢ 10° 38′ longitude in 1750; multiplying the 50″ of this formula by the fine of 79° 22′, we fhall get 49″.1; and multiplying 8″.03 by the cofine of 79° 22′, taken negatively, we find 1″.5; the difference is 47″.6. This is the fecular diminution of the latitude of Sirius in this century.

It would be neceffary to know thefe quantities for more diftant centuries; for example, inftead of 3ˢ 8°, which is the place of Jupiter's node, its longitude 2ˢ 20° muft be fubftituted for the year 50. If the motion of the node of Venus, 14° 38′, be equally taken into confideration; the change of latitude in the firft century of our era will be found 46″.66 fin. long. + 20″.41 cof. long. This quantity is different from that which has been found for this century; and it is by taking a medium, that the fecular change of the fixed ftars in latitude may be found, from the age of Ptolemy to the prefent time. Befides, this change in the firft century depends on the motion of the nodes of each planet, which is yet but imperfectly known; therefore, this effect cannot be determined with precifion.

The fame numbers will ferve to find the change in the longitude of the fixed ftars, M fin. I, fin. D, tang. L; becaufe it is fufficient to change the words into *fine* and *cofine of longitude*, and to multiply the whole by the tangent of the latitude of the ftar. The value for the firft century of our era, and for that in which we are, is as follows: The figns are for northern ftars, and the fign minus indicates a diminution of longitude, (− 46″.7 cof. long. + 20″.4 fine long.) tang. latit. year 50; (− 50″.0 cof. long. + 8″.03 fine long.) tang. latit. year 1750. Thefe expreffions are equivalent to − 50″.93 cof. (long. + 23° 37½′) tang. latit. year 50; A − 50″.64 cof. (long. + 9° 7′) tang. lat. year 1750. The change in the fign of the tangent of this latitude fhould be attended to when the ftar is fouth.

The change of the figns of the cofines and fines fhould alfo be obferved. Thus, for Sirius, the longitude of which is 3ˢ 10° 38′, and the latitude 39° 33′ fouth, we fhall get − 50″ cof. long. = + 9″.2; becaufe the cofine of 3ˢ 10° changes its fign, and + 8″.03 fine long. = + 7″.9, the fum is + 17″.1, which, multiplied by the tangent of 39° 33′, which is negative, gives − 14″.1 This is what muft be taken from the preceffion 1° 23′ 45″: to obtain the mean motion of Sirius 1° 23′ 31″. The real preceffion is here taken, and not the mean, becaufe the equinox and the ftar, each having their proper motion, both muft be taken into confideration; thus, its longitude diminifhes by 14″ in this century, from the attraction of the planets on the earth, independent of the general caufe of the preceffion, and of the particular derangement of this ftar.

The motion in longitude and the motion in latitude, determined by the preceding formulæ, nearly agree with obfervation, as may be feen, by comparing the pofitions which are in the ancient catalogue of Ptolemy, with thofe which are obferved at prefent. We fee, for example, that the firft ftar in Auriga, which, in Ptolemy's catalogue, has 30° latitude, is 30° 49′ in Flamfteed's catalogue; on the contrary, the fourteenth ftar of Gemini, which is fouth of the ecliptic, has 1° 30′ latitude in Ptolemy's catalogue, and only 0° 56′ in Flamfteed's. It is the fame with the latitude of almoft all the ftars. The differences of longitude appear equally changed, in a manner perfectly confonant to this theory. Between the twenty-feventh ftar of the Great Bear, and the tenth of the Dragon, of which the latitude is 81° 48′, we find a difference of longitude lefs by 1° 21′ than it is in Ptolemy's catalogue; becaufe, one of the ftars has augmented in longitude, while the other has diminifhed.

Thefe differences can only be perceptible in ftars that have confiderable latitude; it is nothing for thofe fituated in the ecliptic.

In the general formula for the preceffion of the equinoxes, (fee PRECESSION,) there is one part, L cof. 23½°, common to every ftar; in this cafe, it would be equal to M cof. E V; this part indicates only that the line E V is more advanced than M V, by the quantity M cof. E V; this is the motion of the node of the planet, or of the pole E, referred to the ecliptic.

If an arc of a circle E M B C be drawn perpendicular to E V, and coinciding with the fmall arc E M, this will be the circle of latitude which paffes through the node of the orbit of Venus. The change in longitude of a ftar S, found by the preceding formulæ, is the difference between the angle S E P, and the angle S M P; part of this difference arifes from the variation of the angle E, in the triangle S C E, in which the fide S C and the angle C are conftant; this variation is equal E M fine E, cotang. E S. But, befides this change of the ftar S, relatively to the circle E M C, there is that of P E, or of the colure of the folftices, which paffes from the fituation P E into that of P M; the angle P E B changing itfelf into the angle P M B, is the variation of the angle E in the fpherical triangle P B E, in which P B, and the angle B are conftant. Thus, this quantity is E M, fin. P E B cotang. E P; it is common to all the ftars, and is a part of the preceffion.

The change of the obliquity of the ecliptic, and that of the angle P E B, which is the change of longitude common to all the points of the heavens, may be found in the fame manner as we fhould find the variation in longitude of a ftar at P; that is to fay, that in the preceding formulæ we may confider the pole of the equator as a ftar, of which the longitude is

is 90°, and its latitude 66° 32′, and we may find, by the same formulæ, how much it changes, relatively to the moveable pole of the ecliptic, whether in longitude or latitude. We shall get 50″ for the variation of the ecliptic in this century, and 46″.7 for the first century.

The change of the pole in longitude is found by the same method to be 8″.03 tang. 66° = 18″. This is the diminution of the precession of the equinoxes, which the action of the planets produces in this century by displacing the ecliptic, or the orbit of the earth. This would be 26″.1 according to M. De la Grange. This difference arises from his making a different supposition relative to the mass of Venus.

M. De la Place has given more general and rigorous formulæ for these calculations. (Mem. de l'Acad. 1788.) The following gives the variation of the ecliptic for any number of years n, beginning from 1700; 932″.56 cos. 17″.7686 n — 3140″.34 sin. 32″.8412 n, supposing the change to be 50″ in this century. The second term changes its sign for the years anterior to 1700: thus for the year 300 before our era, 17″.7686, multiplied by 2000, give 9° 52′ 17″.2, the cosine of which multiplied by 932″.56 gives 918″.75; the second term is + 983.″19; the term 932.″56 must be taken from the sum, which takes place when n = 0, or in 1700; there remains 969″.38, which must be taken from the mean obliquity of the ecliptic in 1700, 23° 18′ 43″; and we get 23° 44′ 52″, which differs but little from that employed by M. De la Lande in the solar tables. This formula gives 46″.26 secular for the variation, 2000 years ago; it is 46″.0 according to the tables of M. De la Lande.

In the table which we have annexed the secular variation of the obliquity of the ecliptic is assumed 52″.1 for the present century, and 48″.5 for a period 2000 years back.

The obliquity of the ecliptic is likewise subject to a periodic change from the effect of nutation. (See NUTATION.) This inclination increases to 9″ when the node is in Aries; the pole is then in A (*fig.* 103.); the distance of the poles E A becomes greater by 9″ than when the node is in Capricorn or Cancer, and is greater by 18″ than when the node is in Libra, and the pole in C. The obliquity of the ecliptic, in 1774, was 23° 27′ 57″; in 1784, 23° 28′ 10″; not only it has not diminished 5″, as it ought to have done, but it has augmented 13″, which gives 18″ more for the effect of nutation alone, which is equal to A C.

When the pole of the earth is in O, the obliquity of the ecliptic is E O or E H, and the nutation is equal to P H; the arc A O, or the angle A P O is equal to the longitude of the node, and P H is the cosine of it; now P H is equal 9″ sine O D, or 9″ cos. A O; therefore the nutation P H = + 9″ cos. of the node, or 9″ multiplied by the cosine of the longitude of the moon's node.

This is the change which Dr. Bradley remarked in the variation in declination which the stars situated near the solstitial colure had experienced during 19 years.

This nutation ought to be subtracted from the mean or uniform obliquity, while the moon's node is between three and nine signs: it is additive in the first and fourth quarter of the moon's longitude.

It is now several years since many astronomers who have been in the habit of constantly observing the sun at the summer and winter solstices for the purpose of ascertaining the obliquity of the ecliptic have noticed, that they obtained a different result from their winter and summer observations. The first astronomer who noticed this circumstance was Dr. Slop, who superintended the grand duke's observatory at Pisa. The instrument he used was a six feet mural quadrant constructed by Sisson; as his determination was founded on a comparison with stars that passed on the same parallax, this discordance could not be attributed to any error in the divisions of the instruments. The most plausible supposition was, that it arose from some temporary expansion which periodically affected the instrument in similar situations of the sun. This occurrence took place for many years: the difference observed varied from 6″ to 12″. About the year 1790 the above astronomer received a letter from Oriani, and the astronomers at Milan, who had begun to observe the solstices with a superb mural quadrant of eight feet radius, made by Ramsden, in which they remarked, that to their great surprise they found a discordance they could not explain in the determination of the obliquity of the ecliptic, as deduced from the summer and winter solstices. Neither of the above astronomers made these circumstances known to the public at that time, conceiving they arose from some accidental derangement of their instruments, which time would explain. They were communicated in conversation to the person who has favoured us with this account when in Italy.

It was at this period that Piazzi began to observe at Palermo with the great astronomical circle made by Ramsden. The same perplexing occurrence happened to him, though he was quite ignorant of the same thing having occurred to the astronomers above-mentioned. Finally, the French astronomers in using the repeating circle of Borda, which gave the altitude of the sun with greater accuracy than any instrument before invented, met with the same embarrassment before the observations of Piazzi were published. Mr. Pond, who observed several solstices at Westbury with a very capital circular instrument made by Troughton, found likewise the same discordance, and the difference was very nearly the same as the mean of that found by the French and Italian astronomers; the obliquity appearing about 10″ greater in summer than winter. It may appear surprising that no notice has been taken of this in the Greenwich observations; it can only be accounted for by supposing that some deviation in the quadrant, has caused one error to counterbalance another. In the Philos. Transactions for 1806, Mr. Pond has given an investigation of the state of this instrument, which has been since confirmed by a mechanical examination by Mr. Troughton, by which it appears that the weight of that sine instrument has, in the course of time, caused it to deflect from its original form, and to give a constant error, which increases as the observed objects approach the horizon. (See Dr. Maskelyne's Obs. for 1807, where a table of corrections is given.)

The cause of this want of coincidence in the summer and winter observations is by no means easy to be explained; it has been proposed as a prize by some foreign academies, but no satisfactory explanation has yet been given. The French astronomers, to reconcile their observations, alter both their latitude a small quantity, and likewise the mean refraction as established by Dr. Bradley, but M. Piazzi objects to this, and very properly observes, that his table of refraction was founded on his own observations made with the same instrument. Besides, this suits all latitudes, and it seems probable, that this discordance would be found general, as by the above account it seems to have happened to all those astronomers who had instruments sufficiently accurate to detect it. It has been suggested by M. Piazzi that it may be connected with some peculiar modification of the refractions of the sun's rays which may differ from those of the stars. Not being able to offer any satisfactory conjecture on the subject, we can only present the above statement of this curious fact to our astronomical readers.

Table of the Obliquity of the Ecliptic for forty Centuries, with its Secular Variation.

		Mean Obliquity.			Secular Var.
A. C.	900	23°	50′	26″.2	
	800	23	49	39.6	46″.9
	700	23	48	52.7	47.2
	600	23	48	5.5	47.5
	500	23	47	18.0	47.9
	400	23	46	30.1	48.2
	300	23	45	41.9	48.5
	200	23	44	53.4	48.9
	100	23	44	4.5	49.1
	0	23	43	15.4	49.3
A. D.	100	23	42	26.1	49.7
	200	23	41	36.4	49.9
	300	23	40	46.5	50.1
	400	23	39	56.4	50.3
	500	23	39	6.1	50.5
	600	23	38	15.6	50.8
	700	23	37	24.8	51.0
	800	23	36	33.8	51.1
	900	23	35	42.7	51.3
	1000	23	34	51.4	51.4
	1100	23	34	0.0	51.5
	1200	23	33	8.5	51.7
	1300	23	32	16.8	51.8
	1400	23	31	25.0	51.9
	1500	23	30	33.1	52.0
	1600	23	29	41.1	52.0
	1700	23	28	49.1	52.1
	1800	23	27	57.0	52.1
	1900	23	27	5.0	52.1
	2000	23	26	12.8	52.2
	2100	23	25	20.6	52.3
	2200	23	24	28.3	52.2
	2300	23	23	36.1	52.2
	2400	23	22	43.9	52.2
	2500	23	21	51.7	52.2
	2600	23	20	59.5	52.1
	2700	23	20	7.4	52.1
	2800	23	19	15.3	52.1
	2900	23	18	23.3	52.0
	3000	23	17	31.3	52.0

Ecliptic, *Poles of the.* See Pole.

Ecliptic *Reduction to the.* See Reduction.

Ecliptic, in *Geography*, &c. is a great circle of the globe cutting the equator under an angle of 23° 28′. See Globe.

The terrestrial ecliptic, therefore, is in the plane of the celestial ecliptic; like which it has its equinoctial and solstitial points, and is bounded by tropics.

ECLOGARII, among the *Ancients*, were persons who selected the best pieces of the books they read, which, for that reason, were called *eclogues*, or select pieces. See Eclogue.

ECLOGUE, Εκλογη, in *Poetry*, a kind of pastoral composition, wherein shepherds are introduced converfing together. The eclogue is properly an image of the pastoral life.

The beauty of the eclogue, M. Fontenelle obferves, is not attached to what is rural, but rather to what is calm and easy in the rural life.

Yet there are eclogues in Theocritus of a lofty character; and Virgil has fome in the fublime ftyle: the eclogue, therefore, occafionally raifes its voice. Yet M. Fontenelle efteems it a fault in fome modern poets, to have put matters of high concern in their eclogues, and to have made their fhepherds fing the praifes of kings and heroes. The fentiments in eclogues, the fame author obferves, fhould be finer and more delicate than thofe of real fhepherds; only their form fhould be as fimple and rural as can be. But this fimplicity excludes none befides glaring and exceffive ornaments.

Since the eftablifhment of the academy or affembly of Arcadians at Rome, about the year 1690, the tafte for eclogues has been greatly improved among the Italians. Thofe gentlemen, who are the flower of the wits of Italy, take the name of the fhepherds of Arcadia, and will not allow their affembly to be treated as an academy. They have each of them a poetical name, which is always that of fome fhepherd; and apply themfelves particularly to eclogues, as pieces moft proper to their profeffion. See Academy.

The word eclogue is formed from the Greek εκλογη, *choice*. So that, according to the etymology of the word, eclogue fhould be no more than a felect or choice piece; but cuftom has determined it to a farther fignification, *viz.* a little elegant compofition in a fimple natural ftyle and manner. Idyllion and eclogue, in their primary intention, are the fame thing: thus the Idyllia, Ειδυλλια, of Theocritus, are pieces written perfectly in the fame vein with the Eclogæ of Virgil.

But cuftom has made a difference between them, and appropriated the name of eclogue to pieces wherein fhepherds are introduced fpeaking; idyllion, to thofe written like the eclogue, in a fimple natural ftyle, but without any fhepherds in them. Some imagine the name eclogue to have been originally attributed to fuch poems as were written in imitation of others; fuch as the Eclogues of Virgil, which are only imitations of Theocritus.

Others are of opinion, the word was firft formed from αιξ, αιγος, *goat*, and λογος, *difcourfe*, *q. d.* a converfation or difcourfe of goats, or goatherds. But Ruæus, in his notes on Virgil, thinks they would then have made it Αιγολογια, *agology*, rather than eclogue; or, at leaft, the word would have been written in Greek with αι, and in Latin by *æ*, not *e*.

Barthius advances another opinion, *viz.* that the name eclogue was given to all poetical compofitions that were of a moderate length, though too fhort to give them the name of books; and that hence it is that Statius, in the epiftle at the head of the third book of his Sylvæ, and in the preface of his fourth book, calls his poems eclogues, though he had not called them fo in the title.

Aufonius, in the preface to his Cupid crucified, calls alfo his idylls eclogues. Cruquius alfo, in his comment on Horace, declares that he had feen very ancient manufcripts, wherein the fatires of the poet are called eclogues; in which he is feconded by our learned countryman, Mr. Baxter. See Pastoral Poetry.

Eclogue is alfo applied to certain compofitions in profe. Thus we read of the eclogues of Diodorus, of Polybius, of Ctefias,

Cteſias, Theophraſtus, Strabo, &c. In which ſenſe the word only ſignifies *extract* or *collection*.

ECLOPES, in *Botany*, Gærtner, t. 169. See Relhania.

ECLUSE, L', in *Geography*. See Sluis.

Ecluse, *Fort de P*, or *Fort de la Cluſe*, a ſmall town of France, in the department of the Ain; 12 miles W. of Geneva, on the river Rhône, or rather, near the place where the Rhône, loſing itſelf among rocks, diſappears, as it were, under ground, and re-appears at no great diſtance.

ECLYSE, in the Greek *Muſic*, was lowering the mode, or an alteration of the enharmonic genus, when a ſtring was accidentally lowered three dieſes below its uſual ſtandard.

ECLYŚIS, from εκλυω, *I faint*, a word uſed by the ancient *Phyſicians*, for a general faintneſs and feebleneſs of all parts of the body. Hippocrates uſes it for a loſs of voice, with a general decay of ſtrength, and in ſome other places, for a great weakening of the body, by violent diſcharges of ſtool.

ECMARTYRIA, Εκμαρτυρια, in *Antiquity*, a kind of ſecond-hand evidence, admitted in the Athenian courts. It was not founded on the knowledge of the witneſs himſelf, but on that of another perſon, who had been an eye-witneſs of the fact in queſtion, but was at this time either dead, or in a foreign country, or detained by ſickneſs; for, except in ſuch caſes, the allegations of abſent perſons were never taken for lawful evidence. Pott. Archæol. Græc. lib. i. cap. 21. tom. i. p. 117.

ECMELES, founds in the Greek *Muſic*, which, like thoſe of ſpeech, were inappreciable, and in tune with no fixed tones of the muſical ſcale; conſequently, they could furniſh no melody. This term was oppoſed to *emmeles*, or muſical ſounds.

ECNEPHIAS, from εκ and νεφος, *a cloud*, a word uſed by Galen, to expreſs a peculiar ſort of fever, which, he ſays, was at once hot and humid, and which he therefore reſembles, by the name, to the ſun breaking out from a watery cloud.

ECOBROGIS, in *Ancient Geography*, a town of Aſia, in Galatia. Anton. Itin.

ECOMMOY, in *Geography*, a ſmall town of France, in the department of the Sarthe, chief place of a canton in the diſtrict of Le Mans, with a population of 2662 individuals. The canton contains 11 communes and 12,998 inhabitants, on a territorial extent of 220 kiliometres.

ECORCHEUR *de* Madagascar, in *Ornithology*, the name given by Buffon to the *Lanius Curviroſtris*, which ſee.

ECOS, in *Geography*, a ſmall town of France, in the department of the Eure, chief place of a canton in the diſtrict of Les Andelys; nine miles S. of Giſors, with only 360 inhabitants. But the canton has a population of 9748 individuals, diſperſed in 33 communes, on a territorial extent of 245 kiliometres.

ECOUCHE', a ſmall town of France, on the river Orne, in the department of the Orne, chief place of a canton in the diſtrict of Argentan, and ſix miles W. of that place. It contains 1492 inhabitants. The canton has an extent of 190 kiliometres, with 24 communes, and a population of 11,765 individuals.

ECOUEN, a ſmall town of France, in the department of Seine and Oiſe, chief place of a canton in the diſtrict of Pontoiſe, with a population of 992 individuals. The canton compriſes 22 communes, with 10,508 inhabitants, on a territorial extent of 110 kiliometres.

ECOUIS, a ſmall town of France, in the department of the Eure; ſix miles N. of Les Andelys, in a country which, till the revolution of 1789, was called La Vexin Normand.

ECOUTE', in the *Manege*, is uſed for a pace, or motion of a horſe, when he rides well upon the hand and the heels, is compactly put upon his haunches, and hears, or liſtens, to the heels or ſpurs; and continues duly balanced between the heels, without throwing to either ſide. This happens when a horſe has a fine ſenſe of the aids of the hand and heel.

ECPHONESIS, Εκφωνησις, in *Rhetoric*, the ſame with *Exclamation*: which ſee.

ECPHORA, from εκ, *out*, and φερω, *I bear, projecture*, in *Architecture*, uſually denotes the line, or diſtance, between the extremity of a member, or moulding, and the naked of the column, or other part its projects from.

Some authors, however, account the ecphora, or projecture, from the axis of the column; and define it to be the right line intercepted between the axis and the outermoſt ſurface of a member or moulding. See Projecture.

ECPHRACTICS, Εκφρακτικα, in *Medicine*, ſuch remedies as have a faculty of opening and unſtopping the veſſels through which the humours are to paſs; or which incide and attenuate tough viſcid humours, and thereby promote their diſcharge. They are the ſame with aperients and deobſtruents.

The word is formed from the Greek εκφρασσω, *to free from obſtructions*; of εκ and φρασσω, *obſtruo, ſepio*.

The chief ſimple ecphractics, are the little centaury, wormwood, agrimony, hyſſop, chamædrys, bark of tamariſk, roots of capers, ſcolopendrium, &c.

ECPHRAXIS, is taking away obſtructions in any part. Blancard.

ECPHYSESIS, from εκ and φυσκω, *I breathe*, is a diſeaſe in which the patient breathes thick.

ECPHYSIS, of εκ and φυω, *I produce*, in *Anatomy*, is any proceſs that coheres with, or adheres to a bone.

ECPIESMA, Εκπιεσμα, from εκ and πιεζω, *I preſs*, in *Surgery*, a kind of a fracture of the ſkull, &c. wherein there are ſeveral ſplinters, that preſs and diſorder the inner membranes. See Fracture.

ECPIESMUS, Εκπιεσμος, in the ancient writers of *Medicine*, a word uſed to expreſs a diſtemperature of the eye, which conſiſts in a very great prominence of the entire globe of the eye, which is, as it were, thruſt out of its ſocket, or orbit, by a great flux of humours, or an inflammation.

ECPLEROMA, of εκ and πληρω, *I fill*, in the writings of the *Ancient Phyſicians*, the name given to a kind of cuſhion of leather, ſtuffed with ſome firm ſubſtance, and fitted to the cavities of the arm-pits, uſed in reducing luxations of the humerus.

ECPLEXIS, from εκπλησσω, *I am diſturbed*, a word uſed to expreſs a tranſport of mind, proceeding from ſome ſudden perturbation. Hippocrates and Galen uſe the word to ſignify a ſtupor, or ſtupefaction, in which the patient lies without motion, without ſpeaking, or ſtirring, and with his eyes open.

ECPNEUMATOSIS, in *Medicine*, the ſame with expiration.

ECPNOE, from εκ and πνεω, *I breathe*, a word uſed, by medical writers, to expreſs that part of reſpiration, in which the breath is expelled out of the lungs.

ECPTOMA, from εκπιπτω, *I fall out*, a word uſed by the ancient phyſicians in three or four different ſenſes. It is ſometimes made to expreſs a luxation or diſlocation of a bone. Sometimes it is uſed for the falling off of any corrupted part, ſometimes for the excluſion of the ſecundines after child-birth, and ſometimes for a falling down of the womb, or a deſcent of the omentum or the inteſtine into the ſcrotum.

ECPTOSIS, in *Surgery*, the ſame with luxation.

ECPUCTICA,

ECPUCTICA, from εκπυω, *I suppurate*, in the *Materia Medica*, are condensing medicines.

ECPYE'MA, in *Surgery*. This word is derived from εκ and πυον, *pus*, *suppuration*, an abscess.

ECREGMA, from εκρηγνυμι, *I break off*, in *Medicine*, properly the name of a part, piece, or segment of any thing; but Hippocrates has, in some places, used it as the name of an eruption.

ECRITHMUS, from εκ *without* and ῥυθμος, *number*, an irregular pulse, which observes no method, nor number, incident to any age. Blancard.

ECSARCOMA, in *Surgery*, a fleshy excrescence. The term is derived from εκ and σαρξ *flesh*.

ECSTASIS, in *Medicine*, is understood in a different sense by different medical writers. Sauvages considers it as distinct from catalepsy, inasmuch as the limbs are rigid, and retain the position in which they happen to be at the instant of the seizure; whereas, in the catalepsy they are flexible, and retain any position, into which they are moved by external force. In this acceptation, however, the ecstasis must be considered merely as an imperfect or spurious CATALEPSY under which head we have already mentioned it. (See Sauvages Nosol. Method. class vi. *genus* 25.) Vogel, Burserius, and others, view it in this light, and give the appellation of ecstasis to that variety of catalepsy, during the paroxysm of which the patient avers that he witnessed extraordinary visions, and is said to speak in unknown languages, and even to prophesy future events. "Quidam cataleptici," says Vogel, "*simul ecstatici* fiunt durante paroxysmo, atque mira phantasmata, visiones divinas, consortium angelorum enarrant; linguas, quas non didicerunt, loquuntur, si fabula vera; quin et futura prænunciare videntur." (De cognosc. et curand. præcip. corp. humani affect. § 509.) In this sense the word ecstasis seems to be synonymous with TRANCE, which see.

ECSTATICI, those who labour under the affection termed ECSTASIS.

ECSTATICI, Εκστατικοι, from εξιστημι, *I am entranced*, in *Antiquity*, a kind of diviners, who were cast into trances or ecstasies, in which they lay like dead men, or asleep, deprived of all sense and motion; but after some time, returning to themselves, gave strange relations of what they had seen and heard. Pott. Archæol. Græc. lib. ii. cap. 12. tom. 1. p. 302.

ECSTROPHIUS, from εκστρεφω, *I turn out*, a name given by the ancient writers in *Medicine*, to any thing that threw out the internal tumours of the piles, so that external remedies might be applied to them.

ECTENÆ, in *Ancient Geography*, a people who, according to Pausanias, first inhabited the territory of Thebes in Bœotia. Ogygus is said to have been their first king, whence Thebes obtained the appellation of Ogyges. These people, being exterminated by a plague, were succeeded by the Hyantes.

ECTHESIS, in *Church History*, a name which the emperor Heraclius gave to a confession of faith published by him in 639.

The word is Greek, εκθεσις, and signifies *exposition*.

The ecthesis favoured the error of the Monothelites, and established only one will and one operation in Jesus Christ. Heraclius published it at the instigation of Athanasius, chief of the Jacobites, Cyrus, patriarch of Alexandria, and Sergius, patriarch of Constantinople, by whom it was composed; but the Roman church deemed it heretical, and rejected it in a council held at Rome, A. D. 639. under the pontiff John IV. though Honorius, in spite of his infallibility, had approved it; and another edict was issued, suppressing the ecthesis, called the *Type*, which soon after shared the same fate.

ECTHLIMA, from εκθλιβω, *I press out*, an ulceration arising from a violent compression in the surface of the skin.

ECTHLIPSIS, in the *Latin Prosody*, a figure whereby an *m* is retrenched, or cut off chiefly at the end of a word, when the following word begins with a vowel, or an *h*.

The word is Greek, εκθλιψις, which signifies *elision*.

Thus, in *multum ille, & terris jactatus & alto.* Virg.

In scanning the verse, we drop the *m* at the end of *multum*, and only make three syllables in the two first words, *mult-il-le*.

Some account the ecthlipsis a poetical licence in the Latin versification; but, in reality, the elision of an *m* final, when the following word in the same verse begins with a vowel, is a matter of necessity, not licence.

Anciently the *s* was likewise retrenched before a consonant; as *facundu fœque*, for *facundus*, &c. In reality, the *m* and *s* were peculiarly rough and harsh in the Latin pronunciation; as appears from Quintilian; and it was this that led the poets to retrench them at the ends of their words, as the like cause induced the French to drop their *e* feminine before a word beginning with a vowel, to avoid the hiatus, or concourse of vowels.

ECTHYMA, from εκθυω, *I break out*, in *Medicine*, a name given by Hippocrates to any pustule, or cutaneous eruption.

ECTHYMOSIS, of εκ, *ex*, and θυμος, *animus*, *mind*, a vehement agitation and dilatation of the blood and spirits; such as happens in extraordinary emotions of joy.

ECTODURUM, in *Ancient Geography*, a town of Rhætia, in Vindelicia. Ptolemy.

ECTOMIAS, from εκτεμνω, *I cut off*, a name used, by the ancient physicians, to express a castrated animal.

ECTOPIÆ, in the nosology of Sauvages and Cullen, is the appellation of an order of diseases, which are characterized by tumours, occasioned by the removal of some part of the body from its proper situation. This order includes the varieties of *hernia*, or rupture, of *prolapsus*, and of luxation, all of which are described at length by Sauvages. Class I. ord. 6.

ECTRIMMA, from εκτριβω, *I rub off*, excoriation or galling. Hippocrates has used the word particularly to express exulcerations in the skin about the os sacrum, contracted by lying long in one posture, in cases of fractures of the thigh, or in lingering illnesses, in which the patient is confined to his bed for a long time.

ECTROPIUM, (εκτροπιον, from εκτρεπω, *to divert*,) a turning out of the eye-lid. The lower one is the most subject to this disease, the upper one being very seldom affected. The displaced eye-lid hangs down over the cheek, and does not apply itself properly to the eye-ball; consequently, the inner surface of the eye-lid becomes turned out, while the lower portion of the globe of the eye remains uncovered. This part of the eye, and the sensible lining of the eye-lid itself, in consequence of suffering incessant irritation from exposure to the air, and the stimulus of the extraneous particles always suspended in the atmosphere, very soon become affected with chronic inflammation, which is not only attended with pain, a continual discharge of tears, &c. but also with a preternatural redness and swelling of the membranous lining of the diseased eye-lid. At length, the inner surface of the latter part, in general, loses all its natural appearance, becomes thick, callous, dry, and insensible, and looks like an excrescence at the lower part of the eye.

The turning out of the eye-lid also obstructs the passage of the tears to the inner canthus, and hinders them from entering

entering the puncta lachrymalia. Hence, besides the above complaints, and the very considerable deformity which an ectropium occasions, the patient has the additional annoyance of an incessant flux of tears from his eye.

The most frequent cause of the disease is, either too great a relaxation and swelling of the lining of the eye-lids, or else too great a contraction and shortening of the skin of these parts, or of that on the adjoining part of the face.

Hence, in respect to causes, there are two kinds of ectropium; one depending upon a swelling of the lining of the eye-lid, which swelling occasions a separation of the edge of the palpebra from the globe of the eye, and, at last, turns the inside of the eye-lid completely out; the other arising from a contraction of the skin of the eye-lid, or adjacent parts, in consequence of which shortening of the integuments, the margin of the eye-lid first becomes drawn further from the eye, and, subsequently, inclined quite outward.

Scarpa remarks, that the morbid swelling of the lining of the eye-lids, which causes the first species of ectropium, (putting out of present consideration a similar affection incidental to old age,) arises mostly from a congenital laxity of this membrane, afterwards increased by obstinate chronic ophthalmies, particularly those of a scrofulous nature, in relaxed unhealthy subjects. Sometimes the disease is the consequence of the small-pox, which has severely affected the eyes.

While the disease is confined to the lower eye-lid, as it most commonly is, the lining of this part may be observed rising in the form of a semi-lunar fold, of a pale red colour, like the fungous granulations of wounds, and intervening between the eye and eye lid, which latter it in some measure turns outward. When the swelling is afterwards occasioned by the lining of both the eye-lids, the disease assumes an annular shape, in the centre of which the eye-ball seems sunk, while the circumference of the ring presses and turns outward the edges of the two eye-lids, so as to cause both great uneasiness and deformity. In each of the above cases, on pressing the skin of the eye-lids with the point of the finger, it becomes manifest that they are very capable of being elongated, and would readily yield so as entirely to cover the eye-ball, were they not prevented by the intervening swelling of their membranous lining.

Besides the very considerable deformity which the disease produces, it occasions a continual discharge of tears over the cheek, and what is worse, a dryness of the eye-ball, frequent exasperated attacks of chronic ophthalmy, incapacity to bear the light, and lastly, opacity and ulceration of the cornea.

The second species of ectropium, or that arising from a contraction of the integuments of the eye-lids, or neighbouring parts, is not unfrequently a consequence of puckered scars, produced by the confluent small-pox; deep burns; or the excision of cancerous or encysted tumours, without a sufficient quantity of skin having been saved; or, lastly, the disorder is the effect of malignant carbuncles, or any kind of wound attended with much loss of substance. Each of these causes is quite sufficient to bring on such a contraction of the skin of the eye-lids, as to draw these parts towards the arches of the orbit, so to remove them from the eye-ball and turn their edges outward. No sooner has this circumstance happened, than it is often followed by another equally unpleasant, namely, a swelling of the internal membrane of the affected eye-lids, which afterwards has a great share in completing the ectropium. The lining of the eye-lids, though trivially turned out, being continually exposed to the air, and irritation of extraneous substances, soon swells and rises up, like a fungus. One side of this fungus-like tumour covers a part of the eye-ball; the other pushes the eye-lid so considerably outward, that its edge is not unfrequently in contact with the margin of the orbit. The complaints, induced by this second species of ectropium, are the same as those brought on by the first; it being noticed, however, that in both cases, whenever the disease is very inveterate, the fungous swelling of the inside of the eye-lids becomes hard, coriaceous, and, as it were, callous.

Although, in both species of ectropium, the lining of the eye-lids seems equally swollen, yet the surgeon can easily distinguish to which of the two species the disease belongs. For, in the first, the skin of the eye-lids, and adjoining parts, is not deformed with scars, and by pressing the eye-lid, which is turned out, with the point of the finger, the part would with ease completely cover the eye, were it not for the intervening fungous swelling. But, in the second species of ectropium, besides the obvious cicatrix and contraction of the skin of the eye-lids, or adjacent parts, when an effort is made to cover the eye with the affected eye-lid, by pressing upon the latter part with the point of the finger, it does not give way, so as completely to cover the globe, or only yields, as it ought to do, for a certain extent; or else it does not move in the least from its unnatural position, by reason of the integuments of the eye-lids having been so extensively destroyed, that their margin has become adherent to the arch of the orbit.

From a comparison of the two species of ectropium, it clearly appears, that the cure of this disease cannot be accomplished with equal perfection in both its forms, and that the second species is even, in some cases, absolutely incurable. For, as in the first species of ectropium, the disease only depends upon a morbid intumescence of the internal membrane of the eye-lids, and the treatment merely consists in removing the redundant part; art possesses many efficacious means of accomplishing what is desired. But in the second species of ectropium, the chief cause of which arises from the loss of a portion of the skin of the eye-lids, or adjacent parts, which loss no known artifice can restore; surgery is not capable of effecting a perfect cure of the malady. The treatment is confined to remedying, as much as possible, such complaints as result from this kind of ectropium, and this can be done in a more or less satisfactory manner, according as the loss of skin on the eye-lid is little or great. Cases, in which so much skin is deficient that the edge of the eye-lid is adherent to the margin of the orbit, are to be abandoned as incurable. "Si nimium palpebræ deest (says Celsus) nulla id restituere curatio potest." (lib. 7. cap. 7). Hence, in treating the second species of ectropium, the degree of success attending the cure may always be estimated by remarking to what point the eye-lid admits of being replaced, on being gently pushed with the end of the finger towards the globe of the eye, both before and after the employment of such means as are calculated to effect an elongation of the skin of the eye-lid; for it is to this point, and no further, that art can reduce the part that is turned out, and permanently keep it so replaced. With respect to the treatment of the first species of ectropium, when the disease is recent, the fungous swelling of the lining of the eye-lid is not considerable, and, consequently, the edge of the eye-lid not much turned out, and, in young subjects, (for in old ones the eye-lids are so flaccid, that the disease is irremediable,) it may be cured by destroying the fungous surface of the internal membrane of the eye-lid, with the argentum nitratum, which is to be done as follows. The surgeon must evert the whole of the affected eye-lid with his left hand, and with his right wipe it dry with a piece of rag; then he is to rub the caustic forcibly over the whole surface of the fungous swelling, so as to form an eschar. And, that the patient may suffer

ſuffer as little as poſſible, an aſſiſtant is inſtantly to apply a little oil to the burnt part, immediately when the cauſtic is removed, by which means the argentum nitratum will be kept from diſſolving in the tears, and ſpreading over the eye. Should, however, any part of the cauſtic be diſſolved, and give the patient pain, the ſurgeon or attendants muſt immediately waſh the irritating ſubſtance away, by repeatedly bathing the eye with new milk. The cauterization is to be repeated for ſeveral days in ſucceſſion, until the argentum nitratum has produced a ſufficient deſtruction of the internal membrane of the eye-lid, and of its fungous ſurface, particularly near the tarſus. Afterwards bathing the eye with plain water, or barley-water and mel. roſæ, will prove ſufficient for healing the ſore on the inſide of the eye-lid. The reſult of ſuch treatment will be, that in proportion as the wound within the eye-lid heals, the gaping of the eye-lid will gradually diminiſh, and its edge at laſt return into its natural poſition. Scarpa informs us, that this plan of cure can only be ſucceſsfully put in practice in caſes in which the ectropium is ſlight and recent. To remedy the conſiderable and inveterate form of the firſt ſpecies of the diſeaſe, in an expeditious and effectual way, the quickeſt and ſafeſt plan is, to cut away the whole of the fungous ſwelling cloſely to the muſcular ſubſtance on the inſide of the eye-lid. The patient being therefore ſeated, with his head a little inclined backward, the ſurgeon with the index and middle finger of his left hand is to keep the eye-lid ſteadily turned out, and, holding a ſmall pair of curved ſciſſars with convex edges in his right, he is completely to cut off the whole fungoſity of the internal membrane of the eye-lid, as near as poſſible to its baſe. The ſame operation is then to be repeated on the other eye-lid, ſhould that be affected with the ſame diſorder. If the excreſcence ſhould be of ſuch a ſhape that it cannot be exactly included between the edges of the ſciſſars, it muſt be raiſed as much as poſſible with forceps, or a double pointed hook, and diſſected off at its baſe, by means of a ſmall biſtoury with a convex edge. The bleeding, which occurs at the beginning of the operation, as if it would be copious, ſtops of itſelf, or as ſoon as the eye is bathed with cold water. The ſurgeon is then to apply the dreſſings, which are to conſiſt of two ſmall compreſſes, one put on the upper, the other on the lower arch of the orbit, and over theſe the uniting bandage, in the form of the monocuius, or ſo applied as to compreſs and replace the edges of the affected eye-lids, in order to make them cover the eye. On the firſt removal of the dreſſings, which ſhould take place about twenty-four or thirty hours after the operation, the ſurgeon will find the whole, or almoſt the whole of the eyelid in its natural poſition. The treatment ſhould afterwards conſiſt in waſhing the ulcer on the inſide of the eye-lid with ſimple water twice a day, or elſe with barley-water and mel. roſæ, until it is completely well. If towards the end of the cure the wound ſhould aſſume a fungous appearance, or the edge of the eye-lid ſeem to be too diſtant from the eye ball, the wound on the inſide of the eye-lid muſt be rubbed ſeveral times with the argentum nitratum, for the purpoſe of deſtroying a little more of the membranous lining, ſo that when the cicatrization follows, a greater contraction of it may draw the edge of the eye-lid nearer the eye. In the mean time proper ſteps ſhould be taken with a view of removing the cauſes by which the ectropium was originally induced. Chronic ophthalmy, and a weak and varicoſe ſtate of the veſſels of the conjunctiva, are frequently concerned.

In the ſecond ſpecies of ectropium, or that originating from a contraction of the ſkin of the eye-lids, or adjacent parts, Scarpa obſerves, that the indication is not different from what it is in the caſe already deſcribed. In the ſame manner, as the ſhortening of the integuments has occaſioned a turning out of the eye-lid, the deſtruction of a part of its internal membrane, and the conſequent cicatrix, may replace the eye-lid in its natural poſition. However, as the part of the ſkin, which is loſt, can never be regenerated, and, in whatever degree the eye-lid is ſhortened, ſo it muſt perpetually continue, even after the moſt ſucceſsful operation; it follows, that the ſecond ſpecies of ectropium can never be ſo completely cured, as the firſt. Although the eye-lid may be reſtored to its natural poſition, it will always remain ſhortened in a degree proportioned to the quantity of ſkin which is deficient. But, Scarpa very accurately explains, that, in a great number of caſes the ectropium ſeems to be more conſiderable than might be expected, conſidering the little portion of the integuments which is wanting. The Italian profeſſor refers this circumſtance to the increaſe of the ectropium always happening, when once the affection has commenced, and cauſed by the ſwelling of the lining of the eye-lid. In this manner, the turning out of the part is rendered complete, even when the contraction of the ſkin would produce a very partial ectropium.

Scarpa aſſures us, that, in theſe caſes, the operation proves ſucceſsful in a degree, which inexperienced perſons would never ſuppoſe. When the fungous thickened portion of the membranous lining of the diſeaſed eye-lid has been cut away, and its edge brought near the eye-ball, the ſhortening of the eye-lid, which now continues, is ſo trivial, compared with the grievances and deformity which it occaſioned while the part was turned out, that the ectropium may be regarded as being quite relieved. Hence, when the ſhortening of the integuments of the affected eye-lid is not ſo very great, as utterly to prevent it from being brought up again and partially covering the eye-ball, the ſurgeon ought always to have recourſe to the operation which we have above deſcribed. The curved ſciſſars, or the convex-edged biſtoury, or both, may be uſed according to circumſtances. When the diſeaſe has been of very long duration, and the lining of the eye-lid has become indurated and callous, the part affected with ectropium ſhould be covered for a few days before the operation, with a ſoft bread and milk poultice, with a view of rendering it leſs rigid.

Scarpa lays it down as a poſitive and demonſtrable truth, that dividing the ſcars in the ſkin, which have ſhortened, and turned the eye-lid out, never produces any permanent lengthening of the part, and, of courſe, no laſting benefit. This author accurately notices, that the ſame circumſtance may be remarked, after large deep burns on the ſkin of the palm of the hand and fingers. In theſe caſes, when the parts have healed, the fingers become immediately bent, notwithſtanding the greateſt pains may have been taken to keep them continually extended during the whole of the treatment. The ſame circumſtance may alſo be frequently noticed after burns of the face and neck. Fabricius ab Aquapendente knew very well how uſeleſs it was to make a ſemilunar diviſion of the integuments, with a view of rectifying their ſhortened ſtate, and the turning out of the eye-lids. This writer recommends ſtretching theſe parts with pieces of adheſive plaſter, applied on them and the eye-brow, and firmly tied together.

Whatever beneficial effects may be produced in this manner, Scarpa has learnt, from experience, that equal good ariſes from the employment of the bread and milk poultice for a few days; then uſing oily liniments, and, laſtly, the uniting bandage, put on in ſuch a way, as to ſtretch the contracted eye-lid, in a contrary direction to that in which the part is drawn by the cicatrix.

When

When the operation is to be performed, Scarpa directs that the patient, if an adult, is to sit down in a chair, and, if a child, it is to be laid on a table, with its head a little elevated, and well supported by the assistants. The operator is next to take a bistoury with a convex edge, and make an incision of proper depth, into the lining of the eye-lid, along the tarsus. He must use great caution to avoid wounding the puncta lachrymalia. The edge of the divided membrane is now to be raised with a pair of forceps, and detached, by means of the knife, from all the inner surface of the eye-lid, until the separation is made as far as the place where the membrane is about to leave the eye-lid, and cover the front of the eye-ball, under the name of the tunica conjunctiva. The surgeon is now to raise the detached part of the membrane still more, and then cut it away with the scissars, near the deepest part of the eye-lid.

A compress and the uniting bandage are to be afterwards applied, with a view of promoting the return of the eye-lid, affected with ectropium, towards the eye-ball. When the dressings are changed, a day or two after the operation, the eye-lid will be found to have resumed, in a great degree, its natural position, and the deformity to be materially diminished.

The operation is seldom followed by any disagreeable symptoms, such as vomiting, pain, violent inflammation, &c. Should vomiting happen, however, Scarpa states, that it may be relieved by an opiate clyster. Inflammatory symptoms are to be lessened by applying soft emollient poultices to the part, and employing antiphlogistic means in general, until suppuration has begun on the inside of the eye-lid. The part is then to be washed, twice a day, with barley water, containing a little of the mel. rosæ. The wound may also be now and then touched with the argentum nitratum, so as to keep the granulations from becoming too high. Saggio di Osservazioni e d'esperienze sulle Principali Malattie degli Occhi. Venezia, 1802. Richter's Anfangsgr. der Wundarzn. B and Q.

ECTROTICA, from εκτιτρωσκω, *I cause to miscarry*, a name given, by the ancient physicians, to such medicines as have a power to occasion abortion.

ECTYLOTICS, Εκτυλωτικα, from εκ and τυλος, *callus*, remedies proper to consume and eat off callusses, warts, and other excrescences, formed on the flesh.

ECTYPE, Εκτυπος, amongst *Medallists*, an embossed figure, or impression of a seal, ring, or medal; or a figured copy of an inscription, or other ancient monument.

The word is Greek, αρχετυπον, denotes the *original*, or *model*; εκτυπον, the *copy*, or *image*, moulded, or struck in creux; and εκτυπον, *εδυρον*, the image in relievo, or embossed.

Ectype *Craticular*. See Anamorphosis.

ECU, or Escu, the French crown. See Crown, Escu, and Coin.

Ecu *Ancient*, in *Heraldry*, a term signifying the ancient shield. By this they mean the antique triangular-shaped shield, on which the arms of the noble families of France have been painted. This shield is to be seen on old gems, and some ruins; but the modern shield, which is square, and rounded and pointed at the bottom, has banished the use of this.

ECUEILLE', in *Geography*, a small town of France, in the department of the Indre, chief place of a canton, in the district of Chateauroux, with a population of 1200 individuals. The canton has a territorial extent of 245 kilometres, on which there are 13 communes, and 5695 inhabitants.

ECUR, or Icur, in *Ancient Geography*, a town of India, on this side of the Ganges, placed by Ptolemy in N. lat. 16° 40′.

ECURIE, in the *Manege*, the covert place for the lodging, or housing of horses. The word is French. We use stable in common discourse.

ECURY. See Equery.

Ecury *sur Coole*, in *Geography*, a small town of France, in the department of the Marne, chief place of a canton, in the district of Châlons-sur-Marne. It has only 355 inhabitants, but the canton contains 30 communes, and a population of 7242 individuals, on a territorial extent of 440 kilometres.

ECUSSON, in *Heraldry*, an inescutcheon, or little escutcheon. See Escutcheon.

ECUYER, in the French *Manege*, is used for the riding-master. Sometimes it denotes certain officers formerly in the king of France's household, who helped the king in mounting his horse and alighting, and followed him on horse back, and carried his sword. These are called ecuyers de quartier.

Gentlemen ushers to the queen of France, and the masters of the horse to princes, and persons of quality, are also called ecuyers. Besides these, there are others, called ecuyers cavalcadours. See Cavalcadour.

ECZE'MA, (from εκζεω, *to boil out*,) a hot painful eruption, or pustule. Mr. Pearson implies, by mercurial eczema, a particular kind of eruption, occasioned by the employment of mercury. See Erythema.

ED, in *Geography*, a town of Sweden, in the province of West Gothland; 33 miles N. of Uddevalla.—Also, a town of Sweden, in the province of Smaland; 80 miles N. of Calmar.

EDA, in *Ancient Geography*, a river of the Peloponnesus, in Messenia. Suidas.

Eda, in *Geography*, a town of Sweden, in the province of Warmeland; 40 miles N. of Carlstadt.—Also, one of the Orkney islands, about 7 miles long, and half a mile to two miles broad; situated about 8 miles N.N.E. from Pomona. N. lat. 59° 2′. Long. 0° 33′ E. of Edinburgh.

EDAM, or Eydam, a small but populous town of the kingdom of Holland, in the department of the Amstel, situated about 9 miles N. of Amsterdam, and 6 S. of Hoorn, not far from the Zuyder Zee, with which it communicates by means of a canal. E. long. 5°. N. lat. 52° 53′. There are a great many ships built at Edam; it has a good timber trade; but it is chiefly noted for its cheese trade, being the chief mart for all the cheese made in North Holland, and remarkable for its red crust.

EDBO, a town of Sweden, in the province of Upland; 30 miles E.N.E. of Upsal.

EDDA, in *Antiquities*, is a system of the ancient Icelandic, or Runic mythology, containing many curious particulars of the theology, philosophy, and manners of the northern nations of Europe; or of the Scandinavians, who had migrated from Asia, and from whom our Saxon ancestors were descended. Mr. Mallet apprehends that it was originally compiled, soon after the Pagan religion was abolished, as a course of poetical lectures, for the use of such young Icelanders as devoted themselves to the profession of a scald, or poet. It consists of two principal parts; the first containing a brief system of mythology, properly called the Edda; and the second being a kind of art of poetry, and called Scalda, or Poetics. The most ancient Edda was compiled by Soemund Sigfusson, surnamed the Learned, who was born in Iceland about the year 1057. This was abridged, and rendered more easy and intelligible about an hundred and twenty years afterwards, by Snorro Sturleson, who was

ſupreme judge of Iceland in the years 1215 and 1222; and it was publiſhed in the form of a dialogue. He added alſo the ſecond part in the form of a dialogue, being a detail of different events tranſacted among the divinities. The only three pieces that are known to remain of the more ancient Edda of Sœmund, are the Voluſpa, the Havamaal, and the Runic chapter. The Voluſpa, or prophecy of Vola, or Fola, appears to be the text, on which the Edda is the comment. It contains, in two or three hundred lines, the whole ſyſtem of mythology, diſcloſed in the Edda, and may be compared to the Sibylline verſes, on account of its laconic yet bold ſtyle, and imagery and obſcurity. It is profeſſedly a revelation of the decrees of the Father of nature, and the actions and operations of the gods. It deſcribes the chaos, the formation of the world, with its various inhabitants, the functions of the gods, their moſt ſignal adventures, their quarrels with Loke, their great adverſary, and the vengeance that enſued; and concludes with a long deſcription of the final ſtate of the univerſe, its diſſolution and conflagration, the battle of the inferior deities, and the evil beings, the renovation of the world, the happy lot of the good, and the puniſhment of the wicked. The Havamaal, or "Sublime Diſcourſe," is attributed to the god Odin, who is ſuppoſed to have given theſe precepts of wiſdom to mankind; it is compriſed in about a hundred and twenty ſtanzas, and reſembles the book of Proverbs. Mr. Mallet has given ſeveral extracts of this treatiſe on the Scandinavian ethics. The Runic chapter contains a ſhort ſyſtem of ancient magic, and eſpecially of the enchantments wrought by the operation of Runic characters, of which Mr. Mallet has alſo given a ſpecimen. A manuſcript copy of the Edda of Snorro is preſerved in the library of the univerſity of Upſal; the firſt part of which hath been publiſhed, with a Swediſh and Latin verſion, by Mr. Goranſon. The Latin verſion is printed as a ſupplement to Mr. Mallet's Northern Antiquities. The firſt edition of the Edda was publiſhed by Reſenius, profeſſor at Copenhagen, in a large quarto volume, in the year 1665; containing the text of the Edda, a Latin tranſlation by an Icelandic prieſt, a Daniſh verſion, and various readings from different MSS. Mr. Mallet has alſo given an Engliſh tranſlation of the firſt part, accompanied with remarks; from which we learn, that the Edda teaches the doctrine of the Supreme, called the Univerſal Father, and Odin, who lives for ever, governs all his kingdom, and directs the great things as well as the ſmall; who formed the heaven, earth, and air; made man, and gave him a ſpirit, or ſoul, which ſhall live, after the body ſhall have mouldered away; and then all the juſt ſhall dwell with him in the place called Gimle, or Vingolf, the palace of friendſhip; but wicked men ſhall go to Hela, or death, and from thence to Niſſheim, or the abode of the wicked, which is below in the ninth world. It inculcates alſo the belief of ſeveral inferior gods and goddeſſes, the chief of whom is Frigga, or Frea, *i. e. lady*, meaning hereby the earth, who was the ſpouſe of Odin, or the Supreme God; whence we may infer, that, according to the opinion of theſe ancient philoſophers, this Odin was the active principle, or ſoul of the world, which, uniting itſelf with matter, had thereby put it into a condition to produce the intelligences, or inferior gods, and men, and all other creatures. The Edda likewiſe teaches the exiſtence of an evil being, called Loke, the calumniator of the gods, the artificer of fraud, who ſurpaſſes all other beings in cunning and perfidy. It teaches the creation of all things out of an abyſs, or chaos; the final deſtruction of the world by fire; the abſorption of the inferior divinities, both good and bad, into the boſom of the grand divinity, from whom all things proceeded, as emanations of his eſſence, and who will ſurvive all things; and the renovation of the earth in an improved ſtate; Fables 1, 2. 10. 16. 33. For a farther account of the Edda, ſee Mallett's Northern Antiquities, vol. ii. 1770, paſſim.

EDDANA, in *Ancient Geography*, a town of Aſia, ſituated on the Euphrates; built by the Phœnicians, who eſtabliſhed in it a colony. It is ſaid to have derived its name from Eddanos, the chief of the colony.

EDDARA, a town of Arabia Deſerta. Ptolemy.

EDDISH, or EADISH, the latter paſture, or graſs, which comes after mowing or reaping; otherwiſe called *ear-graſs*, *earſh*, and *etch*.

EDDISTO, in *Geography*, a river of America, in South Carolina, which runs into the ſea by two ſtreams, called N. and S. Eddiſto; the former 16 and the latter 25 miles S.W. of Charleſtown.

EDDRED-SI, a ſmall iſland in the Red ſea, two leagues from the coaſt of Arabia. N. lat. 17° 10′. E. long. 41° 33′.

EDDY, or (as it is more commonly uſed in the plural) *Eddies* (from the Saxon *ed*, *backward*, *again*, and *ea*, *water*), in *Hydrodynamics*, denotes the irregular movements of water, or of wind, *viz.* thoſe deviations from the principal direction of the whole ſtream, which are occaſioned by obſtacles of any kind. And when theſe irregular motions become rotatory or circular about a certain centre, then they are more particularly called *whirlpools*.

Eddies in navigation, in hydrodynamics, or in hydraulics, are highly deſerving the attention of the ſeaman and of the engineer, on account of their being often productive of very ſerious conſequences. The principal cauſes upon which they depend are the momentum of a fluid in motion, and all ſorts of impediments to the direction of the fluid. This will be eaſily underſtood by attending to the annexed figure, which repreſents a river, or ſtream of water, flowing towards W. (*Plate* III. *Hydraulics*, *fig.* 3) From A as far as B the channel is regular, and the water runs uniformly through it. Near B, a part of the ſtream, meeting with the obſtacle C, is forced to alter its courſe in the direction *a b*, whence, acquiring a momentum in that direction, it proceeds a certain way towards *c*; but the other part of the ſtream A B, which has not met with any ſolid obſtruction, croſſes in great meaſure the direction *a b c*, which produces an eddy, and the two parts of the ſtream obſtruct each other. From the ruffling of the ſurface of the water, or from the motion of light bodies floating upon the ſurface, this obſtruction may be eaſily perceived. Farther on, the water paſſes from the narrow part O R into the broader channel P Q, and its momentum will enable it to move on in the ſtraight direction *e d*; but, in conſequence of the attraction between the particles of water, it will drag part of the water at *e*, towards *d*, which occaſions a depreſſion of the level of the water about *e*; hence the water runs from the adjacent parts *f*, *g*, to ſupply that defect, and thus a curvilinear, or whirling motion *d f g e*, is produced. The velocity of the water, then, is checked not only in conſequence of its paſſing from a narrow into a larger channel, but likewiſe in conſequence of the above-mentioned eddy; when theſe whirling eddies are pretty ſtrong, both at ſea and in large rivers, a depreſſion is always obſerved about the centre thereof, which ſometimes is very conſiderable, and becomes very dangerous to ſmall veſſels, for they are ſometimes ſwallowed up by it. Mackenzie (in the Phil. Tranſ. for 1749) ſays, that eddies of this whirling kind, with a cavity of two or three feet, which ſometimes ſwallow up ſmall boats, may be broken and filled up by throwing in an oar. The cauſe of the hollow in the middle of theſe whirls, and of the abſorption of boats, &c. will be pointed out in the ſequel.

The

The inequalities of the bottom of a river are likewise productive of similar derangements in the motion of the water. Thus, for instance, when the motion of the stream is rapid, and the bottom, or bed, of it rises abruptly in some particular part, a sensible rising of the water may be perceived over it, and in many such cases, even sand or mud is forced up to the surface of the water at that particular place.

At sea, and especially amongst islands, or in channels, the eddies arising from tides, currents, winds, &c. are so very frequent, so uncertain, and so impetuous, particularly in stormy weather, as to render the navigation extremely dangerous. Several spots are peculiarly remarkable for such irregularities of motion, and they are, for that reason, well known to all experienced sailors. The Eddystone rocks, near Plymouth, well known for the light-house which is built upon one of them, are said to have obtained their name from the great and powerful eddies that do almost at all times take place among them. But eddies have also been observed in open seas far from any land, where they are produced by the opposition of the wind to a current, or to the tide, or to a swell occasioned by a previous wind. When a vessel is sailing, unless it proceeds with the stream, the eddies which are formed by it are very evident, and they may be perceived for a considerable way behind the vessel. The seamen call that eddy, which seems to throw the water on the rudder of a ship under sail, the *dead water*.

In pipes, conduits, or aqueducts, all sorts of bendings, internal contractions, elongations, enlargements, and projections, of the conducting pipe, diminish the quantity of discharge, more or less, according to the number and form of such irregularities; sharp angular bendings hindering the motion of the fluid, more than those of a regular curvature. The cause of this retardation is undoubtedly owing to the eddies, and to the crossing of the various parts, or (as they are otherwise called) *filaments* of the fluid, which, according to what has been said above, must necessarily take place at those irregularities: for all eddies and cross directions must unavoidably destroy part of the moving force. This production of eddies in the inside of pipes may be rendered sufficiently evident, if an irregular glass tube be applied to a pretty large vessel full of water, and if with the water there be mixed some particles of pounded amber, or other substance, whose specific gravity differs but little from that of water; as these particles will easily shew the irregularities of the motion of the water in its passage through the glass tube.

Whenever an irregularity of the shape of the aperture, or some particular conformation of the vessel; (or even an obstacle to the stream at some distance from the aperture,) compels the particles of the fluid to run obliquely towards an aperture, a circular motion is readily communicated to the fluid, and an hollow whirl, or eddy, is formed above the aperture. By this circular motion the particles of the fluid acquire a centrifugal force, in consequence of which they endeavour to recede from the centre, or from the axis of motion, where, of course, a hollow is formed, which is larger or smaller, according as the rotation of the fluid is more or less rapid. When the whirling motion is pretty considerable, if any light bodies float upon the fluid, they will be readily drawn towards the centre, and then downwards towards the aperture; for since the specific gravity of the fluid is greater than that of those bodies, the fluid will acquire a greater degree of centrifugal force, and will recede farther than those bodies from the axis of the whirl. This may be easily observed in a common funnel, when water or other fluid is running out of it.

It needs hardly be observed, that such eddies as occur in water, must likewise take place in other fluids under similar circumstances; due allowance being made for their different specific gravities, tenacities, densities, elasticities, &c.

The eddies, and whirls, of air are so commonly met with in the streets of a town, especially when the wind is pretty brisk, and they are so often indicated by the smoke which issues out of chimneys, as to require no farther illustration in this article. Amongst seamen, the *eddy wind* is that wind which is returned, or beat back, from any sail.

EDDYSTONE, or EDDYSTONE-*Rocks*, in *Geography*, the name of a cluster of rocks situated in the English channel, at the distance of about 14 miles from Plymouth-sound, lying nearly in the direction of vessels coasting up and down the channel; they formerly proved very dangerous, and many vessels were cast away on them. To guard against these disasters, it was deemed necessary to erect a light-house here; but to effect this in a complete and permanent manner, so as to resist storms and afford light, was a task of extreme difficulty. The rocks are so peculiarly exposed to the swells of the ocean from the south and west, that the heavy seas break upon them with uncontrolled fury. Sometimes, after a storm, when the sea is apparently quite smooth, and its surface unruffled by the slightest breeze, the growing swell, or under current meeting the slope of the rocks, the sea beats tremendously upon them, and even rises above the light-house, overtopping it for the moment as with a canopy of frothy wave. Notwithstanding this awful swell, Mr. Henry Winstanley undertook, in the year 1696, to build a light-house on the principal rock, for the rest are under water; and in 1700 he completed it. So confident was this ingenious mechanic of the stability of his edifice, that he declared his wish to be in it during the most tremendous storm that could arise. This wish he unfortunately obtained, for he perished in it during the dreadful storm which destroyed it Nov. 27, 1703. Another light-house, of a different construction, was erected of wood on this rock, by Mr. John Rudyard, in 1709: which being consumed by fire in 1755, a third, of stone, was begun by the justly celebrated Mr. John Smeaton, April 2, 1757, and finished Aug. 24, 1759, which has hitherto withstood the attacks of the most violent storms. The rock, which slopes towards the south-west, is cut into horizontal steps, into which Portland stone and granite are dove-tailed and strongly cemented: for Mr. Smeaton discovered that neither could be used exclusively, as the former would be subject to the depredations of a marine animal, and the working of the latter would have been too expensive. He therefore used the one for the internal part of the structure, and the other for the external. Upon the principle of a broad base and accumulation of matter, the whole, to the height of thirty-five feet from the foundation, is a solid mass of stones engrafted into each other, and united by every possible augmentation of strength. The light-house consists of four rooms, one over another, with a gallery and lanthorn at the top. The stone floors, which are flat above, but concave below, are prevented from pressing against the sides of the building by a chain let into the walls. The edifice is eighty feet in height; and has now stood fifty years, during which time, though frequently assaulted by all the fury of the element, it has withstood the most violent attacks without sustaining the smallest injury: and, in all probability, as Mr. Smeaton said, nothing but an earthquake can destroy it. The wooden part was burnt in the year 1770, but renewed in 1774. Its situation is long. 4° 21′ W. Lat. 50° 3. N. For an interesting, scientific account of this structure, and for much useful information concerning similar buildings, the reader is referred to Smeaton's "History, &c. of Eddystone Light-house."

·houſe," with plates, 8vo. Many additional particulars reſpecting it are recorded in the "Beauties of England and Wales," vol. iv.

EDDYSTONE, a rock on the coaſt of Patagonia. S. lat. 48° 30′. W. long. 64° 56′.

EDDYVILLE, a poſt town of America, in the ſtate of Kentucky, and county of Livingſton; 821 miles W. by S. from Waſhington.

EDEBASSUS, in *Ancient Geography*, a town of Aſia Minor, in Lycia. Steph. Byz.

EDELBACH, in *Geography*, a town of Germany, in the archduchy of Auſtria; 6 miles E.S.E. of Bavarian Waidhoven.

EDELINCK, GERARD, in *Biography*, was an engraver of conſiderable eminence, a member of the French royal academy of painting and ſculpture, and one of the conſtellation of diſtinguiſhed artiſts that ſhed luſtre on the reign of Louis XIV. He was born at Antwerp, but reſided at Paris after the year 1665, where he was honoured with the title of Chevalier, and had, by the king's appointment, an apartment in the Gobelins. He engraved both portraits and hiſtory with admirable ſkill. His portraits are chiefly thoſe of artiſts and men of ſcience; and ſome of his hiſtorical engravings are very large, particularly his "Cruciſixion," and his "Tent of Darius," both after Le Brun, and an "allegorical" engraving in honour of the king. He died at Paris, at a very advanced age, in the year 1707. For ſome further particulars of this artiſt, ſee FRENCH *School of Engravers*.

EDELING. See EDHILING, and ATHELING.

EDELMANN, JOHN FRIED., born at Straſbourg, 1749, a harpſichord maſter, and compoſer for that inſtrument, long reſident at Bruſſels. He had a lively finger and played his own pieces with great neatneſs and ſpirit. But his ſtyle of compoſition would now be called flimſy and rattling. It is a bad copy of Schobert's nervous ſymphonic ſtrains. Emanuel Bach's refinements in melody, and ſcience in harmony and modulation, had not reached Bruſſels, or, at leaſt, touched the heart of Edelmann, when he compoſed any of his leſſons which have come to our knowledge. We believe this muſician, who had the character of an innoxious good natured man, much eſteemed by his pupils, had removed to Paris previous to the revolution, in the horrors of which he was early involved, and ſuffered under the guillotine at Straſbourg; we never heard why, except that it was Robeſpierre's pleaſure.

EDELSTEIN, in *Geography*, a town of Sileſia, in the principality of Neiſſe; five miles S. of Ziegenthals.

EDEMA, in *Ancient Geography*, a town of Judea, in the tribe of Naphtali.

EDEN, *Land* or *Country of*, in *Scripture Geography*, a diſtrict or province of Aſia, in which was "Paradiſe" or the "Garden of Eden." The word *Eden*, according to its primary meaning in the Hebrew language, denotes pleaſure or delight; and hence it was uſed as an appellative for ſeveral places, whoſe ſituation was peculiarly pleaſant and delightful. Such was the *Eden*, or Beth-Eden, mentioned by the prophet Amos (ch. i. v. 5) which, as Huet, biſhop of Soiſſons, thinks, was a valley ſituated between the mountains of Libanus and Antilibanus, in that part of Syria, of which Damaſcus was the metropolis. Some have ſuppoſed that the paradiſe of our firſt parents was ſituated in this valley; and they have been induced to adopt this opinion by having diſcovered in its vicinity a town called "Paradiſa," and mentioned both by Pliny and Ptolemy. There is alſo a village called *Eden*, near Tripoli in Syria, ſeated on mount Libanus, near which were the river Adonis and the cedars of Lebanon. Maundrel alſo mentions this village. In this place ſome have ſought the ſite of the terreſtrial paradiſe. But in order more preciſely to aſcertain the ſituation of the "Garden of Eden," thoſe who acquieſce in the literal deſcription of it given by Moſes, refer to his account of it, and inveſtigate the country in which it was ſituated by the attendant circumſtances, which he has recited. (See Gen. ii. 8—14.) From the ſcripture account it appears, that the Eden, in which was planted the garden of paradiſe, lay on a river or ſingle channel, which out of Eden was parted into four heads or rivers, called Piſon, Gihon, Hiddekel, and Perath or Euphrates. We are, therefore, to inveſtigate ſome ſingle channel or river, common to theſe four rivers; ſuppoſing that their courſe has not been materially altered in ſubſequent times, and particularly by the cataſtrophe of the deluge. *Piſon*, the firſt of theſe rivers, *compaſſeth*, ſays the ſacred hiſtorian, *the whole land of Havilah, where there is gold; and the gold of that land is good: there is bdellium and the onyx-ſtone.* In order to diſcover this land of Havilah, we find that it is mentioned in two other places of ſcripture, *viz.* Gen. xxv. 18. and 1 Sam. xv. 7. In both theſe places we may well ſuppoſe; that the expreſſion "from Havilah unto Shur" denotes the whole extent of that part of Arabia, which lies between Egypt to the weſt, and a certain channel or river (which empties itſelf into the Perſian gulf) to the eaſt. Shur appears to have been the weſtern extremity of this part of Arabia, (Exod. xv. 22.) which came up to the bottom of the Red ſea or Arabian gulf, and ſo joined on to Egypt. Havilah, therefore, was the eaſtern extremity of this part of Arabia. Moreover, ſacred and profane authors have highly commended the gold of Arabia. (See Ezek. xxvii. 22, 23. Diod. Sic. l. ii. and iii.) As for the bedolach, or bdellium, mentioned by the hiſtorian, writers have differed concerning the meaning of the term; ſome having ſuppoſed that it ſignified pearls, and others, that it was a peculiar kind of gum. Both theſe, it is ſaid, are to be found in the land of Havilah. The ſea about Baharen, an iſland in the Perſian gulf, which ſea lies next to the land of Havilah, has always abounded with pearls of the fineſt kind; as we learn from the teſtimonies of Nearchus, one of Alexander's captains, Iſidorus of Charax, Pliny, Arrian, Ælian, Origen, Benjamin of Navarre, Teixeira, a Portugueſe, and many other modern travellers. If by bedolach or bdellium we underſtand a gum, this is likewiſe found in the land of Havilah, as we learn from Dioſcorides, Iſidorus, Galen, Pliny, Strabo, Arrian, &c. &c. Precious ſtones have been alſo found from time immemorial in the ſame country. (See Ezek. xxvii. 22, 23.) Nearchus, Strabo, Diodorus, and Pliny, teſtify to the ſame fact, and Pliny, in particular, ſays, on the authority of the ancients, that the onyx-ſtone, if we underſtand this to have been the "ſchoham" of the text, was no where elſe to be found but in the mountains of Arabia. It further appears, that a channel, or river, called by Moſes Piſon, bounds Havilah eaſtward, and diſcharges itſelf into the Perſian gulf, and conſequently anſwers to his deſcription. Beſides, as Moſes is ſuppoſed to have written his hiſtory in Arabia Petræa, or ſome place nearly adjoining it, this river was the neareſt to him of the four rivers which he names, and, therefore, it is natural to imagine, that it muſt be the firſt which he would mention. The etymology of Piſon, derived from *puſeh*, to be full or increaſe, or from *poſeha*, to ſpread itſelf, correſponds to the ſituation of this river, for the tides in this part of the Perſian gulf are ſo violent and ſo high, that no trenches furniſh a ſufficient defence againſt their irruption into the neighbouring grounds, which are ſoft and low. No name could be more appropriate to that channel, which was apt ſo often to overflow, as that of Piſon.

Of

Of the second river Moses says; *the name of the second river is Gihon; the same is it that compasses the whole land of Cush.* As Pison was the first river with respect to the place where Moses was writing, it is natural to imagine, that Gihon, being the second, was the river next to it, and the most easterly channel of the two, into which the Euphrates, after its junction with the Tigris, is again divided. The name Cush did formerly belong to the country washed by this easterly river. By the Greeks and Latins it was called Susiana, and it is now called Chuzestan or Chusistan, evidently indicating its original appellation Cush.

The third river is thus described; *and the name of the third river is Hiddekel, that is it which goes before Assyria.* Hiddekel, the Hebrew name, is rendered by the LXX interpreters Tigris; and that this was the Hiddekel of Moses has been argued from the etymology of the word Tigris. In the Levant they call it Diglath; and if we take away the aspiration from Hiddekel, we have the word Dekel, which the Syrians termed Diklat, called by Josephus and the Chaldee paraphrasts, and also by the Arabians and Persians Diglath, and by the modern orientals Degil and Degolah, by Pliny Diglito, and by the Greeks, instead of Digli, Tigris. Hence it is inferred, that the names Tigris and Diglito are one and the same, varied according to the diversity of dialects or languages. The method observed by Moses in reckoning up these four rivers is also alleged as a presumptive argument, that the Hiddekel is the Tigris. Having named the Pison and the Gihon, it was natural for him to return towards the place where he was writing, and to mention the first river he met with on his return, and this was the Tigris. Besides, the river Tigris actually runs along Assyria, the province or district surrounding Ninivch the capital, so considered with respect to the place where Moses was writing.

As to the fourth river, or the Euphrates, it would naturally be the last mentioned by Moses. This river and the Tigris join together into one channel, which is afterwards divided again into two channels, the westerly one of the two being the river Pison, and the easterly one the river Gihon. Now, the *country of Eden* was situated on the common channel of these four rivers; and the words of Moses obviously intimate, that the *Garden of Eden*, or the terrestrial paradise, lay on the single channel, which is common to all the four rivers, for *from thence*, that is, out of Eden, *it was parted and became four heads.* Some other circumstances have been adduced in order to ascertain the situation of Eden. The fertility of the soil has been alleged as affording a concurring argument in favour of the district to which it has been now referred. It has been farther argued, that Moses, by saying the garden was planted *eastward* in Eden, designed to mark out to them, in what part or place of the land of Eden Paradise was situated. Since, then, Paradise lay in the easterly part of the land of Eden, and the river that watered it ran through that province before it entered into Paradise, it must follow, that Paradise was situated on one of the turnings of this river, that goes from west to east, and probably at the easterly end of the southerly branch of the lowest great turning, taken notice of by Ptolemy.

It has been imagined that the "Garden of Eden" was the original of those curious gardens, which the princes of the East caused to be made, and by which they would represent this delightful spot. Such was that golden garden valued at 500 talents, which Aristobulus, king of the Jews, presented unto Pompey; and which Pompey afterwards carried in triumph, and consecrated to Jupiter in the capitol. It has been also apprehended, that the conformity between the words "Garden of Eden" and "Garden of Adon" seems to shew, that to the garden of Eden was owing the rise of those gardens consecrated to Adonis, which the Greeks, Egyptians, and Assyrians, planted in earthen vessels and silver baskets, for the purpose of adorning their houses, and which they carried about in their processions. Hence it has likewise been supposed, that the poets formed their "Fortunate islands," the "Elysian fields," the "Meadows of Pluto," and the gardens of the Hesperides, of Jupiter, and of Alcinous, as well as those of Adonis. Wells's Geography of the Old Testament, vol. i. Shuckford's Creation and Fall of Man.

EDEN, in *Geography*, a town of Germany, in the circle of Westphalia, and county of Rietberg; one mile E.S.E. of Rietberg.

EDEN, a river of England, which rises in Westmoreland, on the borders of Yorkshire, traverses the county of Cumberland, and discharges itself into an arm of the sea, called Solway Frith; about seven miles below Carlisle.

EDEN, a river of Scotland, which runs into the Tweed, not far from Coldstream.

EDEN, a post town of America, in Hancock county, and state of Maine, incorporated in 1796, taken from the northerly part of mount Desert; 764 miles easterly from Washington.—Also, a township of Orleans county, in the state of Vermont, N.W. of Craftsbury, which adjoins to it.

EDENBURG, a town of Hungary, 29 miles S.W. of Presburg, and 36 S. of Vienna.

EDENBERRY, a town of Ireland, in King's county; 29 miles W. of Dublin.

EDENKOBEN, a small town of France, in the department of Mont Tonnerre, chief place of a canton in the district of Spire, with a population of 3014 individuals. The canton has 26 communes, and 16,468 inhabitants.

EDENTON, a district of America, on the sea coast of N. Carolina, bounded N. by the state of Virginia, E. by the ocean, W. by Halifax district, and S. by Newbern. It is subdivided into nine counties, *viz.* Chowan, Pasquotank, Parquimins, Gates, Hertford, Bertie, and Tyrrel. It contains 56,986 inhabitants, of whom 21,632 are slaves. The lands in this district are level, rich, and well watered, and produce abundance of wood, chiefly pine, oak, cypress, and juniper.

EDENTON, the capital of the above district, is a post town and port of entry, situated at the head of a bay on the N. side of Albemarle sound, and at the N.E. side of the opening of Chowan river. It contains more than 150 wooden buildings, and 1302 inhabitants, of whom 713 are slaves. Its public buildings are an ancient brick episcopal church, a court-house, and a gaol. The prosperity of this town, though its situation is favourable for trade, has been retarded by its insalubrity. It is 97 miles N. of Newbern and 440 S.S.W. of Philadelphia. N. lat. 36° 6′. W. long. 77° 11′.

EDER, a town of Africa, in Morocco, on the coast of the Atlantic; 10 miles N.E. of Cape Cantin.—Also, a river of Bohemia, which runs into the Elbe, at Leitmeritz.—Also, a river of Germany, which runs into the Fulda; seven miles S. of Cassel.

EDERIC, a town of Asia, in the country of Tibet; 40 miles S.S.E. of Tosun-Hotun.

EDERITZ, a town of Germany, in the circle of Upper Saxony, and principality of Anhalt-Cothen; four miles S. of Cothen.

EDESHEIM, a town of Germany, in the circle of the Upper Rhine, and bishopric of Spire; 14 miles W. of Spire.

EDESSA, in *Ancient Geography*, a city of Asia, in Mesopotamia, and the capital of Mygdonia, which formed a part of Osrhoene; seated on the bank of a small river called Scirtus,

Scirtus, N.E. of Zeugma, and E.S.E. of Samesata. It was about 20 miles beyond the Euphrates, into which the Scirtus discharged itself. Edessa is said to have been one of those numerous cities, which were built by Seleucus Nicator about 300 years B.C. It was once a place of great celebrity, and famous for a temple of the Syrian goddess, which was one of the richest in the world; and hence it was denominated Hierapolis, or the holy city. During the intestine broils, which greatly weakened the kingdom of Syria, Augarus, or Abgarus, seized on the city of Edessa, and its fruitful territory, which he erected into a new kingdom, styling himself king of Edessa, and transmitting the same title to his posterity. He left this small principality in a very flourishing condition, and was succeeded by his son Abgarus II.; the name of Abgarus being common to all the kings of Edessa. This prince made himself master of the province of Osrhoené, and entering into an alliance with Pompey against Tigranes the Great, king of Armenia, supplied his army with provisions. In the Parthian war he pretended to take part with Crassus, but maintaining a private correspondence with the enemy, contributed to the great overthrow which the Romans sustained at Carrhæ. From him the royal authority descended to Abgarus III. a prince celebrated by ecclesiastical historians on account of the letters which are supposed to have passed between him and our Saviour. (See ABGARUS.) We learn from St. Austin, (apud Aug. Epist. 230.) that our Saviour promised Abgarus that the city should be impregnable; and Evagrius (Hist. Eccles. b. iv. c. 27.) observes, that although this circumstance was not mentioned in our Lord's letter, it was the common belief; which was much confirmed, when Cosrhoes, king of Persia, having set down before it, was obliged to raise the siege. The deliverance of the city is ascribed to the picture of Christ, which was the perfect impression of his face on linen, and which being exposed on the rampart, served as a palladium to the besieged. This image was revered as a pledge of the divine promise already mentioned, that Edessa should never be taken by a foreign enemy. After this important service, the image of Edessa was preserved with respect and gratitude. This fable, as Gibbon imagines, (Rom. Emp. vol. ix.) was invented between the years 521 and 594. most probably after the siege of Edessa in 540. Abgarus V. reigned in the time of the emperor Claudius, and joined C. Cassius, governor of Syria, who had been ordered by that emperor to place Meherdates on the throne of Parthia; but abandoning the Romans in the heat of an engagement, he occasioned the defeat of their army. Abgarus V. was contemporary with Trajan, and was declared by him friend and ally of the Roman people. But he afterwards destroyed and burnt the city of Edessa. Another prince of the same name reigned at Edessa in the time of the emperor Severus, and having assisted him in his wars in the East, attended him to Rome, where he was received and entertained with extraordinary pomp and splendour. But being afterwards suspected by Caracalla of holding a correspondence with the enemies of Rome, and being summoned to justify himself before the emperor, he was, by his order, confined, and his kingdom reduced to a Roman province. The emperor Julian took occasion, on account of the disorderly conduct of the Arians in this city, to confiscate the whole property of the church, and to distribute it among the soldiers. In the time of the crusades, towards the close of the 11th century, count Baldwin, being called to the assistance of a Greek or Armenian tyrant, who had been suffered under the Turkish yoke to reign over the Christians of Edessa, accepted the character of his son and champion; but no sooner was he introduced into the city, than he inflamed the people to the massacre of his father, occupied the throne and treasure, extended his conquests over the south of Armenia and the plain of Mesopotamia, and founded the first principality of the Franks or Latins, which subsisted 54 years beyond the Euphrates. About the middle of the 12th century, Zenghi, son of Alcantar, a valiant Turk, having commenced his military career by the defeat of the Franks at Antioch, proceeded to the siege of Edessa, and after 25 days, he stormed the city, and recovered from the Franks their conquests beyond the Euphrates.

EDESSA, in *Geography*, a town of European Turkey, in the province of Macedonia, near the Vistricza, called by the Turks "Moglena"; 316 miles W. of Constantinople. N. lat. 40° 50′. E. long. 22° 3′.

EDESSENUM, the name of a famous collyrium, reckoned among the number of the monohemera, or such as cured certain disorders of the eyes in one day. It is supposed to have had its name edessenum from the city of Edessa, where it was first invented, and in great use. Its composition was this: take gum arabic, tragacanth, farcocolla, acacia, and starch, of each two drams; opium, four drams; cerusse, eight drams; cadmia, sixteen drams; these were all to be reduced to a fine powder, and afterwards mixed with a sufficient quantity of water, to be used to wash the eyes.

EDETA, LIRIA, in *Ancient Geography*, a very ancient town of Spain, situated towards the south, at some distance on the left of the river Turia, N.W. of Valencia. It has given name to the *Edetani*, whose territory extended from the Iberus to the river Xucar, and was bounded by Celtiberia on the west, and on the east by Iberiaonia. This territory contained, besides Edeta, several other towns, as Salduba or Saragossa; Celsa below Salduba, and on the opposite side of the river; Belia, Carthago Vetus, S. of Celsa; Turbula or Tervil, near Albaraçin, where the Edetani were defeated by Quintius Minucius, A.U.C. 557; Segobriga or Segorbe, on the right bank of the Morviedro; Saguntum or Morviedro, destroyed by Hannibal and restored by the Romans, famous for its clay; and Valentia or Valencia.

EDFUERIM, in *Geography*, a town of Norway; 36 miles N. of Berga.

EDGAR, in *Biography*, one of the most distinguished of the Saxon kings of England, was son of Edmund. When he was but 13 years old, he was placed by the insurgents, who had rebelled against his brother Edwy, at their head, and upon the death of Edwy he succeeded peaceably to the throne, in 959. The monks and Dunstan had been the instruments of Edgar's elevation, and to them he gave great powers, allowing them the government of all monasteries instead of the secular canons, who were accused of a general dissoluteness of manners. This prince, however subservient to the monks in religious concerns, never gave the civil and military concerns of his kingdom out of his own hands. He maintained a large body of troops to repel the invasions of the Scots, and fitted out a navy, which he always kept under strict discipline, to prevent any attack of the Danes: hence he secured the submission of the little independent princes of Wales and Ireland. One of the most remarkable circumstances in the reign of Edgar, is the extirpation, or at least, the great diminution of wolves in the southern parts of the island. This he effected by commuting the punishment of certain crimes for a fine of wolves' tongues, and by exchanging a tribute in money from Wales for a payment of the heads of those animals. Edgar, in the monkish histories, is celebrated for his piety, but he was a man of very licentious morals. As his reputation allured a great number of foreigners to his court, they imported all the vices of their respective countries, and contributed to encourage the king's licen-

licentiousness, and to corrupt the simple manners of his subjects. One of his amours has afforded an interesting subject for a tragedy. Elfrida, daughter of Olgar, earl of Devonshire, was highly celebrated for her beauty; the report reached the king, who sent his favourite, the earl of Athelwold, to discover if the praises bestowed upon her were such as her beauty claimed. The earl found it too great for him to withstand. He satisfied the king by a false report, that it had been greatly exaggerated, and then obtained leave to marry her as a very rich heiress. Edgar soon discovered the artifice, and desired to be introduced to his wife, who, perhaps, ambitious of being the wife of the king rather than of one of his subjects, displayed her person in the most striking manner. Edgar, transported with rage, drew Athelwold to a retired place in a wood under pretence of hunting, stabbed him with his own hand, and shortly after married the widow. King Edgar, says judge Blackstone (vol. iv.), who, besides his military merit, as founder of the English navy, was also a most excellent civil governor; observing the ill effects of three distinct bodies of laws, *viz.* the Dane-lage, West-Saxon-lage, and Mercian-lage (see COMMON *Law*), prevailing at once in separate parts of his dominions, projected and begun what his grandson king Edward the Confessor afterwards completed, that is, one uniform digest or body of laws to be observed throughout the whole kingdom; this was probably no more than a revival of king Alfred's code, with some improvements suggested by necessity and experience; particularly the incorporation of some of the British, or rather Mercian customs, and also such of the Danish as were reasonable and approved, into the West-Saxon-lage, which was the ground-work of the whole.

EDGARTON, in *Geography*, a port of entry and post-town of Massachusetts, and chief town of Duke's county, situated E. of the island of Martha's Vineyard. The fertile island of Chabaquidick is within the jurisdiction of Edgarton, and has a small trade to the West-Indies. It is 100 miles S. S. E. of Boston, incorporated in 1671, and containing 1226 inhabitants.

EDGCOMB, formerly *Freetown*, a township of America, in Lincoln county and state of Maine, E. S. E. of Wiscasset, containing 989 inhabitants. It was incorporated in 1774, and is distant 180 miles N. by E. from Boston.—Also, a county of Halifax district in N. Carolina, bounded S. by Pitt county, S.W. by Wayne county, and Tar river, which affords a communication with several counties in the state, W. by Nash county, and E. by Martin and Halifax counties. It contains 9898 inhabitants, of whom 3580 are slaves.

EDGCUMB-BAY, a bay on the N. E. coast of New Holland. S. lat. 20°.

EDGCUMB-*Island*, one of the cluster called "Queen Charlotte's islands," in the South sea, so called by Capt. Carteret in 1767. It has a fine pleasant appearance, and lies in S. latitude 11° 10'. E. long. 165° 14'.

EDGE *in with a ship*, in the *Sea Language*, is said of a chace, that is making up to it.

EDGE *away*, is to decline gradually from the shore, or from the line of the course which the ship formerly steered, when she sails nearer the direction of the wind, or *larger* before the wind.

EDGECOMBE, MOUNT, in *Geography*, a high round mountain, so called by Cook in 1769, situated upon the main land S. W. by S. of the island of Mowtohora, in the South Pacific ocean, and not far from the sea. It stands in the middle of a large plain, and on this account is the more conspicuous. S. lat. 37° 59'. E. long. 193° 7'.

EDGECUMBE, *Cape*, a cape on the west coast of North America, in the north Pacific ocean. It is a point of land that shoots out from a round elevated mountain, called by Capt. Cook, in 1778, "Mount Edgecumbe." N. lat. 57° 3'. E. long. 224° 7'.

EDGEFIELD, a district of South Carolina, in America, bounded N. by Saluda river, which separates it from Newbury district, S. W. by Savannah river, which divides it from the state of Georgia, and W. by Abbeville. This district is about 45 miles long and 24 broad. The post-office in this district, called "Edgefield court-house," is 20 miles from Abbeville court-house, 25 from Augusta, and 60 from Columbia.

EDGEMONT, a township of America, in Delaware county, Pennsylvania, containing 509 inhabitants.

EDGEWARE, a town of England, in the county of Middlesex, on the borders of Hertfordshire, with a weekly market on Thursday; 8 miles N. W. of London.

EDGHILL, the name of an elevated place in Warwickshire, situated about 14 miles from the town of Warwick, and near the village of Kineton, or Kenton. It is memorable in the military annals of the kingdom for a battle fought here in the time of the civil wars between king Charles and the parliament: on which occasion nearly 1500 persons were killed in the field, among whom were several of the nobility. It occurred October 23, 1642, and the monarch's army proved victorious. They afterwards marched to Banbury, took possession of its castle, and then proceeded to Oxford. Mr. Jago, in a poem entitled "Edge-hill," has related many interesting events concerning this engagement, and has described the features of the country with much felicity and propriety.

Near this place is the noted vale of Redhorse, so called from a figure of a horse cut on the side of a hill. The figure is supposed, by Mr. Wise, who has written a dissertation on the subject, to have been cut in commemoration of the valorous feats performed by Guy, earl of Warwick, who possessed Fulbrook castle in the vicinity.

EDGINGS, in *Gardening*, rows of shrubs, herbs, or flowers, placed by way of borders around beds, compartments, &c. For the edgings of compartments, box seems the most proper. See BOX.

EDHILING, EDHILINGUS, an ancient appellation of the nobility among the Anglo-Saxons.

The Saxon nations, says Nithard, Hist. lib. iv. is divided into three orders, or classes of people; the edhilirgi, the frilingi, and the lazzi; which signify the nobility, the freemen, and the vassals or slaves.

Instead of edhiling, we sometimes meet with atheling, or ætheling, which appellation was likewise given to the king's son, and the presumptive heir of the crown. See ATHELING.

EGHIR, in *Geography*, a town of Hindoostan, in the country of Golconda, 10 miles W. of Rachore, and 75 S.W. of Hydrabad.

EDICT, an instrument, signed and sealed by a prince, to serve as a law to his subjects.

Edicts have no room in England, where the enacting of laws is not lodged in the king, but in the parliament.

In the Roman law we find frequent mention of the edict of the prætor, *quod prætor edixit*, which was a phrase appropriated to the ordinances of the prætor; though it was sometimes also used on other occasions.

These occasional edicts of the prætors supplied the silence or ambiguity of the laws. This ancient prerogative of the Roman kings was transferred, in their respective offices, to the consuls and dictators, the censors and prætors; and a similar right was assumed by the tribunes of the people, the ædiles, and the pro-consuls. At Rome, and in the provinces, the duties of the

the ſubject, and the intentions of the governor, were proclaimed, and the civil juriſprudence was reformed by the annual edicts of the ſupreme judge, the prætor of the city. As ſoon as he aſcended his tribunal, he announced, by the voice of the cryer, and afterwards inſcribed on a white wall, the rules which he propoſed to follow in the deciſion of doubtful caſes, and the relief which his equity would aſſord from the preciſe rigour of ancient ſtatutes. A principle of diſcretion, ever congenial to monarchy, was introduced into the republic: the art of reſpecting the name, and eluding the efficacy of the laws, was improved by ſucceſſive prætors; ſubtleties and fictions were deviſed to defeat the plaineſt meaning of the decemvirs, and where the end was ſalutary, the means were frequently abſurd. A juriſdiction thus vague and arbitrary was expoſed to the moſt dangerous abuſe: the ſubſtance, and alſo the form of juſtice were often ſacrificed to the prejudice of virtue, the bias of laudable affection, and the groſſer ſeductions of intereſt or reſentment. But the errors or vices of each prætor expired with his annual office; and the temptations of injuſtice were removed by the Cornelian law, which compelled the prætor of the year to adhere to the letter and ſpirit of his firſt proclamation. It was reſerved for Adrian to accompliſh the deſign, which had been conceived by Cæſar; and the prætorſhip of Salvius Julian, an eminent lawyer, was immortalized by the compoſition of the "Perpetual Edict." Dion Caſſius fixed the perpetual edict in the year of Rome 686. (tom. 1. l. 36.) This well digeſted code was ratified by the emperor and ſenate; the long divorce of law and equity was at length reconciled; and inſtead of the twelve tables, the perpetual edict was fixed as the invariable ſtandard of civil juriſprudence. This perpetual edict was formed by a ſelection from all the ancient edicts of prætors, and Adrian ordained that this ſhould be always conſidered as a law, from which no deviation ſhould be allowed.

The celebrated "Edict of Milan" was announced by Conſtantine about five months after the conqueſt of Italy, A. D. 313, as a ſolemn and authentic declaration of his ſentiments, and was the means of reſtoring peace to the Catholic church. In the perſonal interview of the two weſtern princes, Conſtantine, by the aſcendant of genius and power, obtained the ready concurrence of his colleague Licinius; the union of their names and authority diſarmed the fury of Maximian; and after the death of the tyrant of the Eaſt, the edict of Milan was received as a general and fundamental law of the Roman world. The Latin original of this edict is preſerved by Cæcilius (De Mort. Perſecut. c. 48.); and Euſebius (Ecc. Hiſt. l. x. c. 3.) has given a Greek tranſlation of it, which refers to ſome proviſional regulations. The wiſdom of the emperors provided by this edict for the reſtitution of all the civil and religious rights of which the Chriſtians had been ſo unjuſtly deprived. It was enacted, that the places of worſhip and public courts, which had been confiſcated, ſhould be immediately reſtored without any expence. The ſalutary regulations which guard the future tranquility of the faithful are formed on the principles of enlarged and equal toleration: and the two emperors concurred in proclaiming to the world that they granted a free and abſolute power to the Chriſtians and to all others, of following the religion which each individual might prefer, as the beſt adapted to his uſe. They alſo exacted from the governors of the provinces a ſtrict obedience to the true and ſimple meaning of an edict, which was deſigned to eſtabliſh and ſecure, without any limitation, the claims of religious liberty, and they aſſign two weighty reaſons, which induced them to allow this univerſal toleration: the humane intention of conſulting the peace and happineſs of their people, and the pious hope, that by ſuch a conduct, they ſhall appeaſe and propitiate the Deity, whoſe ſeat is in heaven. Gibbon's Hiſt. Rom. Emp. vol. iii.

In the French law, edicts, *edits*, make a great figure; they are of various kinds; ſome importing a new law, or regulation, as the edict of duels, that of ſecond marriages, &c. Others, the erection of new offices, eſtabliſhment of duties, rents, &c. Sometimes articles of pacification, as the edict of Nantz, paſſed by Hen. IV. in 1598, and revoked by Louis XIV. in 1685, &c. Edicts are all ſealed with green wax, to ſhew that they are perpetual and irrevocable.

Edicts with them were much the ſame as proclamations with us; but with this difference, that the former had the authority of a law in themſelves, from the power which iſſued forth; whereas, the latter are only declarations of a law, to which they refer, and have no power in themſelves.

EDICT, *chamber of the*. See CHAMBER.

EDIFICE, ÆDIFICIUM, a building. See BUILDING.

The word is formed of the Latin *ædes* and *facio*, I make.

EDILE, or rather ÆDILE. See ÆDILE.

EDINBURGH, in Latin *Edemburgum*, or *Aneda*, in *Geography*, the capital of Scotland, is a large, populous, and ancient town ſituated in the northern part of the county of Mid Lothian, or Edinburghſhire, about two miles ſouth of the eſtuary of the river or friſth of Forth; 380 miles N.W. of London, and 225 N.E. of Dublin, in W. long. 3° 35′. N. lat. 55° 56′ 22″.

The origin of Edinburgh is involved in much obſcurity. That part of Scotland where it is ſituated formed, in the days of Agricola, the Roman province of Valentia. On the departure of the Romans from Great Britain, this province fell into the hands of the Saxon invaders, under their leaders Octa and Ebuſa, in the year 452, and continued in their poſſeſſion till the defeat of Egfrid, king of Northumberland, by the Picts, in 685.

The earlieſt mention of Edinburgh has been detected by the induſtry of Mr. David Macpherſon, in the "Annales Ultonienſes," a manuſcript in the Britiſh Muſeum, where this paſſage occurs, under A. D. 637, "Bellum Giine Mureſan et Obſeſſio Edin." In 960, Eden town is mentioned, in an old manuſcript quoted by Camden, as being evacuated by the Saxons, and abandoned to Indulf, king of the Scots. In a charter of Alexander I., Edinburgh is called Edineſburg; in one of David I., Edwyneſburg; in the Chronicle of Melroſe, Edenburc and Edinburgh; by Simon of Durham, Edwineſburch; in the Chronicle of Lanercoſt, Edwyneſburgh; by Hemingford, Edeneſburgh; in the Polychronicon of Higden, Edenburch; by Knighton, Edayſborg and Edeneſburgh; by the prior of Lochleven, Edynburch, Edynbrowch, Maydyn-caſtle, and the Sorrowful Hill; by the highlanders Dun Edin; and by the Welſh, Myned Agned. This laſt appellation of Myned Agned, or Caer Agned; in Engliſh, Maiden-caſtle; and, in Latin, Caſtrum Puellarum, might, in time, have been lengthened into Aned, and then inverted into Edan, a conjecture, which was firſt ſuggeſted by the Edinburgh reviewers, and which appears, in ſome degree, ſupported by the Latin Aneda.

Mr. J. Sibbald, in his "Chronicle of Scottiſh Poetry," thinks, that Snadoun Eaſt muſt have been Edinburgh; becauſe Stirling was Snodon, or Snedin Weſt; ſo that its name was firſt Sneddinburgh, then Neddenburgh, and, laſtly, Edinburgh. Others derive its name from Edwin, a Saxon monarch. But the moſt probable etymology is from the Gaelic Edin, the ſteep face of a rock, a compound which occurs in Edenbelly, Edinmore, and other local appellations. When the Saxons acquired poſſeſſion of the fortreſs,

tress, Dun Edin, of course, became Edinburgh; the former name being still retained by the highlanders.

To David I. Edinburgh must have been indebted for the distinction of being a royal borough, as this king is supposed to have been the first who erected royal boroughs in Scotland, and in his charter of foundation of the abbey of Holyroodhouse, in the year 1128, the town is mentioned by the title of "Burgum meum de Edwinesburg."

In the year 1215, the first parliament was held at Edinburgh, in the reign of Alexander II., but it was only after the year 1456, when parliaments continued to be held regularly in this city, that it was looked upon as the capital of Scotland. Little is known of the history of Edinburgh before this period. The oldest charter in the archives of the town, is one granted by king Robert I., on the 28th of May, 1329, in which he bestows upon Edinburgh the town of Leith, with its harbour and mills, and his grandson John, earl of Carrick, who afterwards ascended the throne by the name of Robert III., conferred upon the burgesses the privilege of erecting houses in the castle, on the sole condition of their being persons of good fame.

When James III. was at variance with his nobles, in 1482, the inhabitants of Edinburgh distinguished themselves in his behalf, and he granted them two charters, in which, among other privileges, the provost was made hereditary high sheriff within the city, an office which is still enjoyed by the chief magistrate; the town council invested with the power of making statutes for the government of the city; and the corporated trades were presented with a banner, known by the name of the "Blue Blanket," which still exists, and is always confided to the convener of the trades.

A considerable degree of alarm was excited at Edinburgh, in 1497, by the first appearance of the venereal disease, which, being considered as a species of plague, all persons affected with it were sent to Inchkeith, a small island in the middle of the frith of Forth.

In the year 1504, the tract of ground to the south of the city, called the Burrough Muir, or Borough Moor, or Myre, being covered with wood, the town-council enacted, that whoever should purchase as much of the wood as was sufficient to make a new front to his house, might extend it seven feet farther into the street. Edinburgh, in a short time, was filled with houses of wood, instead of stone, and the principal street was reduced fourteen feeth in breadth.

The loyalty which Edinburgh displayed to James IV. on his expedition into England, led to the establishment of the town-guard. A considerable number of the inhabitants, headed by the earl of Angus, their provost, joined the royal army, and shared in its defeat at Flowden, in 1513. This disaster obliged, at first, every fourth man to keep watch at night: but when the alarm had subsided, the militia, known by the name of the town-guard, was raised for the defence of the city. The plague raged with violence at Edinburgh during the general consternation which succeeded that unfortunate expedition.

In 1542, Edinburgh was plundered and burnt by the English forces, under the earl of Hartford, and when it had recovered from this misfortune, it fell again into the hands of the same commander, after the defeat of the Scottish army at Pinkey: but though exposed to pillage, it escaped conflagration.

The progress of the reformation of religion, which, about that time, spread over the greatest part of Europe, occasioned several disturbances at Edinburgh, particularly in 1559, when the boisterous Knox was appointed a preacher in the city, and French troops, whom the queen regent had called to her assistance, seized Edinburgh. These troubles were allayed by the powerful help of queen Elizabeth of England. A parliament was held, which sanctioned the confession of faith of the reformed church.

On the 1st of September, 1561, Mary, queen of Scots, made her public entry into Edinburgh, to take possession of the throne: but the different religion in which she had been educated soon created fresh disturbances in 1563, when the town council caused the picture of St. Giles to be cut out of the town's standard, and the thistle to be inserted in its place.

During the commotions which distracted Scotland after Mary's retreat into England, Edinburgh suffered much from the divided interests of the different factions, being sometimes in the possession of the one, and at other times under the power of the other, till, at length, the castle surrendered to the English, and James, having a short time after attained his majority, a parliament was convened at Edinburgh. On the 17th of October, 1579, James made his public entry.

The spirit of fanaticism which succeeded the reformation not having yet subsided, violent commotions continued to take place at Edinburgh. In the year 1588, when the kingdom was alarmed at the approach of the Spanish armada, the people entered into a bond, known by the name of the "Covenant," for the maintenance of the true religion, and the defence of the king's person, on which occasion the town-council raised three hundred men for the protection of the city.

In December, 1591, the inhabitants of Edinburgh defeated the earl of Bothwell's attempt to seize the king. In 1592, the Presbyterian church government was established in Scotland by law: but the mutual distrust of the monarch and the clergy occasioned a fresh commotion in 1596. James, with all his attendants, withdrew to Linlithgow. Parliament, and the courts of justice, were ordered to leave a city where it was no longer consistent either with their safety or dignity to remain. Deprived of its magistrates, deserted by its clergy, who fled to England, abandoned by the courts of justice, and proscribed by the king, the capital of the kingdom was left to desolation and despair, until Elizabeth of England interceded with the offended monarch in its behalf.

On the Sunday previous to the departure of James to take possession of the English throne, in 1603, he repaired to the church of St. Giles, at Edinburgh, to bid a formal farewell to his northern subjects. Six years after, the differences between the king and the inhabitants of Edinburgh appear to have been entirely buried in oblivion. The provost was allowed to have a sword of state carried before him, and the magistrates were permitted to wear gowns on public occasions. In 1618, when James paid his last visit to Edinburgh, he was received by the magistrates with uncommon magnificence.

A perfect harmony seems to have subsisted between the court and the city of Edinburgh in the beginning of the reign of Charles I.: but this good understanding was not of long duration. The establishment of episcopacy was a favourite object with Charles, and Presbyterianism was too deeply rooted in Scotland to yield to his attempts. The people renewed the covenant against popery. Some of the bishops were assaulted, and narrowly escaped with their lives. Yet, when Charles visited Edinburgh, in 1641, he was sumptuously entertained by the magistrates.

During the civil war, which ended in Cromwell's usurpation, Edinburgh was again desolated by the plague; and almost depopulated in 1645.

Upon the accession of king William to the British throne,

the populace plundered the abbey church of Holyrood-houſe, having firſt defeated a party of about one hundred men, ſtationed in the abbey, who adhered to the intereſts of James.

The union of the two kingdoms of North and South Britain cauſed freſh diſturbances at Edinburgh in 1707. Whilſt the act was paſſing in the Scottiſh parliament, four regiments of foot were introduced, in addition to the regular guards, for the purpoſe of preſerving the peace of the city. But, during the rebellion of 1715, Edinburgh remained faithful to the cauſe of the houſe of Brunſwick. An attempt of the rebels upon the caſtle was rendered abortive. The loyalty of Edinburgh was ſtill more conſpicuous in 1725, when the Exciſe Bill excited diſturbances in almoſt every part of Great Britain.

The year 1736 was diſgraced by the execution of captain Porteus of the town guard by the populace. This unfortunate officer had been found guilty of having ordered the ſoldiers to fire upon a mob that had aſſailed the guards, when they eſcorted to the ſcaffold a criminal, who had become an object of general compaſſion, for having enabled his companion to eſcape, at the peril of his own life. The queen, in the abſence of the king, had granted captain Porteus a reprieve, and it was the ſuppoſition that his life would ultimately be ſpared, which led to this atrocious inſult on government.

In the month of September, 1745, Edinburgh was occupied by the army of prince Charles, the Pretender's eldeſt ſon. General Gueſt, governor of the caſtle, on being appriſed of the circumſtance, diſcharged ſeveral guns, as a warning for the inhabitants not to approach the caſtle-hill. On the 25th of the ſame month, he fired upon the rebels ſtationed at the Weſt-port, or Weſt-gate. This occaſioned the prince to order a guard to be placed at the Weigh-houſe, to prevent all intercourſe between the city and the caſtle. On the 1ſt of October, ſeveral perſons, who were carrying proviſions to the caſtle, were fired at by the highlanders, who, in their turn, were fired upon from the caſtle. Many houſes in the city were damaged, and ſome perſons wounded. To cut off all communication between the caſtle and the town, the prince placed guards in St. Cuthbert's church and Livingſtone's yards. On a ſally from the caſtle, one of the guard-houſes was ſet on fire, a few of the rebels were killed, and ſome taken priſoners. But as theſe unimportant ſkirmiſhes did not raiſe the blockade, a cannonading was commenced againſt the rebel's poſts, on the 4th of October; in the following night, a party from the caſtle burnt ſome houſes on the eaſtern ſide of Caſtle-hill, where the rebels uſed to ſhelter themſelves. The Pretender's army raiſed the blockade on the 5th, and on the 31ſt the prince left Edinburgh, on his march to England. His defeat at Culloden put an end to the rebellion. The provoſt of Edinburgh was tried for not having defended the city; but acquitted.

Several tumults of inferior importance have agitated Edinburgh in the years 1756, 60, 63, 65, 78, 79, and 84, moſtly on account of a temporary ſcarcity of proviſions, and on the repeal of the penal laws againſt the Roman Catholics.

The French revolution of 1789 occaſioned alſo ſome diſturbances at Edinburgh, and cauſed the trial and condemnation of a few individuals. But in the war of 1793, and in that which commenced in 1803, and is ſtill raging, (1809) the inhabitants of Edinburgh have evinced their attachment to the genuine principles of the Britiſh conſtitution, by the voluntary arming of all ranks. Every attempt to diſturb the peace of the city on account of a temporary high price of proviſions, has latterly been checked in its origin by the ſpirited conduct of the magiſtrates.

Edinburgh is on all ſides ſurrounded by lofty hills, except northwards, where the ground gently declines to the frith of Forth. Arthur's ſeat, Saliſbury Craigs, and Calton hill bound it on the eaſt; the hills of Braid and the extenſive ridge of the Pentland hills on the ſouth; and the beautiful Corſtorphine hill on the weſt. The principal part of the old town is built upon a hill of ſingular form, which, riſing gradually from eaſt to weſt, is terminated towards the weſt by a precipice three hundred feet in height. On the rock forming this extremity of the hill, ſtands the caſtle, and along the ſummit of the ridge is carried a ſtreet, which, under the ſeveral denominations of the Lawn-market, High-ſtreet, and Canon-gate, extends from the caſtle to the place where the riſe of the hill commences, a diſtance of ſomewhat more than a mile. At its eaſtern extremity, it is terminated by the palace of Holyrood-houſe. On each ſide of the hill, which thus forms the central parts of the town, is another ridge of ground inferior, however, in elevation, and terminating much leſs abruptly. The ſouthern hill is covered with what may be termed the new part of the old town, which, though it contains many good ſtreets and buildings, is laid out with little attention to that regularity which diſtinguiſhes the new town. It is connected with the central ridge by a bridge of nineteen arches, only one of which is viſible. This is named the South-bridge. The intervening valley is occupied by a long, narrow, and dirty ſtreet, called the Cow-gate, from which numerous ſtreets and alleys run up the ſides of the hill to High-ſtreet.

The new town is the peculiar pride of Edinburgh, and as far as regards regularity of deſign and beauty of ſituation, it may be conſidered as one of the moſt ſplendid aſſemblages of buildings in the kingdom. It ſtands on the ridge to the north of the old town, from which it is ſeparated by a deep valley, formerly a moraſs, called the North Loch. The communication between the two towns is effected by the North-bridge, and by an earthen mound, thrown acroſs the valley, a little further to the weſt. This mound was formed entirely from the ſoil and rubbiſh obtained in laying the foundations of the new town. The north bridge is remarkable for the lightneſs and elegance of its ſtructure, and for the ſingularity of the views which it commands.

The plan of the new town is extremely ſimple. Three principal ſtreets, extending nearly a mile in parallel lines from eaſt to weſt, are interſected at right angles and at equal diſtances by ſix croſs ſtreets, about a quarter of a mile in length.

The improvements of Edinburgh began in the year 1753, by the erection of the Royal Exchange. At that time Edinburgh occupied the ſame ſpace of ground which it had done for two centuries before; but ſince that period, it has been enlarged to more than twice its former ſize. The extent of Edinburgh, from eaſt to weſt, is about two Engliſh miles, and from north to ſouth nearly the ſame diſtance. The circumference of the whole is upwards of eight miles.

Edinburgh is governed by a town council of 33 members, twenty-five of whom conſtitute the ordinary council, the remaining eight are named extraordinary councilmen. The chief magiſtrate, whoſe office is much the ſame with that of the lord mayor in London, is ſtyled lord provoſt. He is high ſheriff, coroner, and admiral within the city and liberties, and the town, harbour, and roadſtead of Leith. Under him are four magiſtrates, called bailies, equivalent to the aldermen in London. There is alſo a dean of guild, who has the charge of the public buildings, and without whoſe warrant no houſe can be erected within the city. The revenue

venue of the town consists of an impost on wines, shore dues at Leith, duties on markets, &c. and is supposed to amount to 10,000*l.* sterling, annually. The hall, where the magistrates meet, is situated at the north-west entrance of the Parliament square, or Parliament close.

Of the principal public buildings the most ancient is the castle, situated on the western and rugged extremity of the central hill, on which the old town is built. It is separated from the buildings of the city by a space of about 350 feet in length and 300 in breadth. The area of the rock, on which it stands, measures about seven English acres. It is 294 feet above the level of the sea, and accessible only on the eastern side; all the other sides are nearly perpendicular. It is chiefly used as a station for soldiers. A long range of new barracks affords accommodation to about one thousand men, and the other buildings together may accommodate as many more. The governor is generally a Scottish nobleman. It has besides a deputy governor, who resides in the garrison, a fort-major, a store-keeper, a master-gunner, and a chaplain.

Holyrood house, the royal palace of Edinburgh, stands at the eastern extremity of the city, at the bottom of Canongate. It is a beautiful building of a square form; the area in the centre measures 230 feet in circumference. The western front consists of two lofty double towers, joined by a gallery adorned with a balustrade, in the middle of which is a portico decorated with four Doric columns, which support a cupola in the form of an imperial crown. Underneath the cupola is a clock, and over the gateway are the royal arms of Scotland. Round the area in the inside is a handsome arcade. The more ancient parts were built by James V. about the year 1528. It was destroyed by Cromwell's troops, and repaired and altered into its present form by Charles II. The duke of Hamilton is hereditary keeper of the palace. Some years ago, apartments were fitted up in Holyrood house for the residence of the count of Artois. Adjacent to the palace is the ruined abbey of Holyrood-house, founded by David I. in 1128, and destroyed by the English about the middle of the fifteenth century.

The buildings of the mint of Scotland, which were erected in 1574, but in which no money has been coined since the union, form a small square, which, as well as the abbey of Holyrood house, is an asylum for insolvent debtors.

The parliament house occupies the south and west angles of the square, to which it gives its name. It was begun in 1632 and completed in 1640. It forms no inconsiderable ornament to the city; but yields in point of grandeur to the register office, a building erected in 1774 for preserving the public records. This noble edifice stands at the east end of Prince's-street, and its front looks southward along the north bridge. In its centre is a large dome 50 feet in diameter, and 80 in height, lighted from the top by a window 15 feet in diameter.

On the north side of the High-street is the Royal Exchange, an elegant building in the form of a square, with a court in the centre. The bank of Scotland, at the head of the entrance to the earthen mound, is likewise one of the architectural ornaments of Edinburgh. Two other public buildings of lesser importance are the tollbooth and the weigh-house.

In the old town the houses are all remarkably high, some having not less than thirteen stories. Each story, or *flat*, as it is termed in Scotland, is inhabited by two families.

The population of Edinburgh, including the port of Leith, was in 1678 computed at 35,500 persons; in 1755 at 70,430; in 1775, according to Mr. Arnot, at 13,806 families, which he supposed to have given 82,836 individuals; in 1791, according to Sinclair's statistical account, at 84,886 persons; and in 1802, Mr. Pinkerton supposed it to fall little short of 90,000. But in 1806, as there had been fifty new streets built since 1791, Mr J Stark was of opinion, that Edinburgh, with its suburbs and the seaport town of Leith, might fairly be supposed to contain considerably upwards of 100,000 inhabitants.

The religious establishments of the Presbyterian church are upheld by twenty-four ministers. The number of parishes into which Edinburgh is divided, and of which they are the pastors, are fourteen, including the suburb of Canongate, St. Cuthbert's, and Leith. The number of churches is the same; but some of the buildings contain under their roof more than one place of worship. There are also three chapels belonging to the old episcopal church of Scotland, in which are retained all the ancient forms of this establishment. One of the bishops resides in the town. Besides these, there are three chapels of the English episcopal establishment, where the form of worship is similar to every respect to that observed in England. The places of worship belonging to the different dissenters from the established church, and other sectaries, are numerous. The Antiburghers have two; the Burghers three; the Relief three; the Glassites, or Sandimanians, one; the Quakers one; the Bereans one; the Baptists one; the Methodists one; and the Roman Catholics two. There is likewise a chapel where the service is performed in the Gaelic or Erse language for the benefit of the highlanders. Tabernacles have been lately established on Mr. Whitefield's plan, under the auspices of Mr. Haldane. That in Leith walk is perhaps the largest place of worship in Scotland. The total number of churches and chapels is forty-four. Considered as architectural objects, the principal churches are St. Giles's church, a magnificent Gothic fabric, Tron church, St. Andrew's church in the new town, and St. George's chapel. Edinburgh has a society for propagating Christian knowledge, and a missionary society.

Among the charitable institutions of Edinburgh, the Royal Infirmary, founded in 1736, claims the first rank. The male and female patients are kept entirely distinct. Two hundred and twenty-eight sick individuals can be accommodated in separate beds. It has a well lighted theatre, where upwards of 200 students may attend, when chirurgical operations are performed. The Public Dispensary is an useful supplement to the Royal Infirmary. The principal hospitals are Heriot's, Watson's, Gillespie's, Merchant maiden, Trades maiden, Trinity, orphan, and Lying-in-Hospital. Edinburgh has also a society for the relief of ministers' widows, and for the sons of the clergy, a magdalen, and an asylum for the blind. A new house of industry was opened in January 1801, for the reception of poor and destitute women, who are willing to work but unable to procure employment, and for poor female children who are taught lace working. The whole of their earnings is regularly paid to them; they have a warm comfortable room to work in, their dinners gratis, and such of the women as have young children six pence weekly in addition; they come in the morning and go home at night.

The celebrity which Edinburgh has derived from the splendid talents of Hume, Blair, Home, Robertson, Black, and others, is still kept up by a numerous body of literary and scientific men, whose valuable productions are daily issuing from the Edinburgh press. In the year 1763, Edinburgh had only six printing offices; in 1790 their number had increased to twenty-one; in 1800 to thirty; and in 1805 to forty. They employ upwards of 120 printing presses.

The university of Edinburgh was established in the year 1582,

1582, by king James VI. and from that period to the present has been progressively advancing in its reputation as a school of literature and science. The buildings connected with this institution are situated in the old town on the most southerly of the three ridges. They were originally constructed on so small a scale, that a new building was commenced in 1789. the greatest part of which, however, is still in an unfinished state. It is called the college; the university business is conducted in what remains of the old building, and in that part of the new structure which is completed. The plan of education pursued in the college of Edinburgh is the same with that of the Protestant German universities, and differs materially from that adopted in the English universities. The students are dispersed in lodgings in different parts of the town, and no direct obligation is imposed upon them to attend to the daily business of the college. They are taught through the medium of lectures, delivered by the several professors of the different departments of science and literature. The number of professors is about thirty, of whom eleven are connected with the several branches of medical study, three with the study of divinity, and three with that of the law. The remainder are occupied with the classes of general literature, mathematics, and philosophy. Their emoluments depend almost entirely on the fees which they receive from the students. As a school of medicine, the university of Edinburgh ranks higher than any other in Europe. The anatomical theatre, situated in the new part of the college buildings, is remarkable for its spaciousness and elegance. There are no academical honours conferred except in the medical line, and the number of graduates frequently exceeds forty in a year; foreigners generally compose the fifth part of this number. An idea may be formed of the progress of the school of medicine at Edinburgh, from its commencement in 1720, till the year 1800, from the following statement.

From 1720 to 1790, consequently during 70 years, the number of students in medicine amounted to - - - - - - -	12,800
And from 1790 to 1800, during ten years only, to - - - - - - - - -	3,130
Total -	15,930

Upon an average of five years the total number of students is supposed to be 1400 annually. Mr. Thomas Forsyth, in his "Beauties of Scotland," states the university to be attended by from 1200 to 1400 students.

Connected with the university are the observatory and the botanic garden. The latter contains about five English acres of ground; its collection of plants is very large. The observatory is situated on the top of Calton hill. It was completed in 1792, but in a style far inferior to what its utility deserved. Astronomy has made very little progress at Edinburgh. The library of the university is valuable and extensive.

The grammar school of Edinburgh, called the High school, was established in the year 1578; the number of scholars, by whom it is annually attended, is upwards of 600.

But it is not only to its scholastic institutions that Edinburgh owes its literary celebrity. Several courses of lectures are delivered during both the winter and summer sessions, by individuals who have no immediate connection with the university. There are also several learned societies, among which the Royal Society assumes the first place. It was founded in 1783, and published the first volume of its Transactions in 1788. The Society of Antiquaries was likewise established in 1713, and published its first and only volume in 1792.

Societies established for the verbal discussion of questions of literature and science are numerous at Edinburgh. They are attended not merely by the students, but by many respectable and well informed inhabitants of the place. The principal are the Medical Society, remarkable for a large and valuable medical library, and the Speculative Society, where the subjects discussed are of a more general nature.

The advocate's library, which is by far the most considerable in Scotland, is chiefly supported by the money paid by advocates on their admission into the faculty. It has valuable collections of manuscripts, prints, coins, and medals. Of printed books there are upwards of 60,000 volumes.

Theatrical entertainments, music, and dancing, constitute the principal public amusements at Edinburgh. The theatre stands at the north end of the North bridge, in the middle of a small square, called Shakespeare-square. Contrasted with the other public edifices it has but a mean appearance. Subscription concerts are performed in the assembly rooms and at Corri's, formerly the royal circus. The equestrian company, which annually resorts to Edinburgh, performs in a temporary wooden building erected on the north side of the college.

The police of Edinburgh is well conducted. A new court of police was opened on the 13th of July, 1805. It is under the superintendance of a judge of police and a clerk. There are six inspectors for the different wards, into which the city is divided. All offenders under the police act are prosecuted by these inspectors. The old prison, in the building called the Tolbooth, is, however, deficient in those accommodations which the benevolent Howard has so humanely recommended. The new Bridewell, or house of correction, finished in 1796, is on a larger and more liberal scale, and particularly well situated, being on a high hill on the east of the suburb, named the Calton.

Edinburgh is supplied with excellent spring water, which is conveyed in pipes. The markets afford all the necessaries, and many of the luxuries of life, in considerably variety. The fruit, greens, veal, poultry, butcher, and fish markets, on the north side of the High-street, occupy part of the declivity of the hill on which the old division of the city is built. They are disposed in terraces, which communicate with one another by flights of stairs; and being all in one place, they are very convenient for the inhabitants. There are, besides, butcher's shambles and shops in different parts of the city and suburbs.

The want of a proper regard to cleanliness in the inhabitants of Edinburgh, and the abominable practice of discharging filth from the windows into the streets, have been severely and frequently noticed. The New Town, however, is not liable to these animadversions, and by the strict attention of the police, the nuisance is in a great measure removed in the Old Town. Edinburgh is lighted in winter by crystal lamps, but their number is far from being sufficient for the convenience of the inhabitants.

Manufactures of different kinds are carried on at Edinburgh and in its neighbourhood. The manufacture of shawls and kerseymeres, and that of printed cottons and linens, are very extensive. For the latter Edinburgh is reported to be indebted to thirteen French protestant families from Picardy. In the environs are many large paper mills, manufactures of glass, and several cast-iron founderies. The distillation of malt spirits occupies large capitals, and candles and soap are manufactured on an extensive scale.

Edinburgh is surrounded with many fine walks, the principal of which are, the Castle-hill, the King's park, the meadows

dows and the Calton-hill, on the weſtern ſide of which is a burying ground, in which are depoſited the remains of the celebrated David Hume. A large rotund monument, with a ſimple inſcription, marks the ſpot. This hill is alſo remarkable for a naval monument in honour of the hero of Trafalgar. J Stark's Picture of Edinburgh, 1806. Aikin's Athenæum, vol. ii. 1807.

EDINBURGHSHIRE. See Mid Lothian.

EDINGTON, or Eddinton, anciently *Æthendune*, a pariſh in the hundred of Whorlidon, and county of Wilts, England, contains 170 houſes and 334 inhabitants. This place is noted in the annals of Engliſh hiſtory, for a conqueſt, which king Alfred obtained over the Danes here. On the ſummit of a hill near Edington is a large encampment, called Bratton caſtle, where it is ſtated that Alfred beſieged his enemies for fourteen days, when they capitulated. The caſtrametation covers an area of about 24 acres; is nearly of an oval form, and has very deep ditches. On the ſouth-weſt face of the ſame hill is a monument of antiquity, ſaid to have been cut, or formed by the Saxons, in commemoration of the event already noticed. It is a repreſentation of a large white horſe, which is formed by cutting off the ſurface of the ground, and laying bare the ſubſtratum of chalk.

The church at Edington was built by biſhop de Edington, who was a native of this place, and who alſo founded here a college for ſecular canons. This prelate was treaſurer and chancellor to king Edward III. For further particulars relating to Edington and the biſhop, ſee Beauties of Wiltſhire, vol. ii. 8vo.

EDISTO, or Pompon, a navigable river of America, in S. Carolina, which riſes in two branches from a remarkable ridge in the interior part of the ſtate. Theſe branches, meeting below Orangeburgh, formEdiſto river, which is navigable for 120 miles.—Alſo, a poſt town of Orange county, in S. Carolina; 577 miles from Waſhington.

EDITOR, of *edo*, I publiſh, in the commonwealth of learning, a perſon who takes care of publiſhing the work of another author, frequently an ancient author.

Eraſmus was a great editor of ancient writings; the Louvain doctors, Scaliger, Petavius, Fa. Sirmond, biſhop Walton, Mr. Hearn, &c. are learned editors; the Benedictines, of the fathers; the Dauphins, of the claſſics; Hardouin, of the councils, &c.

EDMER, in *Biography*, a learned Engliſh Benedictine monk, who flouriſhed about the end of the eleventh century. He belonged to the order at Canterbury; was abbot of the monaſtery of St. Alban's, and afterwards raiſed to the ſee of St. Andrew's, in Scotland. He was a voluminous writer, chiefly in biography; and from his pen we have the lives of St. Anſelm, archbiſhop of Canterbury; of St. Oſwald, archbiſhop of York; of St. Dunſtan, archbiſhop of Canterbury, with a letter to the monks of Glaſtonbury; of the bleſſed Bregwin, archbiſhop of Canterbury; and of Odo, archbiſhop of Canterbury. He wrote likewiſe "A Treatiſe on the Liberty of the Church," in vindication of Anſelm, in his conteſts with king William Rufus; and the hiſtory of his own times from 1066 to 1122, which was publiſhed by the learned Selden, with notes, in folio, 1623. Moreri has mentioned the titles of his other works, which, however, being of leſs repute, need not be noticed here.

EDMONDES, *Sir* Thomas, was born at Plymouth, in Devonſhire, where his father was chief officer of the cuſtoms. He was introduced to court by his nameſake, ſir Thomas Edmondes, comptroller of the queen's houſehold, and being initiated into public buſineſs by ſir Francis Walſingham, ſecretary of ſtate, he was, through his means, employed by the illuſtrious queen Elizabeth in ſeveral embaſſies. In 1592 he was appointed her reſident or agent at the court of France, with a ſalary of twenty ſhillings a-day; and on the 17th of May, 1596, ſhe made him a grant of the office of ſecretary to her majeſty for the French tongue. Between this and the ſpring of 1603, he was employed in divers foreign embaſſies. At this period he received the honour of knighthood from king James I. and, upon the concluſion of the peace with Spain, was appointed ambaſſador to the archduke at Bruſſels. He was about the ſame time choſen one of the repreſentatives for the borough of Wilton, in the parliament which was to have met at Weſtminſter Nov. 5, 1605, but was prevented by the diſcovery of the gunpowder-plot. He was, in 1608, ſent ambaſſador into France, where he continued, with ſome intervals of abſence, till the year 1617, when he returned, and was appointed ſucceſſively to the offices of comptroller of the king's houſehold, privy counſellor, and treaſurer of the houſehold. In 1625 he was elected one of the burgeſſes for the city of Oxford, but on the meeting of parliament his election was declared void, and he was choſen for another place. In June 1629 he went out again ambaſſador to the French court, and with this concluded all his foreign employments. The remaining ten years of his life he ſpent in privacy. He died Sept. 20, 1639. Sir Thomas was a man of ſound underſtanding, uncommon ſagacity, and indefatigable induſtry: he was firm and unſhaken in the diſcharge of his duty, beyond the influence of terror, flattery, or corruption. Some of his parliamentary ſpeeches have been printed. His letters and papers, in 12 vols. folio, were once in the poſſeſſion of ſecretary Thurloe, and afterwards of lord chancellor Somers. The ſtyle of them is clear, ſtrong, and maſculine; free from the pedantry and puerilities which infected ſome of the beſt writers of that age. Biog. Brit.

EDMUND I. king of England, was ſon of Edward the elder, and ſucceeded his brother Athelſtan. This was in the year 941, but the Northumbrians, ever reſtleſs and ſeeking for opportunities of rebelling, threatened the peace of Edmund's reign. The king marched ſuddenly againſt them, and reduced their leaders to the moſt abject ſubmiſſion. As a ſurety for future good behaviour, they offered to embrace Chriſtianity, "a religion," ſays Hume, "which the Engliſh Danes had frequently profeſſed, when reduced to difficulties, but which, for that very reaſon, they regarded as a badge of ſervitude, and ſhook off as ſoon as a favourable opportunity offered." Edmund, however, was a man of ſpirit and penetration; he put it out of the power of the Northumbrians to become his enemies, and conquered Cumberland, conferring its government on Malcolm king of Scotland, on condition that he ſhould do him homage, and protect the north from all future incurſions of the Danes. This prince was young and full of ſpirit, but his reign was ſhort, and his death violent. At a feſtival in Glouceſterſhire he ſaw Leolf, a notorious robber, who had been condemned to baniſhment to expiate his crimes. Enraged at his inſolence in joining the royal party, he bid him depart, and not complying with the order, Edmund ſeized him with his own hand, when the villain, taking advantage of the ſtruggle, ſtabbed the monarch to the heart. This event happened in the year 946, before he had completed the ſixth year of his reign. Hume, Hiſt. vol. i.

Edmund II. ſurnamed Ironſide, king of England, was eldeſt ſon of Ethelred II. He obtained the name of Ironſide from the hardy valour which he diſplayed in the conteſts maintained between his father and the Daniſh kings, Sweyn and Canute. Edmund had no ſooner ſucceeded to the crown, than he found himſelf obliged to contend for it in the field. In a battle with Canute, which he meant to be

be decisive, he was defeated, in consequence of the defection of Edric, duke of Mercia. Edmund was not destitute of resources, but assembling a new army at Gloucester, he felt himself capable of disputing the field, when the Danish and English nobility, equally harrassed with these convulsions, obliged their kings to come to a compromise, and to divide the kingdom between them by treaty. To Canute were ceded the northern and midland parts of the kingdom, while the southern provinces were left to Edmund. This prince survived the treaty only a short month, being murdered at Oxford by two of his chamberlains, who were instigated to the bloody deed by Edric. Canute now became sole master of the kingdom, but the line of Edmund was again introduced by the marriage of his great grand-daughter Matilda to Henry I. Hume, vol. i.

EDOIA, in *Ancient Geography*, a town of Arabia Felix, placed by Diodorus Siculus in the isle of Panchæa.

EDOLO, in *Geography*, a town of Italy, in the Bressan; 15 miles N.N.W. of Breno.

EDOM, in *Scripture History* and *Geography*, a name given to Esau, the eldest son of Isaac, and signifying *red*. (See Gen. xxv. 24—34.) He was the progenitor of the Edomites, alterwards called Idumæans. The place of their first habitation was mount Seir (Gen. xxxv. 6—9.) which had been originally occupied by a people called Horites, and the mountain itself was denominated Hor. (See Numb. xx. 22—28. Deut. ii. 12.) Some time before Esau's settlement in this place, this region had taken the name of Seir, probably from that of a considerable person among the Horites, and retained it afterwards to the exclusion of Hor, which was restricted to a part of this mountainous district. (Numb. xx.) This country was situated on the south of the Salt, or Dead sea, extending from this sea to the Red sea, or Arabian gulf. (1 Kings, ix. 26.) From this circumstance we deduce the origin of the appellation of Red sea, which was given to the Arabian gulf, as it denoted the same with the sea of Edom, or Idumæan sea. Some of the Greeks, in allusion to the signification of the Hebrew word Edom, called it the Erythrean sea, from the term which denoted red in their language. This country, when first inhabited by the Horites, was probably governed by patriarchs, or heads of families, which was the most ancient form of government, afterwards by kings, elected into their office, and, in process of time, by governors, styled dukes, and succeeding one another by primogeniture. The Edomites, who occupied the country after the Horites, were first governed, like them, by dukes, and afterwards by kings; which change, in the form of their government, seems to have taken place, with a view to their greater security against the hostile attacks of invaders, during the emigration of the Israelites in the wilderness. The king of the Edomites refused to grant these emigrants from Egypt, towards Canaan, a free passage through their country, though they requested it in a very respectful manner; and first threatened to oppose them with the whole force of his kingdom, if they made an attempt for this purpose, and afterwards, upon their renewed solicitations, actually took the field, and marched to oppose them. At length, however, he furnished them, for money, with such supplies as his country afforded. (Numb. xx. 14. 21. Deut. ii. 28. 29.) After this transaction, we find no account of the Edomites, till the reign of king David. In the mean time, however, they appear to have extended their dominion, to have applied themselves to trade and navigation, and to have seized on the empire of the sea, at least in the Arabian gulf. They trafficked in very rich commodities; such as pure gold, gold of Ophir, the topaz of Ethiopia, coral, and pearls, (Job, xxviii. 15—20.) and established a very considerable kingdom. But, in the height of their prosperity, their country was invaded by the victorious arms of Israel, about the year 1040 B. C., and Edom began to feel the effects of Isaac's prophecy, that "the elder should serve the younger." For David, after having gained several victories over the Syrians, Moabites, and Ammonites, finished his conquests with Idumæa. Hadad, their king, being a minor, and the party that accompanied him, sought the protection of Pharaoh, and the young prince was kindly received by him, and supported with the dignity becoming his royal rank; and the queen's sister was given to him in marriage. (1 Kings, xi. 15—26.) Whilst Hadad made his way into Egypt, others of the Edomites took different routes; some fled to the Philistines and the sea-ports, and fortified Azoth, or Azotus. Accordingly, they contributed to improve the inhabitants of those parts in the arts of navigation and commerce, and laid the foundation of the future celebrity of the Phœnicians, who are known to have migrated from the Red sea, about the time when David conquered and dispersed the Edomites. Hence it was, that the Philistines called many places Erythra, in memory of their being Erythræans, or Edomites, and of their coming from the Erythræan sea. Edom, Erythra, and Phœnicia, it is said, are names of the same signification, the words denoting a "red colour;" and hence, it is probable, that the Erythræans, who fled from David, settled in great numbers in Phœnicia, that is, in all the sea-coasts of Syria, from Egypt to Zidon; and by calling themselves Phœnicians, in the language of Syria, instead of Erythræans, gave the name of Phœnicia to that whole sea-coast, and to that only. Other Edomites, who dealt in shipping, escaped the rage of the conqueror, by taking a longer route, and went towards the Persian gulf. In a word, the Edomites dispersed into all parts, when they found that they could have no security in their native country. Hadad, after remaining for a considerable time in the court of Pharaoh, obtained a dismission, and, returning to Idumæa, made several unsuccessful attempts to regain his dominions. In the mean time, the kingdom of Edom remained under the house of David till the days of Jehoshaphat, being governed by deputies, or viceroys, appointed by the kings of Judah. At length, about the year 889 B. C. the Edomites, anxious to recover their ancient liberty, embraced an opportunity which offered itself for this purpose, and succeeded. For, in the days of Jehoram, the son of Jehoshaphat, the whole nation arose, and, assassinating, or expelling their viceroy, appointed for themselves a king; and, having gained a considerable advantage over Jehoram's army, they were afterwards defeated with great slaughter, and obliged to retire within their intrenchments. After this period, the Edomites remained secure from any attempts against them on the part of the kings of Judah for 60 years. At length they became subject to the king of Babylon; and when the captivity of the Jews commenced, they retaliated upon them, with ample vengeance, the sufferings they had endured in the days of king David, cut off many of them who were endeavouring to make their escape, and consumed with fire the remains of the temple, as soon as the Chaldæans, or Babylonians, had withdrawn. They even attempted to level the whole city with the ground, and insulting the God of Israel with horrid blasphemies, triumphed in the prospect of beholding the utter end of the Jewish nation. For this cruelty, they were threatened by the prophets with a severe retaliation, importing, that, for the devastation they had made in Judah, they should behold their land become desolate, when those of their now-oppressed enemies should flourish. (Ezek. xxv. xxxii. xxxv. xxxvi. Joel, iii. Amos, i. ix.) These predictions were speedily accomplished: for their

their country was diſtracted with violent commotions and perſecutions; inſomuch, that many of them abandoned it, and ſettled in the vacant land of Judæa, particularly in the ſouth-weſtern parts; and probably at this time, they made an end of the temple of Jeruſalem. Thoſe, who remained in Edom, joined the children of Nebaioth, and were ever afterwards called Nebatæans; and thus the ancient kingdom of Edom loſt its name, which was tranſferred to that part of the land of Judea which the refugees occupied, and which had never been part of their old kingdom, but the lot of the tribes of Simeon and Judah. This is the Idumæa, and theſe are the Idumæans, mentioned by Pliny, Ptolemy, Strabo, and other ancient writers.

Having traced the Edomites from their origin to the downfal of their kingdom, we ſhall terminate this article with a brief account of thoſe Edomites, who ſettled in Judea. Of theſe it is only known with certainty, that a decree was iſſued againſt them by Darius Hyſtaſpes, commanding them to deliver up all they had belonging to the Jews. (1 Eſdr. iv. 50.) Upon the decline of the Perſian monarchy, and after the days of Alexander, they were under the power of the Seleucidæ, when their ancient averſion from the Jews being revived, they warred againſt that nation, under the conduct of Gorgias, their governor, for Antiochus Epiphanes; but they were conſtantly worſted by Judas Maccabæus, who, at laſt, took and ſacked their chief city Hebron. (1 Maccab. v. 65. 68.) Having loſt their ſtrong holds, and many of their number, the ſurvivors fled to two ſtrong towns, whence many of them eſcaped by bribery and treachery. At length theſe two ſtrong caſtles were forced, and 20,000 Idumæans were put to the ſword. The Edomites in Idumæa were afterwards agitated by continual broils and wars, till about the year 130 B. C., they were conquered by John Hyrcanus, who reduced them to the neceſſity of embracing the Jewiſh religion, or of quitting their country. They choſe the former alternative, ſubmitted to be circumciſed, and became incorporated with the Jews. Accordingly in the firſt century after Chriſt, the name of Idumæan was loſt, and quite diſuſed.

EDON, a mountain of Thrace. Plutarch ſpeaks of a town, called *Edonide*, near the river Strymon. Steph. Byz. on the authority of Ariſtotle, gives this name to Antandros, which was ſituated at the foot of mount Ida.

EDONI, a people of Thrace, who inhabited the banks of the river Strymon; and their country was called Edonis, on the frontiers of Thrace and Macedonia, ſeparated from Odomantice by the Strymon.

EDOSA, a town of Ethiopia, ſituated W. of the Nile. Pliny.

EDRAI, a town of Paleſtine, in the tribe of Judah, mentioned in the book of Joſhua, and alſo by Euſebius.—Alſo, a town of Paleſtine, near the torrent Jabok, called *Eſdraei* by Euſebius and Jerom. who ſay that it is the ſame with *Adara* in Arabic, 24 miles from Boſtra. It was ſituated in the half-tribe of Manaſſeh, on the other ſide of Jordan.

EDRED, in *Biography*, the brother of Edmund I., ſucceeded to the throne in the year 946. His reign, like that of his predeceſſor, was diſturbed by the rebellions and incurſions of the Northumbrian Danes, who, though quelled, were never entirely ſubdued, nor had ever paid a ſincere allegiance to the crown of England. They attempted to ſhake off the yoke in the early part of Edred's reign, but he was ſufficiently powerful to reduce them to ſubmiſſion, and having laid waſte their country by fire and ſword, as a puniſhment for their rebellion, he forced them to renew their oaths of allegiance. After this he fixed Engliſh garriſons in their moſt conſiderable towns, and placed over them an Engliſh governor, who might watch all their motions, and ſuppreſs any inſurrection on its firſt appearance. Notwithſtanding the energy of this prince's mind in matters of ſtate policy, he was the ſlave of Dunſtan in the ſuperſtition of the times, which obtained the name of religion. To the guidance of this prieſt, whom he advanced to the higheſt offices, he blindly and implicitly delivered over his conſcience, and at length the management of his civil affairs. Through his influence, a ſet of foreign monks of the Benedictine order were introduced, who affected an extraordinary purity of doctrine and auſterity of manners, and proved formidable rivals to the ſecular clergy of the kingdom. Edred died after a reign of nine years, leaving children too young for the cares of government, and the crown accordingly devolved on Edwy, nephew of the deceaſed king. Hume.

EDRISITES, the denomination of a dynaſty of the Arabian empire, who erected the kingdom and city of Fez, on the ſhores of the Weſtern ocean. This dynaſty was founded by Edris, who died in the year of the Hegira 214 (A. D. 829.) in the prime of manhood, and terminated in the year of the Hegira 307. A. D. 919.

EDRON, a port of Italy, in Venetia, formed by the two rivers Medoacus, according to Pliny, and ſuppoſed by Hardouin to be the modern *Chioza*.

EDROS, or Hedros, a deſert iſle, placed by Ptolemy on the weſtern coaſt of Hibernia; named Andros by Pliny; and ſuppoſed by Camden to be the iſle of Bardſey.

EDSAN, in *Geography*, a river of Ruſſia, which runs into the Lena; 20 miles S.E. of Ziganſk.

EDSWOL, a town of Norway; 18 miles S.W. of Berga.

EDUCATION, in a general ſenſe of the term, may be defined the art of bringing up, forming, and inſtructing children.

Education, in the limited acceptation of the term, may be conſidered as that regulation of the external impreſſions by which the developement and cultivation of the various faculties and affections of the mind are affected. In this definition very general expreſſions are uſed, becauſe the term education is applicable to that direction of the external impreſſions by which the progreſs of the mind is checked, by which its faculties are rendered inactive, or its affections deadened or perverted; as well as to that by which its faculties and affections are developed and cultivated. But though general, our definition is ſcarcely ſufficiently comprehenſive, for we ſometimes hear of the *education of circumſtances*, and, *accidental education*; and no ſufficient objection preſents itſelf to this application of the term to caſes in which there is no direct intentional interference for the purpoſe of regulating the impreſſions. To comprehend theſe caſes of the application of the term, we muſt define education to be, that ſeries of impreſſions, whether intentional or accidental, by which the developement, &c. See above.

We here ſpeak of education in the way in which the term appears to be uſually employed, with reference to the effects produced on the mind by external agency, without conſidering the direct efforts of the individual object of it. But no one who has watched the proceſſes of the mind, particularly where it is vigorous, and its education (in the moſt limited ſenſe) neglected, can heſitate in the belief, that more is often done by the expreſs voluntary exertion of the individual towards the cultivation of his faculties and affections, than by any external agency. This ſelf-culture ought to be conſidered as one ſpecies of education; and in order to include it under the term, we muſt once more extend our definition, and ſtate, that education, in the moſt comprehenſive acceptation of the term, is that ſeries of impreſſions, or of voluntary

voluntary exertions of the mind, by which the developement and cultivation of the various faculties and affections are affected.

Though we allow it to be frequently convenient to apply the term to a series of what are to us casual impressions, yet our concern with education, except merely as a branch of mental philosophy, is limited to the cases in which the interference of man may modify or controul the effects of external circumstances on the mental faculties and affections. But these are much more numerous than would at first be supposed, by those who have had no practical acquaintance with the object: and hereia appears the almost incalculable importance of mental philosophy, as a foundation for the *art* of education, that it serves to disclose the effect of external impressions in the culture of the mind, and (where they are under human controul) shews what are to be employed, and what are to be avoided, according to the various differences of ability or disposition, in order to remedy or supply the effects of original constitution on the mental system. It is true, mental philosophy is yet imperfect and limited; but, even in its present state, it renders most important aid in the business of education.

To enter into the subject of education in its widest extent, would be to shew how every class of circumstances, whether casual or intentional, operates in affecting the developement and culture of the powers and affections of the mind;—our object is much more limited; and we shall be satisfied if we succeed in laying before our readers a tolerably extensive and accurate view of those means, the employment of which may be expected to assist such developement and culture, without attempting to investigate those minutiæ which are not of general occurrence.

Without ascertaining whether there can be any clearly defined distinction between the moral and the intellectual powers, it is obvious, that the difference between thoughts and feelings, between the understanding and the affections, and also between the means by which the powers of the understanding are to be developed and improved, and those by which the affections are to be produced and regulated, is sufficiently distinct to allow of our dividing the business of education, according to its objects, into *intellectual* and *moral*. In order to bring the system of thought and feeling into its due state of perfection, both as to comprehensiveness and vigour, and to proper direction, the organs of sensation must have vigour and sensibility: much, too, of intellectual improvement and of moral culture depends upon the state of the muscular and nervous system in general. The education of the human being, as far as respects these objects, may be termed *physical*.

Under the article Physical Education, then, we shall, without encroaching upon the science of pathology, give a view of those means by which the external organs of the mind, the organs of sensation, and the muscular and nervous system, so far as the mind is directly concerned with their operations, are to be preserved in a sound and healthy state, and improved in activity and vigour. In Intellectual Education we shall enter into the consideration of the cultivation of those powers of the mind which come under the head of understanding. And in Moral Education we shall consider the methods of cultivating and regulating the affections. Under the topic of intellectual education, the various branches of knowledge, which form the objects of instruction in different departments of education, will of course receive some attention.

As there will be sufficient opportunity, under these three separate articles, to enter as fully as the nature of our work will admit, into all the particular topics connected with the subject of education, we shall not enlarge much here, and we shall only subjoin a few observations of a general nature, respecting the importance of attention to the object,—what has hitherto been publicly done with a view to the improvement of the art of education, and, the education of the poor. Respecting the second of these topics, we shall have an opportunity of saying more in our separate articles, and shall content ourselves here with a very summary view. Respecting the first, it is unnecessary to enlarge, for we consider it as a prominent and very pleasing feature of the age, that the business of education is pretty generally considered as of primary importance, and is made much more an object of scientific attention, than it has been at any former period. The long agitated question, whether and in what cases public or private education is to be preferred, will be best considered under the separate heads of Intellectual and Moral Education.

The opinion that every thing in the intellectual and moral system is the result of education, has had some ingenious supporters, but it can never stand the test of accurate observation. If every human being could be placed in precisely the same circumstances for the first few months after birth, and could be exposed to exactly similar impressions in every respect, there is no room for reasonable doubt, that still great diversities would be manifest in their dispositions and capacities. We infer this, because the rudiments of disposition and capacity are obviously different when we have first the power of discerning them; and it is inconceivable that the few impressions which are received within two weeks after birth, should of themselves produce all that diversity, which, even then, is, in many instances, clearly perceptible to the accurate observer. In some, even at that early period, it may be distinctly perceived that the sensitive powers are quick and lively; in others, they are dull and sluggish: and this early aptitude to receive sensations with different degrees of vividness, must arise from a difference in the original system, over which education will seldom be found to triumph. Greater or less degrees of physical sensibility, are the foundation of greater or less degrees of mental sensibility; and it is, in a great measure, upon the vigour of our early sensations, that the furniture of the mind, the thoughts and affections, depend for their strength and durability. Besides, suppose what we will with respect to the precise degree in which the mental system depends upon the conformation of the brain, more or less the former must be affected by the latter; and while the external structure, and the external organs of the mind, so essentially differ in different children, as soon as mind is at all perceptible, it is reasonable to suppose that the internal structure, and the more concealed corporeal system on which the offices of the mind depend, must also be essentially different.

But though education cannot do every thing, it can do a great deal. It cannot implant an aptitude to receive vivid and vigorous sensations where it is not, but it can render the sensations actually received more efficacious. It can call into action, or greatly repress, the sensibilities of the frame. It can enliven the powers of the mind, and exercise and strengthen them. It can extend, refine, and invigorate the affections.

Probably the advocates for the opinion that the intellectual and moral system owes its peculiarity entirely to education, do not themselves understand their position in that extent in which it is understood by their opponents: and both, in general, seem almost equally willing to admit the only valuable practical inference from the discussion, *viz.* that an early, well-directed, and persevering attention to the business of education, is of the highest importance, and that it is the duty

duty of all who have it committed to them, to discharge it fully and faithfully. It must, however, be allowed, that the opinion that there is no original intellectual difference between man and man, though founded upon a very curfory examination and incomplete induction, is more likely to ſtimulate to exertion than that which ſome of its opponents have maintained, *viz.* that where there are certain inherent natural tendencies, it is in vain to attempt to free the mental conſtitution from them. The principal practical injury reſulting from the former is, that when perſons find, as inevitably they muſt, that their efforts are often unavailing, and that it is totally out of the power of any individual to have under his command all the impreſſions by which the diſpoſitions and powers of the mind are to be exerciſed, and their peculiar caſt given to them, they are apt to ſit down in deſpair reſpecting the efficacy of what is in their power. Happily the great work of education can, in the earlieſt periods of life, go on without the direct interference of man; and if he will only permit the powers of the mind to be unfolded as occaſion calls for them, and keep off improper impreſſions which might debaſe and pervert the affections, almoſt every thing will be done well. We are, however, well aware that this cannot be thoroughly done without ſkilful care and attention; but an exceſs of care and attention is, in many inſtances, the bane of both the mental and moral powers. In the early period of education, our buſineſs is to watch the opening intellect, and ſometimes to preſent opportunities and excitements for its exertion;—to allow the kindly affections materials for their growth, and to check theſe which injure the moral ſyſtem. In the later periods a great deal is of courſe to be done by the direct methods of inſtruction. All we wiſh to maintain is, that one grand ſecret of education is to temper our direct interference, and to reſt ſatisfied without forcing the progreſs either of the intellect or of the affections.

The foundation of a true and comprehenſive ſyſtem of education muſt be laid in right views as to the laws of the human mind. It is true, that in many reſpects a practical acquaintance with theſe laws is ſufficient to guide us wiſely in the buſineſs of education; and numbers, poſſeſſing nothing but good ſenſe, accurate obſervation, and right diſpoſitions, have ſucceeded in conducting the intellectual and moral culture of others beyond what might at firſt be expected; and partial ſyſtems of education may be formed, by thoſe who have only ſuch practical knowledge, which may prove of eminent utility: but a full, comprehenſive, and juſt ſyſtem of education, can be founded only upon an enlightened and extenſive acquaintance with the principles of the human mind, with the characteriſtic features of intellectual and moral excellence, and with the manner in which the powers of the mind are expanded and perfected, and in which the diſpoſitions are formed and properly directed. In fact, the theory of education is nothing more than the extenſion of one grand branch of mental philoſophy. If any eſſential change ſhould take place in the condition of men, and the viſions of a benevolent philoſophy ſhould ever be realized as to the diffuſion of knowledge and moral worth, it will only be through the extenſion of practical knowledge as to the objects of education, and the means by which they are to be effected. It is much to be wiſhed that the reſults of individual obſervation, as to the effects of certain diſcipline or other circumſtances, on peculiar diſpoſitions or intellectual biaſſes, were to be more frequently regiſtered for public notice. Perhaps it requires ſome conſiderable degree of mental culture, and of acquaintance with the principles of the human mind, to determine theſe effects with any tolerable preciſion; but if the object were more attended to, by degrees a large fund of obſervations would be collected, from which the more philoſophic mind might produce an approximation towards a rational and comprehenſive ſyſtem of education, ſuch as would ſerve materially to accelerate the progreſs of the community towards its utmoſt degree of improvement.

It is earneſtly to be wiſhed that a judicious view of the chief practical principles of mental philoſophy were acceſſible to all the thinking part of the public; and that to impart them to the female ſex in particular, and familiarize their minds with them, formed an eſſential branch of their education from the period when their underſtandings had been prepared by the acquiſition of the more uſual objects of education, (we ſpeak of courſe of thoſe caſes in which female education has been directed beyond exterior accompliſhments,) to that in which they themſelves enter upon the buſineſs of education. The education of the nurſery, at leaſt maternal education, has indiſputably the greateſt ſhare in the determination of the future character, particularly in a moral point of view.

One female writer, (Miſs Hamilton,) has the high praiſe of rendering acceſſible to her ſex, ſome of the moſt important principles of the philoſophy of the mind. Her work on education, as far as it reſpects the affections, is of very great value; and there is reaſon to hope that it has had, and will have, great influence in judiciouſly guiding maternal inſtruction. Her hints reſpecting the cultivation of the intellect are not equally valuable. They are founded on an erroneous claſſification, and often are themſelves inaccurate and indiſtinct. But even from this part perſons who have paid but little attention to the ſubject may learn much; and as to the cultivation of the affections, her work is yet unrivalled. As far as reſpects early education, this point is firſt in importance; for every one knows that the affections are the grand ſpring by which the whole ſyſtem is animated; and where this is active and well-regulated, there is a principle on which the future culture of the intellect may be founded with the beſt proſpect of ſucceſs.

We do not mention Miſs Hamilton as having alone been guided by mental philoſophy in her views on education, but ſimply bring forwards her work as containing more of the philoſophy of the mind than is acceſſible perhaps in any other form, to thoſe who have not received conſiderable culture of intellect. Her contemporaries, Miſs Moore and Miſs Edgworth, have furniſhed many exceedingly important remarks reſpecting the principles of education: and, except in the examination, arrangement, and correction of the principles which have already been detailed by them, and their predeceſſors, Locke, Prieſtley, &c. and in the accumulation of new facts, little more, probably, will be done, till ſome one, early impreſſed with the importance of the object, diſciplined to habits of correct obſervation, and of cautious and accurate induction, and poſſeſſed of ſound views of the philoſophy of the mind, and of the effects of external circumſtances upon different diſpoſitions and intellectual biaſes, and different periods of mental and moral culture, ſhall devote himſelf to the undertaking; when it may reaſonably be expected, that a ſyſtem will be produced which may ſerve as a clear, ſteady, and ſecure guide to the well informed parent or preceptor.

It is not probable that in uncivilized ſtates any direct attention can have been paid to education, except ſo far as relates to inſtruction in the arts of gaining ſuſtenance and clothing, and in providing means of defence, and to the cultivation of courage and fortitude. In ſome of the ancient ſtates which had made conſiderable advances towards civilization, education was made the care of the ſtate. Sparta preſents the moſt complete ſyſtem. It has been well obſerved, that all the plans of Lycurgus had in view to keep ſociety

juſt as it then was: certainly the mode of education adopted by that legiſlator had this object as its guide and principle. But however much we may admire the ſyſtem of Lycurgus, conſidered as cultivating a ſpirit of heroiſm, and of excluſive patriotiſm, ſurmounting alike all regard to the intereſt of other ſtates, and their own individual intereſts, it is obvious that it was narrow and confined, and had no tendency to elevate the human intellect, or to ſtimulate into activity any noble and generous affections which had not the love of their country as their baſis. Could the inſtitutions of Lycurgus have been preſerved in their vigour and efficacy, the Spartans might have continued preciſely the ſame, deſtitute of all knowledge of the arts and ſciences which adorn and improve ſociety.

Wherever the ſpecific education of the people has been under the guidance of the ſtate, it has hitherto (with little exception) been calculated only to mould them all into one form; to produce habitual ſubmiſſion to the will of one, or to the will of many. No doubt can exiſt which is to be preferred, the total neglect of education, or that artificial and forced method of which we now ſpeak; but all that the ſtate has to do is, to take care that none ſhall be without the means of inſtruction, and to leave every individual to follow the bent of his own inclination, or to the peculiar direction of his employment of them. Further than this, the interference of the ſtate is as injurious to education, as it is to commerce.

It is to be ſuppoſed, that where individuals poſſeſſed any ſtrong ſenſe of moral, and eſpecially of religious obligation, the attention would be paid to the training up of thoſe habits and diſpoſitions, which are favourable to virtue and religion. In thoſe nations which were firſt civilized, the power of the parent was conſidered as abſolute; and as implicit ſubmiſſion was, from the firſt, inculcated upon the young, the labour of education was greatly diminiſhed, and the limited knowledge and ſentiments of the parent were very eaſily communicated to youth. The round of duty was leſs extenſive, and its parts leſs complicated than at preſent. Among the Iſraelites, where moral education appears to have made the greateſt advances, the ſyſtem of duty was completely laid down in the written law; ſo that all the knowledge which the age and country poſſeſſed, was certainly to be gained, and the moral principles certainly to be regulated aright, where the parent employed wiſely that authority which the law enforced, and which the cuſtoms of the times would otherwiſe have allowed. One grand object of moral education, ſo far as it reſpects rectitude of diſpoſitions and affections, is to cultivate the habit of ſelf-controul. Religious people, of all periods, who have poſſeſſed the light of revelation, have, in a particular manner, been ſenſible that this habit lies at the foundation of moral worth; and where the authority of the parent is generally preſerved, the cultivation of this habit follows as a matter of courſe. It requires a wiſe choice of means to prevent filial ſubmiſſion from being the ſubmiſſion of a ſlave, rather than of a child; but where it is acquired, and rightly directed, the foundation is laid for ſubmiſſion and obedience to the will of God; and where this principle takes a firm hold on the mind, almoſt every thing is done that could be wiſhed, to further the progreſs of the individual towards moral worth. Freedom from improper biaſſes of affection, or the poſſeſſion of power to correct them, is abſolute excellence.

The neceſſity of a tolerably correct direction of the early propenſities, in order to promote domeſtic comfort, muſt in a great number of caſes have led to ſuch direction of them, without any view to the future advantage of the individual. But with reſpect to thoſe who were to come forwards in the employments of the ſtate, or in any other way to be expoſed to the notice of their countrymen, the advantages of early inſtruction in knowledge, and of the early cultivation of thoſe qualities which the wants of the age and country made of great eſtimation, were ſo obvious, that they appear to have led, in a great variety of caſes, to great attention to the work of education; and though we have not, in any inſtances, any account of the proceedures of the ancients, yet, in the few circumſtances which have been recorded, we perceive that, long before any thing like a ſyſtematic plan of education was adopted, individuals made education an object of primary concern. The principal ſyſtematic work of antiquity, on the ſubject of education, is indiſputably that of Quintilian. This writer was poſſeſſed of great good ſenſe, excellence of diſpoſition, and extenſive information; and from his work, though it had a particular object in view, much may be learned by the modern inſtructor, reſpecting education in general. Various excellent principles are to be found ſcattered up and down in thoſe general parts, which amply repay our peruſal, though we are ſeldom invited to proceed by elegance of language, or brilliance of imagination. From different facts which he mentions, we have reaſon to ſuppoſe that, in his time, education was in a moſt degraded ſtate at Rome: and his reflections have, probably, been more uſeful to the moderns, than to his contemporaries.

In our own country, within the laſt two centuries, much has been written on the ſubject of education; and among others, the great Milton produced a work, which had principally as its object to correct the plans of inſtruction then prevalent. But the firſt writer who had in view to deliver a ſyſtem of education in general, waa Mr. Locke. One would naturally expect that a man, who had ſeen ſo much of the world, and known ſo much of human nature, would at once advance the buſineſs of education to the rank of ſcience. He did a great deal; and though what is excellent is mixed with much that is exceptionable, and though his ſyſtem, if followed implicitly, would not fully accompliſh the objects of education, yet he laid the foundation for national attention to education, in like manner as he firſt properly developed the mode of examining the faculties and diſpoſitions of the mind.

Since the time of Locke, various writers have come forward to the public notice, with obſervations and diſcuſſions on the ſubject of education. Several have had in view merely to detail plans of inſtruction in the different branches of commercial, literary, or philoſophical education: others have taken a wider range, and have inveſtigated the principles of education. Some of their peculiarities of opinion will probably come under examination in our ſeparate articles; and we ſhall only add on this point, that all which detail the reſults of experience, are in themſelves conſidered valuable; but that there are many writers, who ſeem to have had in view rather to captivate the imagination with any airy ſyſtem, and to ſtrike out new and ſhorter roads of education, than to trace out thoſe plans which alone can lead to ſatisfactory reſults, by being founded on juſt views of human nature.

We ſhall now conclude our article by a few words reſpecting the education of the poor. Taken in a religious point of view, no one can reaſonably doubt, that it is our duty to afford to the children of the poor the means of knowing their duty; but we ſhall not enlarge upon the ſubject in that view, but attend to it as a national conſideration, as an object in which national welfare is intimately concerned.

It may be truly ſaid, that there is no direction of benevolence, in which national and individual benefit more clearly go hand in hand. And the reaſon is obvious. Wherever induſtry,

induſtry, frugality, and obedience to the laws form the decided character of the poor, there the rich will have their rights reſpected, and, at the ſame time, the poor will be contented and happy. Perhaps, for this purpoſe, national induſtry muſt be principally directed in the channel of agriculture; but however this may be, there can be no doubt that whatever conſtitutes national wealth, the induſtry of the poor muſt have a principal ſhare in the acquiſition of it; and that whatever be the true ſource of national happineſs, the good conduct of the poor is eſſential to it. Few, who have thought cloſely on the ſubject, can doubt, that, among all claſſes of ſociety, the only general and permanent ſource of good conduct is a good education; that training up of right habits, and inſtilling of uſeful knowledge, which, together, may give the individual true views as to duty, and a decided bias towards the practice of it. We would not be underſtood to mean, that no one who has not had the benefits of a right education, can be expected permanently to poſſeſs thoſe qualities which render a man a good member of ſociety, but maintain it, as a certain general principle, that a good education is the only permanent ſource from which good conduct can be expected. And this is peculiarly the caſe among the poor, ſo far as civil and political duties are concerned. The crimes of the rich, againſt ſociety at leaſt, are uſually ſo much the object of general notoriety, that a man is almoſt conſtrained to keep within thoſe limits which the law impoſes, and thoſe few additional limits which a ſenſe of honour ſometimes ſets where better principles are wanting. But among the poor, ſuch a variety of opportunities occur, for the almoſt unobſerved practice of petty fraud and deceit, and the preſſure of circumſtances is ſo much felt, that if you can truly ſay of a poor man, that he is thoroughly and ſtrictly honeſt, you at once eſtabliſh his character. And can any one doubt, that the foundation of ſuch honeſty, to ſay nothing of other virtues, is laid in a right education? And is there ſufficient reaſon to believe, that the poor, unaided by the rich, unnoticed, neglected by them, will, as a general caſe, communicate to their children ſuch habits and knowledge as may render them upright characters, and, in in their reſpective ſituations, truly worthy members of ſociety. Let us take the great maſs of the uneducated poor in large and crowded cities, and conſider their ſituation, and that of their children. "Every child," ſays the Philanthropic Society, "brought up in the reſort of vicious and profligate people, muſt almoſt inevitably imbibe the contagion of moral turpitude, and become an enemy to thoſe laws on which the general good depends. Lying is the firſt leſſon of their tongues, and theft of their hands; every object they ſee is at war with decency, and every impreſſion they receive is a vice." Such a picture, one would hope, cannot often be, in all its parts, correctly drawn out of the metropolis; but of its leading features too many originals may be found in every populous place, among thoſe who have had none of the now common advantages of education. And can any one doubt that ſuch dreadful ignorance of even the common duties of ſociety, is, as far as it extends, a moſt ſerious national injury; that every approach to it is, in its degree, baneful; and that the only general, ſecure, and permanent preventative, is the putting of the means of inſtruction in the power of all.

When contemplating the importance of early education in raiſing the character of ſociety at large, it is highly ſatiſfactory to perceive that we are fully borne out by an appeal to facts; and we ſhall here bring forwards to the attention or recollection of our readers, ſome invaluable ſtatements from the writings of the late philoſophic and benevolent Dr. Currie, (Burns's Life and Works, vol. i. p. 351.) which we wiſh to become familiar to every individual who has the power, either by his influence, wealth, or perſonal exertion, of aiding the highly important cauſe of the education of the poor. "The influence of the ſchool-eſtabliſhment of Scotland on the peaſantry of that country," ſays Dr. Currie, "ſeems to have decided, by experience, a queſtion of legiſlation of the utmoſt importance—whether a ſyſtem of national inſtruction for the poor be favourable to morals and good government."

In the year 1698, Fletcher of Saltoun declared as follows: "There are at this day in Scotland two hundred thouſand people begging from door to door. And though the number of them be perhaps double to what it was formerly, by reaſon of this preſent great diſtreſs," a famine then prevailed, "yet in all times there have been about one hundred thouſand of thoſe vagabonds, who have lived without any regard or ſubjection either to the laws of the land or even to thoſe of God and nature; fathers inceſtuouſly accompanying with their own daughters, the ſon with the mother, and the brother with the ſiſter." He goes on to ſay, "that no magiſtrate could diſcover that they had ever been baptiſed, or in what way one in a hundred went out of the world." He accuſes them as frequently guilty of robbery, and ſometimes of murder. "In times of plenty," ſays he, "many thouſands of them meet together in the mountains, where they feaſt and riot for many days; and at country weddings, markets, burials, and other public occaſions, they are to be ſeen, both men and women, perpetually drunk, curſing, blaſpheming, and fighting together." This high minded ſtateſman, of whom it is ſaid by a contemporary, "that he would loſe his life readily to ſave his country, and would not do a baſe thing to ſave it," thought the evil ſo great, that he propoſed as a remedy, the revival of domeſtic ſlavery, according to the practice of his adored republics in the claſſic ages! A better remedy has been found, which, in the ſilent lapſe of a century, has proved effectual. The ſtatute of 1696, the noble legacy of the Scottiſh parliament to their country, began ſoon after this to operate; and happily, as the minds of the poor received inſtruction, the union opened new channels of induſtry, and new fields of action to their view."

"At the preſent day," continues Dr. Currie, "there is perhaps no country in Europe, in which, in proportion to its population, ſo ſmall a number of crimes fall under the chaſtiſement of the criminal law, as Scotland. We have the beſt authority for aſſerting, that on an average of thirty years preceding the year 1797, the executions in that diviſion of the iſland did not amount to ſix annually; and one quarter ſeſſions for the town of Mancheſter only, has ſent, according to Mr. Hume, more felons to the plantations than all the judges of Scotland uſually do in the courſe of a year. It might appear invidious to attempt a calculation of the many thouſand individuals in Mancheſter and its vicinity who can neither read nor write. A majority of thoſe who ſuffer the puniſhment of death for their crimes, in every part of England, are, it is believed, in this miſerable ſtate of ignorance!"

It is, perhaps, worth while to add to the foregoing view the following ſtatements from Mr. Howard's works, (vol i. p. 9. and 484.) He informs us, that the number of executions in London, for twenty-three years preceding 1772, amounted to 678, or between 29 and 30 annually: that in the twelve following years, including 1783, there were 467 executed in London, on an average of 39 annually; and in the four laſt years preceding 1784, the average of the London executions was 49 nearly each year. In Scotland, during thirteen

thirteen years and a half, preceding 1782, only 76 were capitally condemned, of them 54 only were executed.

Dr. Currie goes on to inform us, that schools have long been established and supported for the education of the poor in New England, in the Protestant cantons of Switzerland, and in certain districts in England, particularly in the northern parts of Yorkshire and Lancashire, and in the counties of Westmoreland and Cumberland. "The similarity of character between the Swiss and the Scotch, and between the Scotch and the people of New England, can scarcely be overlooked. That it arises in a great measure from the similarity of their institutions for instruction cannot be questioned." Dr. Currie admits, however, that it is increased by physical causes, on which he makes some judicious remarks, and thus concludes: "how much superior in morals, in intellect, and in happiness, the peasantry of those parts of England are, who have opportunities of instruction, to the same class in other situations, those who inquire into the subject will speedily discover. The peasantry of Westmoreland, and of the other districts mentioned above, if their physical and moral qualities be taken together, are, in the opinion of the editor, superior to the peasantry of any other part of the island."

Happy had it been for Britain, if the "warning counsels, the prophetic page" of Currie, had been listened to and followed by her statesmen. As far as our relation with other nations is concerned, the time is past; but we may yet profit by those representations which shew us what is to be done in order to raise the intellectual and moral character of the nation at large. It is not improbable that national reformation will begin with national distress; but it is not too much to say, that a permanent reformation in the condition and character of the poor, can only be brought about by well-directed attention to their education, in connection with a proper regulation of the laws relative to the indigent poor. Whether in the counsels of an all-wise Providence it is decreed that Britain should be thrown from that lofty pinnacle to which she has elevated herself, time only can determine; but it appears clear, that the surest way of avoiding national judgments is by endeavouring, each in his station, to reform those evils which affect our conduct and character as a nation; and in this point of view also, the communication of knowledge to the poor, may be considered as a national benefit, and as a probable means of lessening national punishment. We shall close this article with the following general observations.

The plan of education, whether it be domestic or collegiate, should be suited to the station and views of parents, and to the genius of their children; and it is also right to consult their constitution and inclination. It is of great importance, that those who are destined to occupy superior stations in society, should enjoy the benefits of an enlarged and liberal education; that they should be furnished with every substantial and ornamental accomplishment; and those that are intended for any particular profession or employment should be principally directed to those studies which are appropriated to their respective views; and in every rank of life, an attention to the morals of youth should be a primary object. Though the municipal laws of most countries have made no provision for constraining a parent to bestow a proper education on his children; yet in the case of religion they are under peculiar restrictions in our country. Some of these restrictions, as they affect those who dissent from the religion of the state, may be thought both impolitic and injurious, and have, therefore, lately been considerably relaxed; and there is room for farther enlargement. See DISSENTERS, PAPISTS, and TOLERATION.

EDULCORATION. This term is applied, in *Chemistry*, to the process of freeing a difficultly soluble substance from one that is easily soluble, by means of distilled water. In fact, it differs little from lixiviation, except that the former term respects the insoluble residue, and the latter the soluble portion. Thus we say, to lixivate wood ashes, because the object of the process is to procure the soluble alkaline ingredient separate from the earth and other impurities with which it is mixed; and on the other hand we say, to edulcorate the precipitate from alum, when the intention of the operation is to obtain the earth quite pure from soluble matter. Hence arises a practical difference between the two processes; lixiviation is carried on no longer than the water runs off charged with a sufficient quantity of soluble matter to defray the expence of boiling down, and hence a minute portion of soluble matter is always left in the insoluble residue. Edulcoration is not reckoned complete till the water returns as pure as when it was first added; hence the latter runnings are never sufficiently charged with soluble matter, to make it worth while to boil them down.

The usual method of edulcorating, is to place the substance on a filter, and continue to add successive portions of hot or cold water, till the runnings indicate, by the common tests, that they hold nothing in solution. This, however, is always tedious, and often not perfectly effectual, as the contents of the filter are in many cases very apt to clot together, so as to obstruct the thorough percolation of the water. It will be found, on the whole, a much more expeditious and satisfactory process, to place the precipitate in a large silver crucible with abundance of water, and heat it more or less according to circumstances; then withdraw it from the fire, allow it to settle for a few minutes, and pour off the clear supernatant liquor; then add fresh water to the residue, and proceed as before, till all soluble impurities are got rid of. A single hour thus employed will finish more work than a whole day in the common method; and the necessary loss on the precipitate is considerably less, which is a circumstance of no small importance to the accuracy of an analysis.

EDULCORATION, of *edulco, I sweeten*, in *Pharmacy*, is the dulcifying or sweetening of any food, or remedy, by means of honey, sugar, or syrups.

EDULIUS, in *Ancient Geography*, a mountain of Spain, in the Tarragonese territory, supposed to be the modern Montserrat in Catalonia.

EDUS, a small river of Italy, in Liguria, said to be the present Sadodela.

EDWARD, in *Biography*, surnamed the Elder, king of England, was son of Alfred, whom he succeeded in the year 901. The reign of this prince was disturbed by an insurrection, at the head of which was Ethelwold, son to king Ethelbert, Alfred's elder brother, who claimed the crown as his right. Edward, after much contention, subdued his enemies, and reduced them to submission. He afterwards repelled an incursion of the Northumbrians, and completely defeated them at Tetenhall in Staffordshire. During the remainder of his life, he was engaged in many conflicts, but was usually successful. He fortified many of the inland towns of England; vanquished Thurketill, a Danish chieftain, and obliged him to retire with his followers into France. He subdued several tribes of Britons, and by his activity proved himself, in some respects, worthy of his descent from the immortal Alfred. On the death of his sister Ethelfleda, he assumed the government of Mercia, which had been before independent of the crown. He died in the year 925, and was succeeded by his natural son Athelstan. Hume.

EDWARD, king of England, and ſurnamed the Martyr, was about fifteen years of age when he ſucceeded his father Edgar, A. D. 975. Though the eldeſt, he was oppoſed in his claims by his mother-in-law Elfrida, who wiſhed to raiſe her own ſon Ethelred to the throne. Edward was ſupported by Dunſtan, who overcame every obſtacle, cauſed the young king to be crowned, and then obtained the ſubmiſſion of the whole kingdom. Edward appears to have poſſeſſed little energy of mind, and to have chiefly employed himſelf in the amuſements of the chace, and in this ſort of paſtime he ſpent four years very innocently. Incapable of any treacherous intention himſelf, he was unſuſpicious of others, of whom he ought to have been perpetually on his guard. His mother-in-law had vehemently oppoſed his ſucceſſion, yet Edward ſoon forgot her conduct, and behaved towards her with the greateſt reſpect, and on all occaſions expreſſed for his brother Ethelred a true affection; but being hunting in Dorſetſhire, and fatigued with the ſport, he left his attendants and rode to Corſe caſtle, the reſidence of Elfrida, with a view, perhaps, of ſhewing reſpect to his relation, and of obtaining ſome refreſhment. He requeſted, while on horſeback, ſomething to aſſuage his thirſt; the liquor was brought, but while he was in the act of drinking, a ſervant of the infamous Elfrida gave him a deep ſtab from behind. He ſet ſpurs to his horſe, but becoming faint with the loſs of blood, he fell, and was dragged in the ſtirrup till death put an end to his ſufferings. He was buried at Wareham, and the tragical fate to which he had been expoſed obtained for him the title of Martyr. Hume.

EDWARD, the Confeſſor, younger ſon of Ethelred II. ſucceeded to the crown of England in 1041; though not the true heir, he was called to the throne in preference to the ſons of Edmund Ironſide, who happened to be on the continent at the death of Hardicanute, the former king. The impatience of the Engliſh to free themſelves from the Daniſh yoke, cauſed them to unite in favour of Edward, and the Danes in the iſland acquieſced in the choice. It was feared that this ſucceſſion to the crown would be oppoſed by earl Godwin, the moſt powerful nobleman in the kingdom, who was on ill terms with Edward; but a reconciliation was brought about, and Godwin agreed to acknowledge the king, on condition that he would marry his daughter Editha. The external forms of marriage the king readily complied with, but either through an averſion to the perſon who was forced on him as queen, or through ſome ſuperſtitious notions that cannot be juſtified, he abſtained from all nuptial commerce, a circumſtance which obtained for him the applauſe of the monks, and contributed not a little to his acquiring the title of ſaint and confeſſor. Having been educated in Normandy, he introduced many of the natives of that country to his court, and French language and manners prevailed throughout the country. Godwin made uſe of this as a popular reaſon for exciting diſcontent among the people, though the uſage of his daughter was probably the real cauſe of his enmity. The rebellion of Godwin was unſucceſsful, and he was obliged to ſeek refuge in Flanders, where, however, he recruited his force, and returned with a powerful fleet, with which he ſailed to London. Edward was now glad to enter into a compromiſe with him, and baniſh the Normans. By this treaty the danger of a civil war was for the preſent averted, but the authority of the crown was conſiderably impaired, or nearly annihilated. Godwin, indeed, ſhortly after died, but he was ſucceeded by his ſon Harold, who in the end became a more dangerous enemy to the king than even his father. About the year 1055 Edward reſtored to the throne of Scotland Malcolm, the ſon of Duncan, by the defeat and death of the uſurper Macbeth. Edward was now faſt advancing in years, and was anxious to appoint a ſucceſſor; with this view he ſent for his nephew Edward, ſon of Edmund Ironſide, who died in a ſhort time after his arrival in England. He next, with the hope of depriving the family of Godwin of all hopes, turned his attention to William, duke of Normandy, and took ſome meaſures to ſecure his ſucceſſion, but he was incapable of acting with that deciſion which the nature of the caſe required, and while he was conſidering what ſhould be done, he died on the 5th of January, 1066, in the ſixty-fifth year of his age, and the twenty-fifth of his reign. He was the laſt of the Saxon line that ruled in England. His reign was on the whole peaceable and fortunate, but he was more indebted for the proſperity which he enjoyed, to the conjunctures of the times, than to his own abilities. The Danes gave him little trouble, and the mildneſs of his own diſpoſition, with a love of peace, led him to acquieſce in the power aſſumed by Godwin and Harold. The talents and power of theſe noblemen enabled them, while they were entruſted with authority, to preſerve domeſtic peace and tranquillity. Edward is deſerving of high commendation for his attention to the adminiſtration of juſtice, and his compiling for that purpoſe a body of laws, which he collected from thoſe of Ethelbert, Ina, and Alfred. The compilation, though now loſt, was long an object of affection to the Engliſh. This prince, who, on account of his piety, obtained the reputation of being able to cure diſeaſes, was the firſt who touched for the king's evil; and "his ſucceſſors," ſays Hume, "regarded it as a part of their ſtate and grandeur to uphold the ſame opinion. It has continued down to our time, and the practice was firſt dropped by the preſent royal family, who obſerved, that it could no longer give amazement even to the populace, and was attended with ridicule in the eyes of all men of underſtanding." Hume, vol. i.

EDWARD I. ſo denominated as being the firſt of that name of the Norman line, was eldeſt ſon of Henry III. and born at Wincheſter in 1239. He was called early into active life, and his talents were of the greateſt ſervice to his country in the conteſts between his father and the diſcontented barons. At the battle of Lewes he routed the Londoners, but purſuing them too far, he found, on his return, that the royal army had been defeated, and the king made priſoner. He himſelf fell into the power of the earl of Leiceſter, but obtaining a releaſe, he became in his turn victorious, and put an end to all further reſiſtance to the royal authority. In 1270 he made an expedition againſt the Saracens, but on his arrival at Tunis he found the French king dead, at whoſe deſire he undertook the project, and was obliged to proceed with his forces to the holy land, where he performed many exploits of valour, and rendered himſelf illuſtrious by his heroiſm. So much terror did he excite among the Saracens, that they bribed an aſſaſſin to murder him, who miſſing his blow, only wounded the prince in the arm, and fell himſelf a ſacrifice to the love of gain. This abſence of the prince from his native country was attended with the moſt diſaſtrous conſequences. The laws were not executed; the barons oppreſſed the common people with impunity, and the populace of London returned to the practices of licentiouſneſs, common in thoſe times. The old king, unequal to the affairs of government, called aloud for his gallant ſon to return, to aſſiſt him in ſwaying the ſceptre which was ready to drop from his feeble and irreſolute hands. Edward returned, but before he could reach his native land his father was dead, and himſelf, without oppoſition, proclaimed ſucceſſor. His firſt acts, after he aſcended the throne, were to reſtore order, and re-animate juſtice in the exe-

cution

cution of her decrees. He repreſſed the violence of the great, and puniſhed corrupt judges; but his motives have been much queſtioned, inaſmuch as he ſcrupled not to fill his own coffers by the fines which he exacted upon the guilty. The Jews felt the weight of his anger, and under the pretence of puniſhing uſury he executed multitudes of that unfortunate race, and baniſhed the others from his realm. He next began to inquire by what title the nobility held their eſtates; the queſtion was firſt put to earl Warenne, a man of as much courage as himſelf, who replied, "By this," drawing his ſword at the ſame moment; and he added, in a tone not to be trifled with, "that William the baſtard had not conquered the kingdom for himſelf alone; his anceſtor was a joint adventurer in the enterprize; and he himſelf was determined to maintain what had from that period remained unqueſtioned in his family." The king, feeling his danger, deſiſted from all farther inquiries of this nature. He next ſummoned Llewellyn, native prince of Wales, to do him homage, which demand being refuſed, the king prepared to compel him to ſubmiſſion by the terror of his arms, and in 1283 he completely deſtroyed the independence of that country. It was thenceforward annnexed to the Engliſh crown, by a community of laws and government; "an important and mutually uſeful acquiſition, which has conferred glory on the king, though ſullied by his barbarous maſſacre of the Welſh bards, of the effect of whoſe animating ſtrains in reviving the national ſpirit he was jealous." According to hiſtorical tradition, Edward aſſembled the leaders of the Welſh, promiſed to give them a prince of unexceptionable manners, a Welſhman by birth, and one who could ſpeak no other language. Captivated with the deſcription, they poured forth violent acclamations of joy, and promiſes of the moſt implicit obedience; the king accordingly inveſted in the principality his ſecond ſon Edward, then an infant, who had been lately born at Carnarvon. The death of his eldeſt ſon ſoon after, made young Edward heir of the monarchy. The principality of Wales was fully annexed to the crown, and henceforth gives a title to the eldeſt ſon of the kings of England.

Edward then ſpent three years abroad, endeavouring to mediate a peace between the kings of France and Arragon. Having ſucceeded he returned, and avenged himſelf on all thoſe who had been guilty of high crimes during his abſence. He ſoon after began his attempt to deſtroy the independency of Scotland; with this view he projected a marriage between Margaret, on whom the Scottiſh crown devolved, and his eldeſt ſon Edward, which he would probably have accompliſhed but for the untimely death of the young queen. Several competitors now aroſe, but the claims of John Baliol and Robert Bruce were conſidered as the moſt valid, and upon theſe it was agreed that Edward ſhould decide. In 1292 he decreed in favour of Baliol, and cauſed him to be proclaimed king of Scotland. A war now broke out between England and France, and during the conteſt Baliol formed a ſecret alliance with the French, which was the commencement of that union between the two countries, which ſo long prevailed to the diſadvantage of England. Edward found great difficulties in raiſing ſupplies, and was forced to the expedient of ſummoning to parliament repreſentatives from all the boroughs in the kingdom, an event which is thought to be the true foundation of a houſe of commons in England. When he had obtained the money which he required, he marched with a powerful army into Scotland and obliged the king to reſign his crown: he then returned, taking with him the famous ſtone of inauguration, kept at Scone, as the palladium of the Scottiſh monarchy. Not contented with this, he ordered all the records and monuments of antiquity to be deſtroyed, broke the ſeal of Baliol, and carried him away as his priſoner. When they arrived in London Baliol was committed to the Tower, and kept priſoner two years, and then baniſhed to France, where he died in a private ſtation. Edward was next involved in a quarrel with the clergy, who refuſed to ſubmit to a tax impoſed upon them, but were afterwards glad to agree to the terms which the ſovereign exacted. Foreign wars and domeſtic troubles kept the king always poor, and to ſupply his wants he was forced to grant to the people a ſolemn confirmation of the great charter, and the charter of the foreſts, and to make other conceſſions in favour of public liberty. Edward died of a dyſentery at Carliſle, on the 7th of July, 1307, as he was leading a very large army into Scotland, againſt the inhabitants of which he had vowed the moſt dreadful vengeance on account of new diſturbances which the oppreſſions of the Engliſh probably excited. He was ſucceeded by his ſon Edward II. whom he charged, with his dying breath, to proſecute the war againſt Scotland, and never to deſiſt till he had finally ſubdued that kingdom.

The enterprizes finiſhed by this prince, and the projects which he formed, were more prudent, more regularly conducted, and more advantageous to the ſolid intereſts of the kingdom, than thoſe which were undertaken in any reign, either of his anceſtors or his ſucceſſors. He reſtored authority to the government: he maintained the laws againſt the efforts of his turbulent barons: he fully annexed to his crown the principality of Wales, and he took vigorous meaſures for reducing Scotland to a like condition. Nor was he leſs attentive to the internal improvement of his kingdom, than to promote its conſequence among its neighbours. The laws of the realm obtained ſo much additional order and preciſion during his reign, that he has been called the Engliſh Juſtinian. He firſt inſtituted the office of juſtice of the peace, and he made various alterations in the executive part of the law, which have continued to modern times. He was inclined to arbitrary meaſures himſelf, but took care that his ſubjects ſhould not act unjuſtly towards each other. He prevented all clerical uſurpations as much as poſſible, and is reckoned the firſt Chriſtian prince who paſſed an act of mortmain. He protected and encouraged commerce, and from him the ſociety denominated "Merchant Adventurers" had its origin, which was inſtituted for the improvement of the woollen manufacture, and the vending of the cloth abroad, particularly at Antwerp. He granted protection and privileges to foreign merchants, and alſo aſcertained the cuſtoms and duties which thoſe merchants were, in return, to pay on merchandize imported and exported. He promiſed them ſecurity, and on all trials reſpecting them or their property a jury was allowed, conſiſting half of natives and half of foreigners. The manners of this prince were courteous: his perſon was majeſtic, though the length and ſmallneſs of his legs gave him the appellation of "Longſhanks." Edward had by his firſt wife Eleanor, four ſons and eleven daughters; three of the ſons and moſt of the daughters died before him. He was married a ſecond time to Margaret of France, by whom he had three children. For queen Eleanor he left many durable tokens of his gratitude and affection, by erecting at every ſtage where her body reſted, in its way from Lincolnſhire to Weſtminſter, a ſtone croſs of elegant Gothic architecture. Of theſe a fine one, in perfect preſervation, is ſtill extant near Northampton; and another in a leſs complete condition exiſts at Waltham Croſs, a village eleven miles north of the metropolis. Hume. See CROSS.

EDWARD II. ſucceeded his father in 1307, but was little inclined to follow the advice given him on his death bed: he was indolent and inclined to pleaſure rather than to the ſerious

rious cares of government. One of his first acts was to recall to his court Piers Gaveston, a licentious young man whom his father had banished, but who by him was made earl of Cornwall, and married to his niece. He next went to France to marry the princess Isabella, to whom he had been some time contracted, but who was ill calculated to render him happy. His barons were exasperated at his conduct with respect to Gaveston: they remonstrated, and he promised to dismiss him for ever from his councils; but in a short time he broke his engagement, which excited an open rebellion. Gaveston fell into the hands of his enemies, and was executed as a public enemy. After the death of Gaveston, he adopted, as a favourite, Hugh Spencer, who was soon as much the object of popular displeasure as Gaveston had been, and the king was compelled to sign against him a sentence of attainder, and perpetual exile. Edward, however, recovered from the consternation into which he had been thrown, and immediately prepared to attack the barons, who were led on by Thomas, earl of Lancaster, his near relation. He obtained over them a signal victory, and Lancaster, who had fled into the north, was taken prisoner and executed at Pontfret in 1322. Many others suffered, and Spencer was enriched with their spoils. In 1324 queen Isabella went over to Paris, where she connected herself with several English fugitives, who agreed with her in hatred of Spencer, and, among the rest, with Mortimer, a baron in the Welsh marches. Here a conspiracy was formed against Edward, and Isabella returned in the character of an open enemy of her sovereign and husband. She landed on the coast of Suffolk, and was soon joined by many persons of rank and distinction. Their party became in a short time irresistible: they gained possession of the tower of London and other strong fortresses, seized and put to death, without trial, both the Spencers, and at length made the king prisoner. He was at first confined in Kenilworth castle: he was then deposed by a vote of parliament, and compelled to sign an instrument of resignation. This was not sufficient: his enemies sent him to Berkeley castle, where he was inhumanly murdered, by thrusting up a red-hot iron into his bowels, in such a way as to prevent any marks of external violence from being seen. His shrieks, however, betrayed the bloody deed to the guards and other attendants in the castle. He died September 21, 1327, having reigned twenty years, and lived forty-three; and was succeeded by

Edward III. who was then only in his fourteenth year, and was proclaimed king under a council of regency, while Mortimer really possessed the principal power of the state. After some fruitless attempts made on the liberties of Scotland, Robert Bruce was acknowledged lawful king, and his son and heir David was contracted to Edward's sister Jane. Mortimer by this act became very unpopular in England, and after enriching himself by fines and confiscations levied on his enemies, he was seized and hanged in the castle at Nottingham. After this, Isabella was confined to her house, with a reduced allowance, and though treated with decency never recovered any degree of authority. Edward now assumed the reins of government, and his first concern was to restore order and submission to the laws. He then undertook the assistance of Baliol king of Scotland, and levying a well appointed army, marched to the borders and took Berwick from those who had got possession of the greater part of the kingdom, and who had driven Baliol to England.

By a bloody battle at Halidown hill, July 19, 1333, in which the Scots were defeated with the loss of 30,000 men, Baliol was restored, who, in gratitude to Edward, recognised the superiority of the English crown, and put into Edward's hands several important fortresses, with all the south-east counties of Scotland. Edward now, owing to an interruption in the lineal succession to the crown of France, which had fallen to Philip de Valois, put in his claim to that crown, in right of his mother Isabella, sister of the late king Charles of France, and prepared to justify his claims by force of arms. With this view, in 1339, he appeared on the north-east frontiers of France, with an army of 30,000 men chiefly foreigners. Philip was not less active, and met him with one double that number, and after some time spent in mutual defiances, Edward wisely withdrew into Flanders, and disbanded his troops. Next year he renewed his attempts, but was obliged to call his parliament together for new aids, who demanded of him certain concessions, which he readily granted to obtain his object. To prevent the attack Philip fitted out a large fleet of 400 sail, manned with 40,000 men, which he stationed off Sluys, in order to intercept the king in his passage. The English navy consisted of only 240 ships, but was completely victorious, destroying the greater part of the French fleet, and their crews. The king himself commanded in person, and it has been said, that this naval fight may contend in glory with any of the most celebrated triumphs in the maritime records of England. Notwithstanding the victory, Edward returned, without attaining the object of his ambition, deeply in debt, and much disconcerted; and to obtain further supplies, he was obliged to make more concessions to parliament. In 1342, new prospects opened upon him, and he again attacked France, but shortly after agreed to a truce for three years. In 1346, the king himself, with all his chief nobility, his eldest son Edward (the famous black prince) and an army of 30,000 men landed at La Hogue in Normandy. He over-ran and ravaged great part of the province, took and pillaged Caen, struck an alarm even into Paris, and then proceeded into Picardy followed by the king of France with 100,000 men. He forded the Somme, and arrived at the village of Crecy. Here he drew up his army in three lines, and awaited the attack of the enemy. Edward, the prince, was then only 16 years of age, yet to him did the king leave the honour of obtaining the first part of the victory with his line unassisted. The rout was afterwards completed with the slaughter of 36,000 of the enemy, though the loss of the English was incredibly small. This victory was followed by the siege of Calais, which occupied the English arms nearly a year. During this period, the Scots under David Bruce made an incursion into England, and penetrated as far as Durham. Here he was met by an inferior force, raised by queen Philippa, and commanded by lord Percy, which gave him a total and signal defeat. David was taken prisoner with many of his principal nobles. Philippa having achieved this noble act, went over to her royal spouse, where she was received with deserved triumph. Calais was now reduced to the greatest difficulties, and the governor offered to capitulate, but Edward would listen to no terms, unless six of its principal citizens were delivered to him with cords about their necks, as sacrifices to his rage. Eustace de St. Pierre and five others offered themselves as voluntary victims. They were led to the English camp, and the entreaties of the queen alone prevented the king from putting to death, men, whose only crime was love to their country and fidelity to their sovereign. Edward caused all the French inhabitants to quit Calais, and substituted an English colony which long possessed it, as one of the keys of France. In 1348, a truce was concluded, but during the truce, the French made an attempt to recover Calais by surprize, which proved unsuccessful. On this occasion, the king himself fought on foot as a private soldier, and engaging in combat with a French knight, took him prisoner, whom he almost instantly

liberated without a ranſom, throwing, at the ſame time, with much courteſy, a ſtring of pearls about his neck. In the year 1349, Edward inſtituted the noble order of the Garter, which ſoon became one of the moſt illuſtrious orders of knighthood in Europe. See GARTER, KNIGHT, &c. In 1355, Edward invaded France on the ſide of Calais, while the black prince did the ſame from Gaſcony, but after much plunder and devaſtation, the king was recalled by a threatened invaſion of the Scots, which he not only repelled, but carried the war into their own country from Berwick to Edinburgh. In the year 1356, was the famous battle of Poictiers, and in a ſhort time Edward had the good fortune to poſſeſs as priſoners, his two moſt inveterate enemies the kings of France and Scotland. In 1359, Edward paſſed over to Calais with an army of 100,000 men. He deſolated the provinces of Picardy and Champagne, and appeared before the gates of Paris; but notwithſtanding all his ſucceſs, he ſeemed to have no chance of obtaining the crown of France, and conſented to a peace, which was concluded in the year 1360, highly in favour of Edward. In the reign of Charles V. he had the mortification to witneſs the loſs of all his ancient French provinces except Bayonne and Bourdeaux, and all his conqueſts except Calais. But he had to experience ſtill greater afflictions, by the death of his heroic ſon Edward, and by the diminiſhed attachment of his people. He died June 21, 1377, in the 65th year of his age, and fifty-firſt of his reign, and the people were then ſenſible, though too late, of the irreparable loſs which they had ſuſtained. The reign of Edward has been eſteemed not only one of the longeſt, but alſo one of the moſt glorious that occurs in the annals of our nation. Edward was great as a warrior, but the domeſtic government of this prince is more admirable than his foreign victories, and England enjoyed, by the prudence and vigour of his adminiſtration, a longer interval of domeſtic peace and tranquillity than ſhe had been bleſſed with in any former period, or than ſhe experienced for many ages after. He gained the affections of the great, yet curbed their licentiouſneſs. He made them feel his power, without their daring, or even being inclined to murmur at it. His affable and obliging behaviour, his munificence and generoſity made them ſubmit with pleaſure to his dominion; his valour and conduct made them ſucceſſful in moſt of their enterprizes, and their unquiet ſpirits, directed againſt a public enemy, had no leiſure to breed thoſe diſturbances to which they were naturally ſo much inclined, and which the frame of the government ſeemed ſo much to authorize.

Edward left behind him a numerous poſterity by his queen Philippa. The line of his eldeſt ſon ceaſed in his unfortunate ſucceſſor Richard II. The two rival houſes of Lancaſter and York were derived from John of Gaunt duke of Lancaſter, the third ſon of Edward, and from Edmund earl of Cambridge, afterwards duke of York, the fourth ſon of Edward.

One of the moſt popular laws enacted by any prince, was the ſtatute which paſſed in the twenty-fifth year of this reign, and which limited the caſes of high treaſon, before vague and uncertain, to three principal heads, *viz.* conſpiring the death of the king; levying war againſt him, and adhering to his enemies; and the judges were prohibited, if any other caſes ſhould occur, from inflicting the penalty of treaſon without an application to parliament. It was alſo ordained, that a parliament ſhould be held once a year, or oftner, if need be; "A law," ſays Mr. Hume, "which like many others, was never obſerved, and loſt its authority by diſuſe." Edward granted above twenty parliamentary confirmations of the Great Charter, which is ſtrong preſumptive evidence, that he occaſionally made no ſcruple in violating it. The uſe of the French language in law proceedings was laid aſide in this reign, as a badge of the conqueſt which it was time to aboliſh. Legiſlation and the laws of police were much improved in this reign; and though commerce ſtill lay under many impolitic reſtrictions, yet the ſtaple of the nation, the woollen manufacture, was promoted by encouragement given to foreign weavers, and by enacting a law which prohibited every one from wearing any cloth but of Engliſh fabric.

Edward was a prince of great capacity, and deſirous of keeping on good terms with his people; "yet on the whole," ſays the hiſtorian, "it appears that the government, at beſt, was only a barbarous monarchy, not regulated by any fixed maxims, or bounded by any certain undiſputed rights, which in practice were regularly obſerved. The king himſelf governed by one ſet of principles, the barons by another, the commons by a third, the clergy by a fourth. All theſe ſyſtems of government were oppoſite and incompatible: each of them prevailed in its turn, as incidents were favourable to it." Hume.

EDWARD IV. was born in 1441. His father, Richard, duke of York, was grandſon of Edmund, earl of Cambridge and duke of York, to whom we have already, in the preceding article, referred. He ſucceeded his father, in the title of York, ſlain at the battle of Wakefield in 1460; and after the battle of St. Alban's, gained by queen Margaret over the earl of Warwick, Edward, collecting the relics of Warwick's forces, advanced, and obliged the queen to retire to the north. He then entered London, where, by popular acclamation, he was declared king, in March, 1461, but he did not ſucceed without a ſtruggle; he had to fight for his crown againſt an army of 60,000 Lancaſtrians, aſſembled in Yorkſhire; a deciſive victory confirmed his title. After this he loſt no time in aſſembling a parliament which recognized his right, and paſſed the ſevereſt laws againſt his opponents. Margaret, however, was not ſubdued, ſhe appeared again in arms; but, being defeated, was obliged to take refuge in Flanders, while her huſband, Henry VI. fell into the hands of his enemies, and was committed to the Tower. Edward was now eaſy on the ſcore of a rival, and began to indulge himſelf in pleaſures that ſeemed ſuited to his age; but a marriage of love, which he contracted with Elizabeth Woodville, widow of a Lancaſtrian, whoſe eſtate had been confiſcated, produced very ſerious conſequences. This lady took the opportunity of an accidental viſit at her father's houſe, to throw herſelf at the king's feet, and implore compaſſion for her ruined children. The ſight of her beauty won the heart of Edward, who privately married her. This circumſtance gave ſo great offence to ſome foreign courts, and to the powerful lords of England, that Edward was at length driven from his own country, and the Lancaſtrians became again triumphant. Henry was once more acknowledged king, and all the attainders of his party were taken off and transferred to the Yorkiſts. Warwick and Clarence were declared regents of the kingdom under Henry, and Margaret, with all the exiles, prepared to return. In 1471, Edward was enabled, by the aſſiſtance of the duke of Burgundy, to land with 2000 men, and to theſe were ſoon added great numbers who flocked to his ſtandard. He marched to London, obtained entrance, and Henry was again made priſoner. Warwick advanced againſt him as far as Barnet, where, on April 14th, a great battle was fought, which terminated in a complete victory to Edward. On the ſame day, queen Margaret and her ſon landed at Weymouth. She advanced as far as Tewkeſbury, was defeated, and, with her ſon, made priſoners. The king ordered them

to

to be brought before him, and asking the prince how he dared to invade his dominions, received a very spirited reply, for which Edward basely struck him in the face with his gauntlet. At this signal, the creatures of the king dragged the heroic young man into an adjoining apartment, and infamously murdered him. Margaret was thrown into the Tower, where she witnessed the death of her husband. Edward, now secure by the destruction of his foes, resigned himself to those pleasures to which he had been ever addicted: in 1475, he made an attempt at French conquests, but was bought off by a present payment of money, and a promised pension, and from this period he ceased to interfere in continental politics. He was chiefly engaged with examining into some charges brought against his brother Clarence, who was, at length, capitally arraigned before the house of peers, and convicted. The commons concurred in a bill of attainder against him; and, finding that his life must be sacrificed, he begged to be drowned in a butt of Malmsey wine, a request in which he was indulged. An expedition of the duke of Gloucester to the borders of Scotland, in which he took Berwick, and forced the Scots to make peace, was the remaining event of this reign. This success encouraged the king to think more seriously of a French war; but while he was making preparations for that enterprise, he was seized with an illness that put an end to his life, in the forty-second year of his age, and the twenty third of his reign. He left two sons and five daughters. He was, according to Hume, "A prince more splendid and showy, than either prudent or virtuous; brave though cruel; addicted to pleasure, though capable of activity in great emergencies; and less fitted to prevent ills by wise precautions, than to remedy them after they took place, by his vigour and enterprise." Hist. Eng. vol. iii.

Edward V. succeeded the father, Edward IV. when he was only in his 13th year; and scarcely had he reigned two months, when, by the ambition of his uncle, the duke of Gloucester, he and his brother Richard were lodged in the Tower, where they were presently murdered, and privately interred at the foot of the stairs of the apartments which they inhabited. (See Richard III.) In the reign of Charles II. when some stones were removed, and the spot dug up which was mentioned as the place of their burial, the bones of two persons were found, which, by their size, exactly corresponded to the age of Edward and his brother. They were, of course, concluded to be the remains of those princes, and were interred under a marble monument by order of the king.

Edward VI., son of Henry VIII., by queen Jane Seymour, was born in 1538. When Henry died, he was but nine years old, and as he lived only till he was sixteen, two years before his father's will allowed him to govern for himself, his acts are to be regarded as those of the counsellors appointed to superintend the affairs of government during the minority, and as such, will require but a short notice in this place. He was celebrated for an amiable disposition, and for considerable talents in the acquirement of learning. His maternal uncle, the earl of Hereford, afterwards duke of Somerset, notwithstanding the will of Henry, (see Henry VIII.) assumed the title of protector, and under him great care was taken to inspire the young king with just principles, with regard to the Protestant religion, by which he was induced to favour the reformation. One of the earliest public events that happened in this reign, was a quarrel with Scotland, respecting a projected marriage between Edward and the young queen Mary. The protector marched an army into the country, and gained a decided battle, which, however, proved of no use to his main purpose; Mary was sent to France, where she was contracted to the dauphin. During the absence of the protector, his own brother plotted against him, of which he was afterwards convicted and executed. This was but the commencement of troubles; insurrections broke out in various parts of the kingdom, which were not suppressed without much bloodshed, and which raised up so many enemies to the administration of Somerset, that he was at length brought to the scaffold. These severities must have been very repugnant to the mild and benevolent spirit of Edward, who could scarcely be brought to sign the death-warrant of a worthy woman accused of heresy. (See Cranmer.) After the death of Somerset, Dudley, duke of Northumberland, became all-powerful, and governed the king and kingdom with equal despotism. (See Dudley.) Through the influence of this nobleman, Edward was induced to set aside from the succession his sisters Mary and Elizabeth, and to settle the crown upon lady Jane Grey. The young king had in the course of one year, been seized with the measles, and afterwards with the small-pox, the effects of which he probably never quite recovered; and as he was making a progress through some parts of the kingdom, he was afflicted with a cough, which proved obstinate, and which gave way neither to regimen nor medicines. Several fatal symptoms of a consumption appeared, and though it was hoped, that as the season advanced, his youth and temperance might get the better of the malady, his subjects saw, with great concern, his bloom and vigour sensibly decay. After the settlement of the crown, which had been effected with the greatest difficulty, his health rapidly declined, and scarcely a hope was entertained of his recovery. His physicians were dismissed by Northumberland's advice, and the young king was entrusted to the hands of an ignorant woman, who undertook to restore him to health in a very short time. Death had, however, pronounced his irreversible decree: the medicines prescribed were found useless: violent symptoms were greatly aggravated; and on the 6th of July he expired at Greenwich, in the sixteenth year of his age, and the seventh of his reign. The excellent disposition of this young prince, and the blow sustained by the Protestant cause, have rendered his memory dear to the nation. He possessed mildness of disposition, application to study and business, a capacity to learn and judge, and an attachment to equity and justice. He is also advantageously remembered as the founder of some of the most splendid charities in the metropolis. Hume's Hist. vol. iv.

Edward, prince of Wales, denominated, from the colour of his armour, the Black Prince, one of the greatest military heroes of his age, eldest son of Edward III., was born in 1330. He accompanied his father on his invasion of France when he was but fifteen years of age; and in 1346, at the battle of Crecy, this young man fought with so much intrepidity, united to the most exact skill, that he was deservedly held up as an example to the bravest men in the army. Being, however, very hardly pressed, a message was sent to the king, who was posted on an adjacent hill, desiring succour, to which his father replied, "I reserve to my son the honour of this day's victory; I am confident that he will prove himself worthy of the trust reposed in him." Animated by the king's expectations, he redoubled his efforts, routed the French, and decided the contest. When the battle was won, the king flew to his arms, and rendered him all the praise and honour which his prowess merited. On this occasion the prince of Wales assumed the crest of ostrich feathers, and the motto "Ich dien," (I serve,) belonging to the king of Bohemia, who fell in the battle, which all his successors have

ſince borne. In 1355, and following year, he penetrated into the heart of France, till he was at length oppoſed by John the king of the country, at the head of 60 000 men, and was reduced to a ſituation that would have obliged him to ſurrender for want of proviſions, had not the French king reſolved upon an attack. This battle, which was fatal to the French army and their king, who was taken priſoner, was fought Sept. 19, 1356, near Poictiers. The monarch, when led to the victor's tent, was met by the prince with every expreſſion of ſympathy and reſpect. So great was the conduct of Edward in this inſtance, that he not only cauſed a noble repaſt to be prepared for the fallen king, but waited upon him in perſon, and in every inſtance treated him as a ſuperior rather than a captive. "Here," ſays the hiſtorian, "commences the real and truly admirable heroiſm of Edward: for victories are vulgar things in compariſon of that moderation and humanity diſplayed by a young prince only twenty-ſeven years of age, not yet cooled from the fury of battle, and elated by as extraordinary and as unexpected ſucceſs as had ever crowned the arms of any commander. He came forth to meet the captive king with all the marks of regard and ſympathy, and adminiſtered comfort to him amidſt his miſfortunes; paid him the tribute of praiſe due to his valour, and aſcribed his own victory merely to the blind chance of war, or to a ſuperior providence, which controuls all the efforts of human force and prudence. All his father's pretenſions to the crown of France were now buried in oblivion: John, in captivity, received the honours of a king, which were refuſed him when ſeated on the throne. His miſfortunes, not his title, were reſpected; and the French priſoners, conquered by this elevation of mind, more than by their late diſcomfiture, burſt into tears of admiration, which were only checked by the reflection, that ſuch genuine and unaltered heroiſm in an enemy muſt certainly in the iſſue prove more dangerous to their native country."

Edward conducted his priſoner to Bourdeaux, concluded a truce with France for two years, and then conducted the captive monarch to England. He landed at Southwark, and was met by a vaſt concourſe of people of all ranks and ſtations. The king was clad in royal apparel, and mounted on a white ſteed, diſtinguiſhed as well for its beauty as for the richneſs of its furniture. The conqueror rode by his ſide in a meaner attire, and was carried by a black palfry. In this ſituation he paſſed through the ſtreets of London, and preſented the king of France to his father, who advanced to meet him, and received him with the ſame courteſy as if he had been a neighbouring potentate that had voluntarily come to pay him a viſit. In 1361 the prince married Joan, daughter of Edmund, earl of Kent, his father's uncle; and he then took up his reſidence in France, where his father had many conquered provinces which he had formed for his ſon, under the title of the principality of Aquitaine. Here he undertook the defence of Peter the Cruel, king of Caſtile, in oppoſition to Henry, count of Traſtamare, whom he entirely defeated. Peter, in juſtification of the bloody character for which he was famed, would have maſſacred in cold blood all the priſoners, but was reſtrained from the ſavage act by the noble minded Edward. Peter, when placed on the throne by the Black Prince, refuſed the ſtipulated reward to the Engliſh troops, and Edward returned with the glory of having ſucceſsfully accompliſhed his enterprize, but with a ruined conſtitution. The government of this prince, notwithſtanding his noble qualities, became unpopular, owing to the taxes which he was obliged to levy to pay the expences of his wars. Appeals were made by the nobles to Charles, their ſuperior lord, the new king of France, who ſummoned Edward, as his vaſſal, to appear before him at Paris. "I will come," ſaid the prince, "but it ſhall be at the head of 60 000 men." The ſtate of his health was become too delicate to admit of any farther exploits: and after a lingering illneſs he died in the forty-ſixth year of his age, leaving behind him a character illuſtrious for every eminent virtue, and from his earlieſt youth, till the hour in which he expired, unſtained by any blemiſh. His valour and military talents formed the ſmalleſt part of his merit. His generoſity, humanity, affability, and moderation, gained him the affections of all men, and he was qualified to throw a luſtre, not only on that rude age in which he lived, and which nowiſe infected him with its vices, but on the moſt ſhining periods of ancient or modern hiſtory. Hume's Hiſt. vol. ii.

Edwards, in *Geography*, a fort in Nova Scotia, in the town of Windſor, in Hants county, large enough, as it is ſaid, to contain 200 men. It is ſituated on the river Avon, navigable to this place for veſſels of 400 tons: thoſe of 60 tons can proceed two miles further.

Edwards, George, in *Biography*, celebrated for his knowledge in natural hiſtory, was born at Weſtnam, in Eſſex, about the year 1693. He was deſigned for trade, but the acceſs which he had, while he was purſuing the elementary parts of a commercial education, to the library of a deceaſed phyſician, gave him a turn to literature and ſcientific purſuits, which detached him from the courſe for which he was originally intended. Having ſpent ſome years in foreign travel, he returned to his native country, and applied himſelf to the ſtudy of natural hiſtory. He practiſed the art of drawing and colouring birds from nature, and obtained, by the ſale of his works, a good ſubſiſtence. He was, in the year 1733, appointed librarian to the college of phyſicians, a ſituation which afforded him ample opportunity for purſuing his favourite ſtudies. Between the years 1743 and 1751, he publiſhed his "Hiſtory of Birds," in 4to. with coloured plates and deſcriptions in Engliſh and French. In addition to his hiſtory of birds were given ſome plates of ſerpents, fiſhes, and inſects. The laſt volume, as a teſtimony of piety and gratitude to his maker, who had enabled him to complete his work, he dedicated "To God." As a ſupplement, he publiſhed, in parts, his "Gleanings of Natural Hiſtory," conſiſting of coloured plates of birds, fiſhes, inſects, and plants. His reputation as a naturaliſt gained him the acquaintance of the celebrated Linnæus, who kept up a conſtant correſpondence with him, and completed the general index to his works according to his own ſyſtem. He received, for his hiſtory of birds, ſir Godfrey Copley's medal, voted to him by the Royal Society, of which body he became a member in the year 1757. He was alſo elected a member of ſeveral of the learned ſocieties in Europe. In the year 1769, he reſigned his office at the College of Phyſicians, having ſold his collections of drawings to lord Bute, and retired to a ſmall houſe at Plaiſtow in Eſſex. In the courſe of the following year, he publiſhed his "Eſſays," in 8vo. which were chiefly collected from the prefaces or introductions of his former works, to which were added inſtructions for drawing, painting, and etching. The remainder of his life was ſpent in privacy among his friends, towards the cloſe of which he was grievouſly afflicted with the ſtone and a cancer in his eye. He bore his ſufferings with manly fortitude and patience, and died at the age of eighty, in July 1773. His temper was cheerful, open, and benevolent; his diffidence and humility prevented him from ſhining in mixed company, but he was entertaining and very inſtructive in a ſmall and private circle. Biog. Brit.

Edwards, Jonathan, an American divine of conſiderable

able celebrity, was born at Windsor, in Connecticut, in the year 1703, and was educated at Yale college, where he took his degree of B. A. before he was quite 17 years of age. He made a rapid progress in the natural sciences, but was particularly attached to moral philosophy and theology, as connected with the profession for which he was designed. Having continued at his college two years after he took his first degree, he was examined, and licensed to preach the gospel as a candidate. In the year 1722, he went to New York, and preached among the English Presbyterians for about eight months with considerable success, but not thinking the circumstances of the society such as to justify him in making choice of this situation for a settlement, he returned to his father's house, where he pursued his studies with much diligence. In 1723, he was admitted to the degree of M A and in the following year was chosen tutor of the college in which he had been educated. In the year 1726 he resigned his situation as tutor, and was ordained pastor of a congregation at Northampton, which he continued to serve with much success till the year 1744, when, from some disputes occasioned, perhaps, by the assumption of too much authority on the part of the minister, he fell into disrepute. His usefulness and his comfort were now nearly at an end, but he continued in this connection till the year 1750, when he was formally dismissed by a vote of the congregation, having only twenty persons in his favour, and more than two hundred against him. In 1751, he became Indian missionary at the town of Stockbridge, in the province of Massachusetts, where he discharged the duties of the office devolved upon him to the entire satisfaction of all concerned, and was honourably supported by the commissioners of the society in London for propagating the gospel in foreign parts. He was, in the year 1757, induced to decline this business, on his election to the presidency of the college of New Jersey. Scarcely, however, had he entered upon this honourable office, when he was advised to be inoculated for the small-pox, on account of the ravages that the natural disease was then making all around him; to the effects of this disorder he fell a victim in the month of March 1758, being in the 55th year of his age. Mr. Edwards was author of many works, but of these the most important, and that by which he is most known, is his "Careful Enquiry into the modern prevailing Notion of that Freedom of Will which is supposed to be essential to moral agency." This was published in the year 1754, and has obtained a high character as a most able and acute justification of the doctrine of philosophical necessity. Mr Edwards was allowed, by all capable of appreciating his talents, to be a man of considerable and deep learning, extensive reading, and sound judgment. He was eager for the acquisition of knowledge, and diligent in the pursuit of it. His piety towards God was ardent, and his benevolence towards his fellow-creature was extensive and liberal. He was a Calvinist in principle, and an able defender of the doctrines which he espoused. Gen. Biog.

Edwards, Thomas, a zealous divine, according to the principles of Presbyterian church discipline, was born towards the close of the 16th century, and was educated at Trinity college, Cambridge, where he took his degree in 1609. He entered into the established church, though he was a puritan in principle. He wrote against toleration, and yet, from his own account of his conduct and character, no one required the latitude granted by toleration more than himself. He never properly conformed to the manners and habits of the church of which he was a member, and speaking of a sermon which he preached on a fast day in July 1640, at Mercer's chapel, he says, he preached "against the bishops and their faction, such a free sermon, as I believe never a sectary in England durst have preached in such a place and at such a time." He chiefly officiated at Hertford as lecturer, and also in some places in London, and more than once incurred the rebukes of his superiors, for the puritanical style of preaching which he adopted, and the offences which he committed against the rules and orders of the church. When the long parliament declared against king Charles I., he became a zealous advocate for the changes in civil and ecclesiastical matters which were gradually introduced, and supported, by every method in his power, the views of the ruling party against the favourers of episcopacy and royalty. He was autnor of many pieces, which are now well nigh forgotten, and which do not merit a mere enumeration. They display much violence and bitterness as well in the matter as in their manner, and there can be no doubt, but that if Mr. Edwards had possessed the power he would not have wanted the will of being a rigid persecutor of those who thought and acted differently from himself. He died in 1647 in Holland, whither he fled to avoid the resentment of the independents, after Cromwell had overturned the power of parliament. Biog. Brit.

Edwards, John, was son of the preceding, and born at Hertford in the year 1637. He received his grammatical learning at Merchant Taylors' school, and pursued the more advanced studies at St. John's college, Cambridge. He distinguished himself for his diligence and superior talents. In 1661, he took the degree of M. A. and was soon after ordained deacon and then priest, by Dr. Sanderson, bishop of Lincoln. In 1664 he undertook the duty of Trinity church, in Cambridge, and greatly distinguished himself as an eloquent and popular preacher; but in the following year, when the plague raged at Cambridge, he removed from the college into the town, that he might devote his whole time to the consolation of his parishioners in the time of their calamity. After this, he refused a good living in Gloucestershire, and chose to continue in his station at Cambridge. About 1688, he was admitted to the degree of bachelor in divinity, and about the same period was chosen one of the lecturers of Bury St. Edmund's, whither he removed, but returned to college in about a year after. He went through many changes, and obtained preferment in Norfolk and Essex. In 1699, he was admitted to the degree of doctor in divinity, and after this, he spent his life in studious retirement. Though a diligent student, and the author of many publications, he never possessed a library, and had indeed few books except bibles, lexicons, dictionaries, and works of a similar nature. He borrowed books from the university libraries; and from booksellers to whom he paid a stipulated sum for the loan. He died in 1716, having attained to his seventy-ninth year. His works are very numerous and very voluminous, mostly on theological subjects; in defence of Christianity, and of the established church of which he was a zealous member. Dr. Edwards was a man of extensive learning, of ardent piety, and exemplary moral conduct. Biog. Brit.

Edwards, Thomas, a divine of the church of England, was born at Coventry in the year 1729, where he received the early parts of his education. In 1747, he was entered at Clare Hall, Cambridge, where he graduated in 1750 and 1754, and was at length chosen fellow of his college. He was ordained to priests' orders in the year 1755, and about this period he published "A new English Translation of the Psalms from the original Hebrew, reduced to metre by the late Bishop Hare, with Notes critical and explanatory: illustrations of many Passages drawn from the Classics, &c." His object was to make bishop Hare's system of Hebrew metre better known, and to shew the utility of a judicious application

tion of it in elucidating the poetical parts of the Hebrew scriptures. He was, in 1758, appointed master of the free school at Coventry, and presented to the rectory of St. John the Baptist; soon after this, he published a work, entitled "The doctrine of irresistible grace proved to have no foundation in the writings of the New Testament." He then engaged in a controversy, respecting Hebrew metre, with Dr. Lowth, which was carried on till the year 1766. It was in this year that Mr. Edwards was admitted to the degree of doctor in divinity. He continued to write on useful and important subjects, till almost the close of his life. In 1770, Dr. Edwards was presented by the crown with the valuable vicarage of Nuneaton in Warwickshire, to which he went in the year 1779, having resigned his school and rectory at Coventry. His last publication was entitled "Selecta quædam Theocriti Idyllia recensuit, variorum notas adjecit, suasque animadversiones, partim Latine, partim Anglice, scriptas immiscuit Thomas Edwards, S. T. P. 8vo. 1779." He died at Nuneaton in 1785, in the fifty-sixth year of his age, having been some time incapacitated from performing the duties of his station by a paralytic stroke. He was a man of much mildness in his manners; benevolent and humane. He was particularly noted for inflexible integrity. As an instructor of youth he obtained a high reputation. He was fond of retirement, and his connection with the learned world was maintained more by correspondence, than by personal intimacy with its members. Biog. Brit.

Edwards, Thomas, was born in London in the year 1699, and educated for the bar. A hesitation in his speech prevented him from ever engaging much in professional practice. He was, besides, too much attached to poetry, and the belles lettres to find amusement in the study of the law. Shakespeare was his favourite author, and on the appearance of Warburton's edition of that dramatist, Mr. Edwards published "A letter to the Author of a late Epistolary Dedication, addressed to Mr. Warburton." This came out in 1744, and in 1747 he followed it by "A supplement to Mr. Warburton's edition of Shakespeare," a work which passed through many editions, and became famous under the title of "The Canons of Criticism." The idea of this work was derived from a hint given by Warburton, that he had once intended to draw up a body of canons for literary criticism. Mr. Edwards pretends to take up the design, and has framed a set of canons drawn from Warburton's notes upon Shakespeare and illustrated by the examples they afford. "The canons," says a good writer, "in the last edition amount to 25 in number; and it is impossible to read them and their illustrations without extraordinary mirth at the expence of the reverend annotator, who, as a critic, has perhaps contrived to be more ingeniously and singularly in the wrong than any other of the profession." An "Essay towards a Glossary," another of Warburton's designs, is annexed and drawn up in the same ironical style. The work has much value, as tending to discredit the rash and fanciful mode of correcting and explaining authors, which has been countenanced by critics of reputation. Mr. Edwards was distinguished as a poet, and printed about 50 sonnets in Dodsley's and Pearch's collections. He was a skilful critic in the English language. He passed his life in literary leisure, and was respected by many of the most respectable characters of his time. He died in the year 1757. The edition of his canons of "Criticism," published in 1765, contained his sonnets; and an "Account of the Trial of the letter y, alias y," in which are discussed the principles of English orthography. These he founds on etymology. A work on predestination was published after his death.

Edward's, *Prince*, *Island*, in *Geography*, a British North American island, near the coast of Nova Scotia, in the gulf of St. Lawrence remarkable for a colony of highland emigrants from Scotland, settled there by the earl of Selkirk, in 1803.

The settlers, to the number of 800 persons of all ages, reached the island in August, 1803. The spot selected upon the coast was almost desert, being separated by an arm of the sea, and an interval of several miles from any older settlement. Before the middle of September, the people were dispersed upon their separate lots, which were laid out in such a manner, that four or five families built their hamlets in a little knot together. This social plan of settlement resembled their style of living in their native country. They were allowed to purchase in fee-simple, and to a certain extent on credit. From 50 to 100 acres were allowed to each family, at a moderate price, which they were not required to pay in full before the third or fourth year of their possession. Every assistance in provisions was likewise a loan under strict obligations of repayment with interest. They constructed their first houses upon the model of those of the American woodmen. Lord Selkirk returned to the settlement twelve months after. He found the settlers engaged in securing their harvest; their crop of potatoes would alone have been sufficient for their entire support. Round the different hamlets, the extent of land in cultivation was, at an average, in the proportion of two acres to each able working hand: and several boats had been built, by means of which a considerable supply of fish had been obtained. The further progress of the colonists was left to their own guidance. Observations on the present State of the Highlands of Scotland, with a View of the Causes and probable Consequences of Emigration, by the Earl of Selkirk, 1807.

Edward's, *Prince*, *Islands*, two islands in the southern Indian ocean, S.E. of the Cape of Good Hope. E. long. 37° 46′. N. lat. 46° 53′. The largest and most southerly is about 15 leagues in circuit, the other nine; they are about five leagues distant from each other, and there is a passage between them at mid-channel.

EDWARDSBURGH, a township of Upper Canada, in the county of Grenville, being the seventh township in ascending the river St. Lawrence.

EDWARDSIA, in *Botany*, so named after Mr. Sydenham Edwards, a highly deserving botanical draughtsman, whose merits are conspicuous in the numerous plates marked with his name in Curtis's Magazine, and whose skill and scientific knowledge extend no less to zoological subjects. This genus is founded by Mr. Salisbury in the Transactions of the Linnæan Society, v. 9. 296, on the *Sophora microphylla*, *tetraptera*, and a third species, likewise from the South Seas, all which we hesitate to separate from the original and genuine genus *Sophora* of Linnæus and Jussieu, though aware of the heterogeneous assemblage subsequently referred to it, which we have long since taken some pains to reform. S.

EDWAY, in *Geography*, a river of South Wales, which runs into the Wye, 4 miles S.E. of Builth, in the county of Radnor.

EDWITH, a river of Wales, in the county of Monmouth, which joins the Usk, at its mouth.

EDWY, in *Biography*, king of England, son of Edmund I., succeeded, at the age of 16, his uncle Edred, in the year 955. He was, at this period, possessed of an amiable figure, and endowed with the most promising virtues. He would have been a favourite of the people, had he not unhappily, at the commencement of his reign, been engaged in a controversy with the monks, who pursued him with unrelenting

unrelenting vengeance during his short reign. His marriage with Elgiva, a beautiful princess of the royal blood, and within the prohibited degrees of kindred by the canon law, was a source of misfortune that only terminated with his life. The savage Dunstan was his principal enemy, who, at the head of the monks, declared war against the king. On the day of his coronation, when the nobles were assembled at a feast, Edwy withdrew from the company to his queen's apartment, where he indulged his fondness for his wife, which was only checked by the presence of her mother. Dunstan, suspecting the cause of the king's absence, burst into the chamber, rudely upbraiding the young couple, and forcibly dragged the sovereign to the banquet. Edwy could not forget the affront; he challenged Dunstan with a mal-administration of public affairs: the haughty monk refused to answer the accusation, and was banished. (See DUNSTAN.) His party excited disaffection against the king: they seized the queen, and, by the order of archbishop Odo, branded her in the face with a red hot iron, hoping thereby to destroy her beauty: they then carried her away by force into Ireland, there to remain in perpetual exile, and Edwy consented to a divorce, which was pronounced by the infamous Odo. Elgiva having completely recovered of her wounds, and time having almost obliterated the scars, was hastening to the arms of her husband, when she fell into the hands of her blood-thirsty enemies, and was by them barbarously murdered. The torments which she endured could only have been inflicted by demons in the shape of priests. These deeds were, however, sanctioned by a barbarous and superstitious people, who rose against Edwy, drove him from the throne, and placed on it his brother Elgar in his stead. The fallen monarch was obliged to take refuge in the southern part of the kingdom, when he was excommunicated, and pursued with unrelenting hatred, till death terminated his calamities, in the year 959. Hume, vol. i.

EDYLIUM, in *Ancient Geography*, a mountain of Greece, in Bœotia, called *Hadylius* by Pliny.

EDYMA, a town of Asia, in Caria. Steph. Byz.

EDYSTONE, in *Geography*. See EDDYSTONE.

EECLOO, a small town of France, in the department of l'Escaut, (the Scheldt,) chief place of a canton, in the district of Gand, with a population of 5827 individuals. The canton contains five communes, with 15,153 inhabitants, on a territorial extent of 112 kiliometres and a half.

EED, a town of Norway, 24 miles N.N.W. of Drontheim.

EEDT, a town of Germany, in the archduchy of Austria; 14 miles E.S.E. of Ens.

EEL, a lake of North America. N. lat. 49°. W. long. 98° 50°.

EEL-*Town*. See KENAPACOMAQUA.

EEL-*Cove* and *River*, lie on the south side of Chaleur-bay, in Lower Canada, about three leagues W. from Maligash. The cove abounds with salmon, which are taken annually in great quantities by the inhabitants who are settled near it.

EEL *River Indians*, are those who occupy the lands on Eel river, a head branch of Wabash river. (See WABASH.) These Indians, at the treaty of Grenville, in 1795, ceded some land at the mouth of the river to the United States; the government paying them a sum of money, and engaging to pay them in goods to the value of 500 dollars annually for ever.

EEL, *Anguilla*, in *Ichthyology*, a species of the *Murena*; which see.

EEL *fishing*. See FISHING.

EEL, *Electrical*. See GYMNOTUS.

EEL, *Indian*, a species of *Trichiurus*; which see.

EELS, *Microscopic, in sour paste*. The long-bodied animalcules, discovered by the microscope in vinegar, sour paste, and many other subjects, have, from their figure, been generally distinguished from the rest of the microscopic animalcules, by the name of eels. These, and the other kinds, have been, by the most judicious naturalists, supposed to be produced of the eggs of other animalcules of the fly kind, floating in the air. But those in paste are discovered to be viviparous animals, producing living creatures of their own shape. In order to be always furnished with these minute eels ready for the microscope, take such paste as bookbinders commonly use, of a moderate consistence, and expose it to the air in an open vessel, and prevent its becoming hard, or mouldy, by occasionally stirring it. After some days, it will turn sour; and, if examined attentively, you may discern multitudes of exceedingly small, long, slender, wriggling animalcules, which grow larger daily, till you will be able to see them with the naked eye. In order to promote their coming forward, pour now and then a drop of vinegar on the paste, and then they may be preserved all the year; the continual motion of these animalcules will contribute to prevent any mouldiness in the paste, which is best kept in some glass vessel. Apply them to the microscope on a single tale, or isinglass, after having first put upon it a small spot of water for them to swim about in, the internal motion of their bowels may be plainly perceived; and when the water is almost dried away, and they are nearly expiring, their mouths may be seen opening to a considerable width. On cutting one of these paste-eels in two across the middle, a long and slender tube is seen to shoot out from each of the divided ends, and a number of seeming ova issue from this; but these, examined strictly, appear to be living eels of different growths, and all included in their proper membranes; some move themselves but slowly, while others coil and uncoil themselves pretty briskly; and the most mature are seen to make strong efforts towards the disengaging themselves of their enveloping membranes, and at length succeed, and swim at liberty like their parent animal. The tube thrust out each way, on dividing the body, is properly the uterus of the animal, which, in the larger eels, is seen to be full of dark spots that are the embryo eels; and these dark spots are also to be observed in the young ones, as soon as produced. Phil. Trans. N° 478. § 13, and vol. xliv. p. 67, and Baker's Microf. 1743. p. 81, &c. See ANIMALCULE.

EEL-*fares* is used for the fry, or brood of eels. Stat. 25 Hen. VIII.

EEL-*pout*, in *Ichthyology*, the English name of the mustela fluviatilis, a fish of the *Gadus* kind. See GADUS.

The name is derived from the German *ael put*, which is, in that language, the name of the same fish, and is compounded of the words *ael*, *an eel*, and *put*, or *pud*, *a frog*; so that the English word should properly be the *eel-frog*. It is commonly, when full grown, about fourteen inches long, and is slender in proportion to its length, and something of the eel-shape, but too short for its thickness, to be truly so. It is very soft and slippery to the touch, like the eel, and is covered either merely with a slimy matter, or else with extremely minute scales. It is of the colour of a tench; its head is large and flat, its nostrils small and round, and its jaws beset with very small teeth, which make them feel rough like a file; and there is, beside these, a semi-circular spot in the palate, rough in the same manner. There are two fins on the back, and one on the belly, reaching from the anus to the tail; and it has a little beard from the extremity of the lower jaw, and between the nostrils and end of the snout, two others, and seven gills. Willughby's Hist. Pisc. p. 125.

p. 125. There is another variety of eel pout, which Linnæus has made a species of *Blennius*; these are viviparous, and bring forth two or three hundred young at a time, a little after the depth of winter. They are common in the Eik, at Whitby, in Yorkshire, and are a coarse fish.

EEL *spear*, a forked instrument with three or four jagged teeth, used for catching eels; that with four teeth is the best. This is struck into the mud at the bottom of the river; where, if it strikes against eels, it is sure to bring them up.

EEL-*backed*, a term used by the dealers in horses, for such as have black lists along their back.

EELWYCK, in *Geography*, a town of Norway; 20 miles W. of Romsdal.

EEMBARG, or EMBARG, a town of Utrecht, seated on the Ems; 5 miles N.N.W. of Amersfort.

EEMS, a river of Holland, which runs into the Zuyder sea, below Eembarg, in the state of Utrecht.

EERSEL, a town of Brabant; 6 miles S.W. of Eyndhoven.

EERSTE RIVER, a river of Southern Africa, which forms one of the divisions of the Droody, or district of Stellenbosch, lying between it and False bay.

EFESE, a town of Asiatic Turkey, in the province of Natolia; 32 miles S.S.E. of Smyrna.

EFFAIRE, or EFFRAYE, in *Heraldry*, a term applied to a beast, when rearing on its hind legs, as if it were affrighted.

EFFECT, the result, or consequence, of the application of a cause, or agent, on some subject.

It is one of the great axioms of philosophy, that full, or adequate effects, are always proportionable to the powers of their causes.

EFFECT, in the *Manege*, is applied to the motions of the hand which direct the horse.

They distinguish four effects of the hand, *viz.* in using the bridle to put a horse forwards, draw him backwards, and shifting it out of the right hand into the left, or *vice versâ*.

EFFECT, in *Music*. This word became technical in England about the middle of the last century; and we believe that it was Abel who brought it hither.

The great bands of sovereign princes in Germany, before the revolution, such as those of Manheim, Dresden, Wirtenberg, Esterhazi, &c. inseparably attached to the same orchestra, under the immediate direction of the composer, had leisure to try effects; and it was at the beginning of the cultivation of symphonies on the new plan of Stamitz, Holzbauer, Canabich, Ditters, Vanmaldere, Toeschi, and Filtz, different from the light opera overture, which had superseded those of Lulli and Handel, that experiments of this kind were tried. The effects of *crescendo* and *diminuendo* were successfully produced in theatrical orchestras, even in songs; and we remember the first air in which we noticed this effect, was composed by Jno. Christ. Bach, and sung by Ciprandi: *Non so donde vieni*, &c.

To produce an effect, is to cause an agreeable and powerful impression in the ear and the mind of the hearer, by unusual musical combinations: so that the word *effect*, in music, means something uncommonly excellent; and effect is not only applied to a single passage, but to such whole movements or works, as are full of effects which produce sensations that appear superior to the means employed to excite them.

Long practice and observation may teach a musical student how to discover passages of effect upon paper; but genius alone inspires them. It is the defect of bad composers, and of all beginners, to heap parts on parts, and crowd instruments on instruments to produce that effect which flies their grasp; and as an ancient said, "to open a wide mouth to blow a small flute." You would expect, in seeing their crowded and laboured scores, that you should be surprized by prodigious effects, but if you are surprized at all, it will be at hearing so meagre, mean, and confused a composition, without effect, and more likely to stun than delight good ears. On the contrary, the eye seeks in the scores of great masters, those sublime and ravishing effects which their music is sure to produce when well executed. Frivolous fillings up are either unknown, or despised by men of fine genius, who never call our attention to a crowd of small and puerile objects, but move us with great effects, the result of that force and simplicity united, which always constitute their character.

EFFECT, in *Painting*, is, properly speaking, the name of that impression which the first momentary glance of a picture produces on the eye and the mind of an observer: but artists have adopted it as indicative of the *cause* of that impression, and hence, with them, it becomes a technical term, signifying the arrangement of the component parts of a picture.

In its most extensive sense, thus employed, it designates the *mode of relievo* in which the objects of a picture are wrought. Its greatest excellence consists in making the subject of a picture at once familiar to the understanding in an interesting and pleasing manner; and when produced by the hand of taste and skill, it leads irresistibly the imagination of the observer, and enforces a more close inspection of the work.

Very many are the masters whose pictures possess excellent qualities, such as drawing, composition, and expression; yet they remain unattractive for want of union and harmony in their various parts; they are, therefore, passed by unnoticed, till accident renders their beauties observable: while works of less intrinsic merit, but possessing a better arrangement, or in other words, a better general effect, are constantly imposing themselves on the eye; and it is only when these qualities unite, that a perfect work can be produced.

Effect depends entirely upon the management of chiaro-scuro and colour: that is, the mode in which they are arranged, and the degree of opposition in which they are applied. It has little or no relation to the execution or finishing of the work; the slightest sketches, wrought in the enthusiasm of feeling, generally possess this quality in a more perfect degree than highly finished works.

The effects of pictures are denominated according to their different kinds; vigorous, powerful, weak, rich, or mean, bright, gloomy, pleasing, &c. &c. but no positive rules for producing effect can embrace the infinite varieties under which it pleases. Rubens in many of his pictures gratifies us with the brilliancy and breadth of effect of broad daylight spread almost equally over every part of them; the local colours alone producing the chiaro scuro; whilst, on the contrary, we behold with pleasure many works of Rembrandt, whose surfaces bear the representation of light upon only $\frac{1}{10}$th or even $\frac{1}{50}$th part of them, and have very little local colour of course, and between these two extremes all the intermediate degrees may be made attractive.

A *vigorous*, or *powerful* effect, is produced by using bright lights and colours with strong dark oppositions to them; in whatever degree as to quantity they may be employed. In general a small portion of light, with broad and strong dark shadows, is the most certain mode of obtaining it. Of this class are most of the works of Rembrandt: those of Rubens sometimes; particularly in his candle-light pieces.

Michael Angelo Caravaggio generally employed it, and so also did Spagnoletto, and many painters who have followed them. Correggio, however, appears to have been the father of this style of effect most observable in his pictures of the Birth of Christ, called "La Notte," which was in the gallery at Dresden, and in his small picture of the Magdalen, also in the same place; in both these pictures it is managed with the utmost sweetness of tone, much more than any of the above-mentioned masters have ever arrived at; though, perhaps, not with so much brilliancy as Rembrandt has sometimes obtained.

The works of the late professor of painting in our Royal Academy, J. Opie, esq. are also excellent examples of power and vigour of effect, gained by strength of opposition in the chiaro-oscuro and colour. In the more confined sense of the word (of which we shall presently speak) *viz.* the *degree* of relievo of the individual objects of the picture, no artist ever surpassed him. Many of his figures appear absolutely round, and fully to project from the canvas.

A more pleasing, though less powerful kind of effect, is produced, by making use of less violence of opposition; less sudden transition from light to dark, and from colour to colour; by blending the lights and shades with a greater breadth of half-teint; and instead of giving the shadows a great depth of tone, allowing them to partake of reflections from the atmosphere, as well as from surrounding objects.

It is also necessary to take care that no colours, which violently oppose each other (such as bright reds and blues,) should come in close contact; but that they should be united by the help of some intermediate teint, or their tones should be blended with each other, and each participate of the general hue of the picture; of this class are the greater part of the works of Correggio; those of Guido Reni in his best style; Murillio, Vandyke, sir Joshua Reynolds, and almost all the painters of the Dutch and Flemish schools; who, after Correggio, are the most perfect masters of this kind of effect.

Rubens united very much of it with the style of Venetian composition; but the range of his genius is so large, and his works of course so various, that it is difficult to assign him as an examplar of effect in any particular branch: he displays in his works all its different species. His picture of the "Descent from the Cross," now in the gallery of the Louvre, at Paris, is an instance of the grave and serious, wrought with great strength and brilliancy; and it is obtained by using one light only, and that about one-third of the picture. His series of pictures, known as those of the gallery of the Luxemburgh palace, are specimens of the gay and luxurious effect of broad lights and bright colours; and his portraits are a medium between these different degrees.

Among the Venetians, Titian may almost alone be said to have possessed (and that not till his later time) the magic power of producing (without the appearance of art,) the true effect of nature in its happiest combinations, by so admirable a management of the chiaro-oscuro and colours, as immediately to lead the eye to the principal object, and yet maintain the whole surface of his picture rich and brilliant; as in his "Diana and Acteon," at the marquis of Stafford's. Sir J. Reynolds has admirably followed him in this particular, but too often with an admixture of the style of effect used by Rembrandt, wherein the artifice, being more apparent, weakens the claim to ingenuity in the artist.

An effect, termed classical, is obtained by the adoption of lines and forms similar to those found in the works of the ancient painters and sculptors; by working upon the same series of thought which appears to have engaged their attention, and also by selecting for representation, the grand features of nature, as N. Poussin has done in his landscapes, and leaving out the more minute parts. The adoption of the reverse; selecting the ordinary forms and scenes of nature, and representing them in a laboured and coarse manner, produces an effect justly denominated *vulgar*.

It has been said before, that the effect of a picture should convey an impression of the nature of its subject; that correspondence is the best test of the merit of the painter, as it proves a comprehension of mind not confined to detail, but exerting itself on the whole together. A picture, the subject of which is *grand*, should have an effect at once imposing and sublime, by its simplicity and power. "The Death of St. Peter. Martyr," by Titian, now at Paris, is a beautiful instance of this happy adaptation of effect to subject. The first impression made on seeing it is awful, and creates in the mind of the beholder somewhat of horror. The parts are large, the tone of colour is deep and sombrous, something like that of twilight, and produces a seriousness of mind instantly on observation, and notwithstanding every part is found; by continued examination, to be wrought with great finish, yet the whole only strikes at first sight.

The portrait of Leo X., by Raphael, with the cardinals de Medici and Rossi attending him, is another instance of this: the character of the personage is grand; the effect of the picture is serious; and to produce this, the actions of the figures are simple, and the tone of colouring is low.

If a pleasing subject be chosen for representation the effect should be gay. Great variety of tints, a bright tone of colour, and sparkling lights and darks, amongst a broad general mass of light, are the requisites for producing this. The best examples of it are the works of Rubens and Watteau; and Paul Veronese among the Venetians adopted it. The French school have generally wrought upon this principle, till, in fact, they have proved that it is as dangerous to push a system too far, as to proceed entirely without one.

Sir Joshua Reynolds, in one of his discourses, has said, (and every painter pursuing anxiously the higher qualities of his art acknowledges the truth of his remark,) that the production of a good *general effect*, that is, a complete combination of all the parts of a picture in such a manner as pleasingly to attract the eye of the observer, and at once to convey the full interest and nature of the subject; is, when the work is composed of many parts, the most difficult branch of the art of painting. It becomes so, from the necessity of maintaining vigour and brilliancy in every part; yet, under the obligation of subduing some, in order to give more relief or more interest to the main point of the work, and by that means attracting and fixing the attention of those who regard it.

In a more confined sense, *effect in painting* is used to signify the *degree of relievo* of the objects of a picture, and the absolute truth of representation of nature in its individual parts. A painting is said to be wrought to great effect when every object appears to project strongly from the canvas; being rounded up with great care, and close imitations of the thing itself, whatever it may be; and thus effecting a degree of deception in the relievo. This kind of effect, however esteemed by some, is a great enemy to that more extended sense of it, in which it has been already described; as it is extremely difficult, if not impossible, to make every object so relievo, and yet maintain but one principal.

This inferior use of the word extends only to positive imitation, within the compass of an ordinary mind by diligent study to obtain. The other is in great measure ideal; and the painter is obliged, in order to produce it, to assist nature by art. It requires great science in the nature and effect of colours,

colours, of forms and the chiaro-oſcuro; ſo to arrange them that as little recourſe as poſſible may be had to artificial or ideal ſhadows; and, when neceſſary to introduce them, to give them their proper places. ſo as to make the principal maſs of a pleaſing form, and more agreeably to exemplify the ſubject of the work, and cauſe the obſerver to dwell with more conſtancy on thoſe parts that are immediately neceſſary for that purpoſe: thus, acting on that difficult, though requiſite principle of art, that of ſacrificing a part for the good of the whole.

Many painters are fully adequate to this latter and more confined ſenſe in which effect is underſtood, who are totally unequal to the production of works poſſeſſing that quality in its more general application. For inſtance, thoſe who paint dead game hanging againſt a deal board, may, and do, repreſent almoſt to deception thoſe objects of their ſtudy; but ſet them to produce a picture containing many groups of theſe ſame objects, and ſtill repreſenting the individual parts truly, with their uſual force and ſpirit; yet, for want of taſte and knowledge in the due ſubordination of parts requiſite to produce a perfect whole, they muſt of courſe preſent only a heap of confuſion, on which the eye finds no reſting place, but wanders from part to part, each having as much power to detain it as its neighbour; till at laſt the obſerver retires with fatigue and diſguſt, inſtead of dwelling on the work with pleaſure, as it does when a more ſkilful attention to general effects, inſtead of that of individual objects, takes place, and gives it repoſe by an union of harmony and propriety.

This abſolutely neceſſary quality in a perfect picture, taken in the ſenſe in which we firſt conſidered it, there is little or no reaſon to conclude, was ever in the contemplation of the ancient painters. The deſcriptions remaining of their works convey no idea of it, unleſs what Pliny ſays of the union and harmony of thoſe of Apelles may lead us to imagine they participated of it. But it is probable that he alludes only to the colouring, which, though a neceſſary part of a good effect, yet to be complete, it muſt have a ſufficient portion of judicious management of the chiaro-oſcuro united with it. In general, thoſe deſcriptions alluded to lead us to conclude, that their ſtudy was rather to give each figure its appropriate action and character in its full force, and that they generally produced ſomething more like the imitation of a bas-relief in ſculpture, than that of a picture poſſeſſing a good general effect, as at preſent underſtood.

On the revival of the art of painting, in the 13th century, it was quite as little, moſt probably ſtill leſs underſtood; till Fra. Bartolomeo and Lionardo da Vinci laid the foundation of the future attention ſo juſtly beſtowed on this valuable part of the art, as they were alſo, in fact, thoſe to whom we owe the firſt advancement of all that is valuable in it. Michael Angelo and Raffaelle caught ſomewhat of the feeling of effect from them, but not happily, and it never flouriſhed in the Roman or Florentine ſchools. The Carracci obtained more of it; and the Venetians improve upon it, particularly Giorgione and Titian, who raiſed highly the taſte for its beauties, by the truth and propriety of their works. The latter in a more ſuper-eminent degree, as the ſhort life of the former prevented him from carrying the great abilities he poſſeſſed ſo far as they appear to have been fully equal to, had he been longer ſpared to pleaſe and inform mankind.

The large work of Titian, the "Death of St. Peter, Martyr," has already been mentioned as an inſtance of grandeur and ſublimity of effect, which, in a greater or leſs degree, is the general characteriſtic of his pictures; but he ſometimes choſe the gay and luxuriant claſs of ſubjects, and in managing them produces, by his brilliancy of colour, by his clearneſs and brightneſs of chiaro-oſcuro, and the excelling power of his pencil in expreſſing his thoughts, great perfection in this branch alſo: a beautiful inſtance of which is the large picture of "Bacchus and Ariadne," now in poſſeſſion of the earl of Kinnaird.

It, however, was Correggio who carried the artifice of effect to its ultimate point. He had not the ſtrength of oppoſition of Titian, but his effects are more ſweet, more chaſte, more inviting, than thoſe of the latter. One general hue more abſolutely prevails, and the eye is more determinately led to the ſubject, not having that confuſion to contend with, which it neceſſarily finds where there is a greater variety of tones to diſturb its enjoyment. The artifice of Correggio is, however, more apparent than Titian's in his beſt works.

The Carracci, and their followers, by endeavouring to unite the valuable parts of both with the ſtyle of deſign of the Roman ſchool, fell gradually from good, to indifferent and bad; and it was with the Flemings and Dutch that effect was retrieved from the diſgrace the Italians were unable to prevent its falling into. Rubens, after ſeveral others who had great ſkill, burſt forth with aſtoniſhing ſplendour in his effects, and Rembrandt ſeconded him with a vigour till then unknown even by Correggio, but not, as has already been ſaid, with his grace and ſweetneſs. Many of Rembrandt's works are of extreme difficulty and beauty in their effects, and have a brilliancy of light almoſt rivalling that of nature. Many of his followers diſtinguiſhed themſelves by treading in his ſteps, and ſucceeded happily in their arrangements; and moſt of the painters of that country, notwithſtanding the vulgarity of the ſubjects they choſe, faſcinate, by the ſkilfulneſs of their general effects, no leſs than by their laborious imitation of the ſubject-matter of their pictures.

In England the art of painting was reſcued, and in this part more particularly by ſir Joſhua Reynolds, from the low ſtate in which it was grovelling: the ſkill and taſte of this great man enabled him to produce effects inferior to none in beauty, grace, and elegance. His pictures ſeldom or never fail to attract and gratify, at a caſual view, however ſlight and unfiniſhed they may appear on a cloſer inſpection; and in ſome of his moſt highly ſtudied works he is equal to the beſt, having made the happieſt imitations of the beauties of others, and ſuperadded a grace peculiarly his own.

EFFECTS, in *Commerce*, &c. the goods poſſeſſed by any perſon, whether moveable or immoveable; particularly thoſe which merchants and dealers acquire by trade. See CHATTELS.

The effects of merchants are uſually diſtinguiſhed into three claſſes, good, bad, and doubtful. By an ordonnance of the French court in 1673, every merchant is obliged to take an inventory or review every year of all his effects of every kind.

EFFECTS, *Vacant*. See VACANT.

EFFECTIONS, in *Geometry*, the geometrical conſtructions of propoſitions.

The term is alſo uſed in reference to problems and practices; which, when they are deducible from, or founded upon, ſome general propoſitions, are called the *geometrical effections* thereof.

EFFECTIVE, in a *Military Senſe*, applies to ſuch individuals in a company, regiment, or body of troops, as may be capable of acting efficiently in their ſeveral ſtations: thus, we ſay, four thouſand ſix hundred and forty-five *effectives*; meaning ſuch as are fit for ſervice, and totally excluding all who from wounds, ſickneſs, or other cauſes, are not qualified to appear in the ranks. In the returns of battalions, a diſtinction

diſtinction is made between ſuch as are included in the numeral ſtrength of the corps, and ſuch as are enrolled beyond the ordinary number of rank and file. Thus, when an adjutant or a quarter-maſter is attached to any particular company, wherein he occupies the place of lieutenant, or enſign, he is ſaid to be *effective ſtaff;* that is to ſay, he is on the *numeral-effective* ſtrength of that company, and not enrolled abſtractedly from any company in the regiment. Conſequently, he ſtands in the way of promotion, and cauſes leſs than in which he is enrolled to have one efficient officer leſs than any other company. On the other hand, when ſuch a ſtaff officer appears only on the liſt of ſtaff in a regiment, without being enrolled in any company, he is ſaid to be *non-effective*, becauſe he forms no part of the complement of any company, all being completed with efficient officers, to the total exemption of ſuch ſtaff-officers. When there are officers, or men, beyond the regulated number, ſuch are called *ſupernumeraries*. Whether an officer be *effective*, *non-effective*, or *ſupernumerary*, his promotion proceeds alike; ſuch matters having no relation whatever to his army, or to his regimental rank. Hence, *ſupernumerary* officers are a great detriment to the promotion of the *effectives;* and this was at one time ſo ſeverely felt, that, in order to do away the uneaſineſs felt by the latter, the ſeveral regiments had an additional number of field officers appointed, partly tellers from the *ſupernumerary* liſt, and filled up from the *effective* officers. Theſe were called *en ſecond*, a term taken from the French ſervice, in which thoſe officers who diſtinguiſhed themſelves were promoted over the heads of ſeniors of their reſpective ranks in the ſame regiments, but had no additional pay. In ſome inſtances, thoſe who had been thus ſuperſeded regained their priority of rank, on being promoted to the ſame claſs with their ſucceſſors. Of late this has been diſcontinued, owing to its being conſidered a grievance, and ſuch meritorious individuals as pre-eminently diſtinguiſh themſelves, are removed to the legion of honour; thus rewarding the brave, and opening a channel for the promotion of the *effective* officers of the corps. When a battalion is weak in officers, it is common to appoint the adjutant and the quarter-maſter, if they are old officers, to the charge of companies; but this by no means alters their deſignation of *non-effectives;* in fact, temporary derangements in the economy, or in the ſtrength of a regiment, cauſe no change in the eſtabliſhments of the ſtaff.

EFFELDER, anciently called *Affaltere*, in *Geography*, a ſmall town of Germany, in the duchy of Saxe Cobourg, with an old caſtle belonging to the duke of Saxe Gotha. It reckons about 300 inhabitants, and has a conſiderable manufacture of tiles.

EFFEMINATE, Effeminati, according to the Vulgate, are mentioned in ſeveral places of ſcripture. The word is there uſed to ſignify ſuch as were conſecrated to ſome profane god, and proſtituted themſelves in honour of him.

The Hebrew word, *kadeſh*, tranſlated *effeminatus*, properly ſignifies *conſecrated*, and hence was attributed to thoſe of either ſex, who publicly proſtituted themſelves in honour of Baal and Aſtarte.

Moſes expreſsly forbids theſe irregularities among the Iſraelites; but the hiſtory of the Jews ſhews, that they were notwithſtanding frequently practiſed. Levit. xxiii. 18.

EFFENDI, in the *Turkiſh Language*, ſignifies *maſter;* and accordingly it is a title very extenſively applied; as to the mufti and emirs; to the prieſts of moſques, to men of learning, and of the law. The grand chancellor of the empire is called *rei-effendi*. See Kodja.

EFFERDING, or Efferting, in *Geography*, a ſmall town of Auſtria, not far from the Danube, in that part of Upper Auſtria which is called the Hauſruck quarter, in the diſtrict which goes by the name of Donauthal, or valley of the Danube; nine miles W. of Lintz. It has an ancient caſtle.

EFFIAT, a ſmall town of France, in the department of the Cantal; ſix miles S.E. of Montpenſier.

EFFERVESCENCE, is popularly uſed for a light ebullition, or a briſk inteſtine motion produced in a liquor by the firſt action of heat, without any notable ſeparation of its parts. See Boiling.

Effervescence is a ſudden and rapid diſengagement of gas, taking place within a liquid and ſeparating from it with a hiſſing noiſe. The gas of effervescence is produced by ſimple or compound elective affinity, and is always a ſign of chemical action. In the former caſe, it is, for the moſt part, carbonic acid, and in the latter it is either nitrous gas or hydrogen. It is manifeſt that the gas muſt have little or no affinity with the fluid in which it is immerſed, in order to produce effervescence: hence it is, that though carbonic and muriatic acids are each of them, when dry, in the form of gas, and are both extricated from their alkaline combinations by ſulphuric acid, yet a ſolution of carbonat of potaſh in water ſhall produce with ſulphuric acid a vehement effervescence, while muriat of potaſh, in the ſame circumſtances, ſhall produce none at all; the carbonic acid having little or no affinity for water acidulated by ſulphuric acid, while the muriatic acid will combine with the ſame very readily.

EFFICACIOUS, Effectual, in *Theology*. Within theſe two centuries there have been great diſputes on the ſubject of efficacious grace. Grace is uſually divided into ſufficient and efficacious; though the Janſeniſts hold that there is no grace ſufficient but what is efficacious, *i. e.* but what effectually determines the will to act.

Efficacious grace is that which enlightens the mind, and touches the heart, in ſuch a manner, as always to produce its effect, however it be oppoſed or reſiſted by the will. See Grace.

Some divines maintain that efficacious grace is efficacious of itſelf. Efficacious grace of itſelf, if there be any ſuch thing, is that which produces its effect merely of itſelf, and not in virtue of any conſent of the will. Calvin is the firſt that uſed the term, *gratia efficax per ſe*, "grace efficacious of itſelf."

A late divine holds the efficacy of grace in itſelf to conſiſt in this: that efficacious grace is always joined with a moral neceſſity of doing the thing it inclines to; and ſufficient grace, joined with a moral impotence of doing it. The Arminian and Popiſh way of conceiving the neceſſity of efficacious grace, is, that this grace is never wanting, at leaſt to the righteous, except through their own default; that they always ſtand in need of other inner graces truly and properly ſufficient, in order to draw down this efficacious grace; and that theſe do infallibly draw it down, when they are not rejected, though they often remain without effect, becauſe men reſiſt, inſtead of yielding their conſent to it.

F. Malebranche maintains, that the mutual commerce between ſoul and body, *i. e.* life, has no other vinculum or principle but the efficacy of God's decrees; and that ſecond cauſes have no proper efficacy, &c.

EFFICIENT, in *Philoſophy*. An efficient cauſe is that which produces an effect. See Cause.

Philoſophers uſually diſtinguiſh four kinds of cauſes in nature; the *efficient*, *final*, *formal*, and *material*. See each under its proper article.

The ſchool philoſophers are exceedingly divided as to the

nature and essence of an efficient cause. Aristotle defines it, *id unde*, "that from which;" or the first principle of change and rest, *i. e.* of production and conservation.

The efficient is called *id unde*, "that from which;" as the end or final cause is that *propter quod*, "for which;" the exemplar, *ad quod*, "that to which;" the matter *ex quo*, "that out of which;" and the form, *per quod*, "that by which." Others of the schoolmen define efficient to be "principium per se influens in aliud sine mutatione sui." The Ramists, after Plato and Cicero, define an efficient to be that, *a qua res est*, "from which a thing is;" to which a great author objecting, that a thing may be also from its end, adds that an efficient is that, "a qua res vera causalitate proficiscitur." Others define efficient to be, *quæ per actionem causat*, "that which causes by acting;" for to effect, every body knows is to act. Lastly, others define an efficient to be a cause, *a qua aliud producatur*, "from which something is produced:" consequently what arises from such a cause is called an effect; and thus God is the efficient cause of the world, and the world the effect of God: to which definition of an efficient, all the former definitions are reducible.

An efficient cause, which most properly deserves the name of a cause, because it produces the effect by some sort of active power or natural agency, is either physical, as the fire is the efficient cause of heat; or moral, as an adviser is the cause of a murder; or universal, which in various circumstances produces various effects, as God and the sun; or particular, as a horse which produces a horse; or univocal, which produces an effect like itself, as a horse begets a horse; or equivocal, according to the old doctrine, as the sun producing a frog: or natural, which acts not only without precept in opposition to artificial, but also from within, and according to its own inclination, in opposition to violent, as fire acts when it warms; or spontaneous, as a dog eating; or voluntary and free.

Others consider efficient causes, either as principal, or as instrumental: others, either as next or remote, or as mediate or immediate; others, in fine, divide efficient causes among all the kinds of beings, natural and supernatural, spiritual and corporeal, substantial and accidental, vital and not vital, &c.

But the most celebrated division of efficients is that into *first* and *second*.

A first efficient cause is that between which and the effect there is some necessary connection: of which kind there is none but God alone.

A second efficient cause is that from which an effect follows in consequence of the will or constitution of the Creator, and which the Cartesians call an *occasional cause*.

But these precarious or occasional causes are, in reality, no causes at all, but only antecedent effects. This is easily shewn; for, 1. All action, at least all corporeal action, is contained in motion; but motion can only result from the first cause, it being an allowed principle, that body of itself is inert and inactive. The true cause of motion, therefore, is a spiritual not a corporeal nature. 2. But neither can a finite spiritual nature be the chief cause of motion; for there is no necessary connection between the will, *e. gr.* of an angel, and the motion of a body, nor between that of any other being except God. Thus, when an angel wills, a stone moves, because God has constituted such a law between the will of the angel and the motion of the stone; and thus we move our hands when we please; not that the soul is the principal cause of motion, but only the occasional cause. See CAUSE.

EFFICIENTS, in *Arithmetic*, the numbers given for an operation of multiplication, called also the *factors*. See FACTOR and COEFFICIENT.

The efficients are the multiplicand and multiplier.

EFFIGY, EFFIGIES, a portrait or representation of a person to the life. See PORTRAIT.

EFFIGY, is also used for the print or impression of a coin, representing the prince's head who struck it.

EFFIGY, *to execute or degrade in*, denotes the execution or degradation of a condemned, contumacious criminal, who cannot be apprehended or seized.

In France, they hang a picture on a gallows or gibbet, wherein is represented the criminal, with the quality or manner of the punishment: at the bottom is written the sentence of condemnation. Such persons as are sentenced to death are executed in effigy.

EFFINGHAM, in *Geography*, formerly *Leavitstown*, a township of America, in Strafford county, New Hampshire, S.E. of Ossipee pond, in Ossipee river, incorporated in 1766, and containing 451 inhabitants.

EFFINGHAM, a county of America, in the lower district of Georgia, bounded by Savannah river on the N.E., which separates it from S. Carolina, by Ogechee river on the S.W. which divides it from Liberty county. It contains 2072 inhabitants, including 762 slaves. Its chief towns are Ebenezer and Elberton.

EFFLORESCENCE, of *ex*, *out*, and *flos*, *flower*, in *Botany*, denotes the blooming of a flower.

EFFLORESCENCE, is the formation of a powdery crust, or of minute spicular crystals on the surface of any substance. It is applied in *Chemistry* to two distinct, and, in some degree, opposite phenomena, which it is of consequence to be aware of. Those salts, which, during crystallization, combine with a large proportion of water, are very apt, on exposure to a dry air, to lose a part of their moisture, in consequence of which they are at first superficially, and afterwards entirely reduced to powder. This effect, at least in its commencement, is called efflorescence. But there is another kind of efflorescence wholly distinct from this, as when we speak of the efflorescence of iron pyrites or of new mortar: in these cases it implies the appearance of a superficial covering of minute hair-like crystals, and is occasioned by the chemical changes that take place on the surface of the substance where these crystals appear. Thus sulphuret of iron is changed by efflorescence into sulphat of iron, or green vitriol: whereas sulphat of soda, when subjected to the kind of efflorescence first mentioned, although changed in form, remains the same in composition, except that it has lost part of its water. The one destroys crystals, the other produces them.

EFFLORESCENCE, in *Medicine*, a redness, or eruption on the skin, from *flos*, *a flower*. It is synonymous with *Exanthema*, which is from the Greek ἄνθος, also signifying *a flower*. See EXANTHEMA.

EFFLUI, in *Geography*, a town of Norway; 32 miles N. of Christiansand.

EFFLUVIA, fluxes, or exhalations of minute particles from any body: or emanations of subtle corpuscles from a mixed sensible body, by a kind of motion of transpiration.

Odoriferous bodies, every one knows, are continually emitting substantial effluvia, by means of which they excite in us the sense of smelling. These minute effluvia are sometimes perceived by the eye, in form of fumes and vapours.

Some bodies are found to emit effluvia for a great number of years, without any considerable loss, either as to bulk or weight; as different odorous bodies, the tenuity of whose emanent corpuscles is incredible; not but that the loss they sustain by the continual emission of effluvia may be made up

to

to them by the reception of other similar effluvia of the same kind of bodies diffused through the air.

It is added, that these effluvia are emitted in manner of *radii*, rays, *in orbem;* and the circumference or bound of the activity of the radiation exhibits the same figure as is that of the radiant. This the astronomers sufficiently prove, from the ratio of the refraction of the atmosphere. For the law of the emission of these effluvia, see QUALITY.

The effluvia may considerably operate upon and have great effects on bodies within the sphere of their activity, is proved by Mr. Boyle, in an express Treatise on the Subtilty of Effluvia; where he shews, 1. That the number of corpuscles, emitted by way of effluvia, is immensely great. 2. That they are of a very penetrating nature. 3. That they move with vast celerity, and in all manner of directions. 4. That there is frequently a very wonderful congruity, or incongruity, in the bulk and shape of these effluvia, compared with the pores of the bodies they penetrate into and act upon. 5. That in animal and organical bodies particularly, these effluvia may excite great motions of one part of the frame upon another, and thereby produce very considerable changes in the economy. Lastly, that they have sometimes a power of procuring assistance in their operations from the more catholic agents of the universe, such as gravity, light, magnetism, the pressure of the atmosphere, &c.

That effluvia are emitted to very great distances, we have a notable proof in odoriferous effluvia being in many cases perceived at the distance of many leagues. Again, that the generality of effluvia retain the proper colour, smell, taste, and other properties and the effects of the bodies whence they proceeded, and this even after they have passed through the pores of other solid bodies, we have abundant proof. And the same we see confirmed in sympathetic inks and powders, and in the sagacity of bloodhounds, &c.

The wonderful extension of effluvia, and the small diminution of the body they issue from, is one of the strangest problems in physics.

The determinate natures of effluvia, according to the principal instances we have of them, are reducible to these three heads: 1. That these effluvia being by condensation, or otherwise reunited, they appear to be of the same nature with the body that emitted them. 2. Their determinate nature may be sometimes discovered by the difference that may be observed in their sensible qualities; forasmuch as those effluvia which are endowed with them proceed from the same sort of bodies, and yet those afforded by one kind of bodies being in many cases manifestly different from those which fly off from another; this evident disparity in their exhalation argues, that they retain distinct natures, according to the nature of each body from which they proceed. 3. We may discover this different nature of effluvia from their effects upon other bodies than the organs of our senses; considering that the effects which certain bodies produce on others by their effluvia, being constant and determinate, and always different from those which other agents produce by their emissions on the same or other subjects, the distinct nature of the corpuscles, emitted on this occasion, may be sufficiently judged of, were it only from this. Boyle "On Effluvia."

EFFLUVIA, in *Medicine*, are those animal and vegetable exhalations which give rise to various diseases of the febrile kind.

These effluvia arise, as we have just stated, from two different sources, and produce different diseases, according to their origin from the animal body, when they are termed *contagious* effluvia; or from the remains of vegetable matter, especially in combination with moisture, as in fens and marshes, when they are usually termed *marsh miasmata*. The effluvia from the animal body, or contagious effluvia, produce *continued* fevers; as the typhus, the ship, gaol, hospital, and other malignant fevers; or the various eruptive fevers, as small-pox, measles, scarlet-fever, chicken-pox, &c. The effluvia of vegetable origin, as the marsh miasmata, give rise to fevers of the *intermitting* and *remitting* class; as the tertian, quartan, and quotidian ague; and the remittent fevers occurring in camps, and in hot and moist climates.

With respect to the animal, or contagious effluvia, it has already been observed, that they are produced in three ways. 1. The natural and healthy effluvia, or insensible perspiration of the human body, when accumulated and confined in a close and ill-ventilated place, become vitiated, and acquire a contagious property. 2. Where people, labouring under any diseases, especially of the febrile kind, are crowded together in great numbers, or in close apartments, the effluvia arising from their bodies are more readily rendered contagious, than in the former case; and the effluvia from the bodies of those already affected with malignant, or eruptive fevers, are always contagious. And, 3. Contagious effluvia are said to have been occasionally sent forth from putrefying animal matter. Of all these modes, in which contagious effluvia originate, examples were formerly adduced. See CONTAGION.

Of the vegetable effluvia, or marsh miasms, we shall have occasion to speak in detail, under the head of *Intermittent* FEVER. See also MIASMATA.

It may be observed, that, after the discovery of the composition of the atmosphere, and of the chemical means of investigating the properties of every species of gas, or air, great hopes were entertained by some speculative physicians, that the power of detecting the presence of these contagious effluvia, which contaminated the air with contagion, would be by those means attained; and Dr. Mitchell, an American, imagined that he had detected this principle of contagion in the nitrogen, or azotic gas, which he thence denominated *septon*, considering it also as the principle of putrescency. But these hopes and speculations were premature and visionary. It has been found, that, so long as the atmosphere retains the due proportion of its component parts, of oxygen and azote, it may, nevertheless, be greatly impregnated with contagious effluvia, which escape the detection of chemical tests, and are not cognizable by the eudiometer: it has been found, too, that even chemistry does not enable us to discover any very material difference between the air abroad, and that in a heated and crowded room, nor any whatever between the air of the country and of the town. In short, the salubrity, or insalubrity of the air we breathe does not depend so much, in general, upon that arrangement of its component parts, which chemistry alone enables us to detect, (we except the occurrence of damps in mines, &c.) as upon the intermixture of those effluvia, which do not change its chemical properties.

EFFLUXION, a flowing out, from *ex*, *out of*, and *fluere*, *to flow*.

EFFOYES, in *Geography*, a town of France, in the department of the Aube; 3 leagues E. of Bar-sur-Seine.

EFFRACTURA, (from *effringo*, *to break down*,) a kind of fracture, in which the bone is much depressed by the blow.

EFFRONTES, in *Church History*, a sect of heretics, in 1534, who scraped their forehead with a knife till it bled, and then poured oil into the wound. This ceremony served them instead of baptism. See BAPTISM.

They

They are likewise said to have denied the divinity of the Holy Spirit.

EFFUSION, the pouring out of any liquid thing with some degree of force.

In the ancient heathen sacrifices there were divers effusions of wine, and other liquors, called *libations*.

Effusion, or *Fusion*, in *Astronomy*, denotes that part of the sign Aquarius, represented on celestial globes and planispheres, by the water issuing out of the urn of the water-bearer. See Aquarius.

EFFUSION, in *Medicine*, relates to various fluids which are poured out into the different cavities of the body, and upon the surfaces of different parts. Effusions of coagulable lymph are usually the result of inflammation, especially of membranous parts, and the appearance of layers of this portion of the blood after death is generally deemed a sufficient criterion of the previous existence of inflammation. This effusion is discovered on the membranes of the brain, in phrenitis; on the pleura and lungs, after pleurisy; in the wind-pipe, after croup; and so on: and it is through the medium of this effusion, that adhesions between inflamed membranes, and other parts, are effected. Thus, when the peritonæum is inflamed, it sometimes becomes glued to the intestines; the lungs to the ribs, in pneumonia, or catarrh; and sometimes suffocation is produced, in peripneumony, from the quantity of this effusion into the substance of the lungs. In a word, it is by this effusion of lymph that nature unites recent wounds, suppresses hæmorrhages, obliterates vessels bound by ligature, and effects other important changes in the animal economy.

Effusions of serum, or the watery part of the blood, into the different cavities of the body, or the interstices of the cellular membrane, constitute the various modifications of Dropsy; which see. Sometimes blood itself is effused into different parts of the body: when under the skin, if in the form of spots, it constitutes *petechiæ*; if in broader patches, *ecchymoses*, or *ecchymomata*; if in stripes, like the strokes of a whip, *vibices*. These occur in malignant fevers, and in purpura and scurvy they are the leading and most obvious symptoms.

Effusion. This word, in *Surgery*, signifies the escape of any fluid out of the vessels, or viscera, naturally containing it, and its lodgment, either in another cavity in the cellular substance, or the substance of parts. Thus, when the chest is wounded, blood is sometimes effused from the vessels into the cavity of the pleura; in cases of false aneurism, the blood gets out of the artery into the interstices of the cellular substance; in cases of fistulæ in perinæo, the urine gets from the bladder and urethra into the cellular membrane of the perinæum and scrotum; and when great violence is applied to the skull, blood is often effused even in the very substance of the brain.

Effusion also sometimes implies an oozing, or separation of some fluid, from vessels, which have not been ruptured. Thus, in cases of inflammation, surgeons frequently speak of coagulating being effused on different surfaces, and in the internal texture of the parts affected.

Effusion *of Blood*, *effusio sanguinis*, in our *Old Writers*, is used for the mulct, fine, or penalty, imposed for the shedding of blood. This the king used frequently to grant to lords of manors. Among others it was granted to the abbot of Glastonbury.

EFLANI, in *Geography*, a town of Asiatic Turkey, in the province of Natolia; 32 miles E.S.E. of Amasieh.

EFNANLU, a lake of Asiatic Turkey, in Natolia; 36 miles W. of Boli.

EFRIM, a town of Egypt; 27 miles E.S.E. of Alexandria.

EFT, or Eff, in *Zoology*, the name of a creature very common in all parts of England, and called also *newt*, and the *swift*, and by others the *common lizard*, *lacerta vulgaris*. See Lacerta.

The beak, or snout, of this creature is oval and obtuse; its back of a rusty-iron colour; its feet have each five toes, and are armed with very sharp though small claws. That toe which is in the place of the fore finger with us is the longest of all; and that which answers to our thumb is placed lower. Ray's Syn. Quad. p. 264.

We have several species of this animal with us. 1. The common land eft, with the black spotted belly. 2. The snake-like eft, which is frequent in our heaths. 3. The small brown land eft. This is very scarce. 4. The yellow scaly land eft, described by Plott in his History of Staffordshire. And, 5. The brown and black spotted water eft. Plott's Staff. p. 252.

The land eft, or, as the naturalists often call it, the land *salamander*, has something very remarkable in its outer coat. Its skin often appears dry, like that of the lizard kind, but often also it appears wetted, and as if covered with a fine shining varnish; the change from one to the other of these states is usually performed in an instant, and it frequently becomes immediately wet all over on touching it. It also contains, under the skin, a sort of milky liquor, which spurts out to a distance on pressing the body of the animal.

The passages for this milk are, a vast number of pores, or holes, many of which are plainly visible to the naked eye; and very probably the first-mentioned liquor, which covers the skin in manner of a varnish, may be the same with this, its white colour not being distinguishable when it is spread so thin over the surface of the animal. This milk resembles very much the milky juice which the tithymals, and many other of the succulent plants, afford on being cut, or broken. It is of an insupportably acrid and styptic taste; and though the tongue receives no injury from touching it, yet the sensation is so violent, that one is apt to imagine there must be a wound made in it. This animal, when bruised, yields also a very disagreeable smell.

It has generally been supposed, that this animal is of a poisonous nature; and the famous salamander of the old writers seems to be of the same genus, if not the same animal. Mr. Maupertuis, determined to inform the world of the truth in regard to these remarkable particulars, caused a larger number of these animals to be brought to him, which the country people, who had caught them about the bottom of old walls, brought to him with as much caution as if they had been vipers.

From his trials, it appeared very evident, that the stories of this creature's being poisonous, are as idle and groundless as those of its living in the fire.

One thing remarkable this gentleman observed in his dissections of the animal, which was, that he found in several of the females, at once, clusters of eggs, and living young ones. The eggs formed clusters resembling those of the ovaries of birds, and the young ones were contained in two tubes, or long pipes, the coats of which were perfectly transparent, and the young ones were easily distinguished through them; and there were counted in one female fifty-four of these, all living and vigorous. Med. Acad. Par. 1727.

The water eft affords an excellent opportunity of seeing the circulation of the blood by means of the microscope, particularly of the solar one. By this apparatus, the vessels are seen beautifully delineated on the skin; and the rude of blood, in the large ones, is equal to that of the stream of water

water which is ſhewn in hydroſtatical experiments thrown out of a veſſel by condenſed air. In either of theſe caſes, you can ſee no appearance of ſeparate drops, or globules, but the whole forms one continued body. In the leſſer veſſels the globules are ſeen paſſing along very ſwiftly, yet evidently ſeparate from one another.

It is remarkable, that in the tail of this animal there ſeem a greater number of veſſels than are immediately neceſſary to the circulation of the blood; for, when thus examined, there will be often ſeen two parallel veſſels, in one of which only the circulation is performed, and this ſucceſſively in one and the other of the veſſels, the tide often leaving the one wholly empty, which had just before been full, and circulating in the other. Phil. Tranſ. N° 460. p. 728.

Eft-*Stones*, in the *Materia Medica* of the American Indians, a name given to certain ſtones, ſaid to be found in the ſtomach of a certain ſpecies of water newt, or eft, in the manner of the bezoars in other animals. The waters of Braſil, Cuba, and Mexico, abound with this ſpecies of eft; but it does not ſeem well atteſted, that this ſort of ſtone was ever found in any of them by thoſe who have diſſected numbers of them, on purpoſe to ſearch for it. We have in Europe ſwallow-ſtones, and other ſuch things, whoſe names, and their fabulous hiſtories, would import their being produced in animals. As many ſwallows have been deſtroyed in England in looking for theſe ſtones, as newts in Mexico in looking for thoſe; and by the appearance of the American as well as the European ſtones, they both ſeem to be dug out of the earth, and to have been once the teeth, or other parts of fiſhes. Redi, Experim.

The virtues of the eft-ſtone of Mexico are celebrated by Ximenes, and all others who have been upon the ſpot. It is ſaid to be a certain remedy for the gravel, and all other nephritic complaints, and even to break and diſſolve the ſtone when already concreted in the bladder. But this account of its virtues ſeems as improbable as that of its origin. Redi tried theſe and many other ſtones of famous character among writers, and found no effect in any of them. Theſe eft-ſtones never produced any viſible effect in his trials, in nephritic complaints, nor the eagle-ſtone in women's labour, nor the ſtones ſwallowed by Caymans in quartans, though Menardes looks on theſe laſt as infallible in this caſe.

EGA, in *Geography*, a river of Spain, which runs into the Ebro, about a league below Calahorra.—Alſo, a town of Portugal, in the province of Beira; 7 miles S.S.W. of Coimbra.

EGABRA, in *Ancient Geography*, a town of Spain, in Boetica; now *Cabra* in Andaluſia.

EGAKTO, in *Geography*, one of the ſmaller Kurile iſlands, in the North Pacific ocean. N. lat. 49° 5′. E. long. 154° 44′.

EGBEL, a town of Hungary; 8 miles W. of Topaltzen

EGBERT, in *Biography*, the firſt king of England, was deſcended from the Saxon princes who eſtabliſhed themſelves in this country, and a branch of the royal family of the kingdom of Weſſex. He had, towards the end of the eighth century, withdrawn into France, ſeeking an aſylum in the court of Charlemagne. Here he was received with hoſpitality, and ſerved in the armies of that monarch, where he acquired thoſe talents which rendered him ſuperior to all his Saxon countrymen. In the year 800 he accepted the invitation of the nobles of Weſſex, and became their king. His firſt employment was againſt the Britons in Cornwall, whom he defeated in many battles. He went on conquering till he finally united the whole heptarchy under his ſovereign authority. This event, which gave political conſequence to England, took place in 827. His government was quiet with regard to his own ſubjects, but the Danes made many incurſions againſt England, which were long a ſource of great calamity to the country. In 832 they plundered the iſle of Sheppey; they next landed on the coaſt of Dorſet, where they were met by the king, and driven to their ſhips with much loſs. In the midſt of his warlike cares Egbert cloſed his life in the year 838, and left the government to his ſon Ethelwolf, who was perfectly unequal to the duties devolved upon him. Hume's Hiſt. vol. i.

EGEDE, Hans or John, ſuperintendant of the Daniſh miſſion in Greenland, was born in the year 1686, and at the age of 21 he became preacher at Bogen, in Nordland. Soon after he formed the project of converting the Greenlanders to the Chriſtian religion, for which purpoſe he went to Greenland, eſtabliſhed the Daniſh miſſion, and employed himſelf in the work with much zeal during fifteen years. He died in 1758, leaving behind him a good deſcription of the natural hiſtory of Greenland, which has paſſed through ſeveral editions, and has been tranſlated into the Dutch and French languages. The edition of 1763, printed at Geneva, was illuſtrated with a map and 10 plates. His ſon Paul, from the age of 12 years, was one of his moſt active aſſiſtants: Denmark was indebted to him for the ſucceſs of its colony at Greenland; and the inhabitants of that deſolate country are under great obligations to him for the anxiety which he felt, and the pains which he took to promote their welfare and comfort. He kept a journal from his twelfth year till his eightieth, which is ſaid to contain a multitude of curious facts reſpecting the Greenlanders, their manners and cuſtoms, and the ſuperſtitious notions which they entertain. He died in June, 1789. Gen. Biog.

EGEK, in *Geography*, a town of Hungary; 8 miles E. S. E. of Levens.

EGELESTA, in *Ancient Geography*, a town of Spain, S.W. of Lobetum.

EGELN, in *Geography*, a town of Germany, in Lower Saxony, and duchy of Magdeburg; 16 miles S.W. of Magdeburg.

EGENBURG, a town of Germany, in the archduchy of Auſtria; 12 miles S.W. of Znayen, and 36 N.W. of Vienna.

EGER. See Drammen.

Eger, *Egra*, or *Cheb*, a handſome town of the empire of Auſtria, in the kingdom of Bohemia, in the territory of the ſame name, ſituated on the river Eger, on the boundaries of Franconia; 120 miles W. of Prague, and 250 N.W. of Vienna. E. long. 12° 30′. N. lat. 50° 2′. It is conſidered as next to Prague in point of importance, and remarkable for its mineral waters.

EGER-HORN, one of the *peaks* of the Wetterhorn group of mountains in Switzerland; which borders on the valley of Grindelwald, and ſlopes gradually from barren rock and ſnow to fertility and cultivation. There are two high pyramids, which tower near the Jungfrau, called from their poſition the exterior and interior Egers. The ſubſtance of theſe mountains is granite, covered with calcareous ſtone lying on reddiſh ſlate, which in many places forms a ſpecies of breccia, compoſed of an argillaceous baſe, covered with calcareous fragments. The height of the Eger is 13,086 Engliſh feet.

EGERI, a diſtrict of the canton of Zug, in Switzerland. See Zug.—Alſo, a lake, 8 miles S.E. of Zug.

EGERMINATE, of *ex*, *out*, and *germen*, *bud*, in *Botany*, ſignifies to bud or ſpring out.

EGERO,

EGERO, in *Geography*, a ſmall iſland near the coaſt of Norway, in the North ſea; 24 miles S. of Stavanger.

EGERTON, Thomas, in *Biography*, viſcount Brackley, was born in Cheſhire about the year 1540, and admitted commoner of Brazen-noſe college in Oxford, in 1556. Here he laid the foundation of learning, and removed to Lincoln's inn, where he applied with much diligence to the ſtudy of the law, and became a noted counſellor. In 1581 he was appointed ſolicitor general to queen Elizabeth, and in the following year he was elected Lent reader of Lincoln's-inn, and one of the governors of that ſociety. In June 1592 he was made attorney-general, and ſoon after received the honour of knighthood. The maſterſhip of the Rolls was conferred on him in 1593, and in 1596, by the queen's ſpecial favour, he received the ſeals, with the title of lord-keeper. He was, at the ſame time, ſworn of the privy-council. Few perſons have enjoyed their advancement with more general approbation than this eminent lawyer. He was conſulted and employed on all weighty affairs of ſtate. He acted as a true friend to the earl of Eſſex, endeavoured to mitigate the impetuoſity of his temper, and to render him ſubmiſſive to the higher powers. When the earl proceeded to open inſurrection, the lord-keeper Egerton was ſent, with others, to Eſſex houſe, to know the meaning of the tumultuous aſſembly held there. He commanded them to lay down their weapons and depart, which they not only refuſed, but held the delegates as priſoners, while Eſſex, with his aſſociates, made their laſt attempt to raiſe the city. (See Devereux.) Upon the death of Elizabeth, her ſucceſſor James I. ſignified his pleaſure that ſir Thomas Egerton ſhould continue to exerciſe the office of lord-keeper. Soon after he created him baron Elſemere, for his faithful ſervices to the late queen and himſelf; and immediately afterwards conſtituted him lord high chancellor of England, an office which he held above 12 years with dignity and reputation. In 1610 he was elected chancellor of the univerſity of Oxford, the duties of which he performed with much honour to himſelf and with advantage to the church of England. His health began to decline about the year 1615, when he was attacked by ſir Edward Coke in an affair relative to an interference of the court of chancery in a matter of common law. The caſe was argued before the king, aſſiſted by ſeveral eminent lawyers, who decided in favour of the chancellor. He was ſoon after appointed high ſteward at the trial of the earl and counteſs of Somerſet, for the death of ſir Thomas Overbury, and after the earl's conviction, he ſteadily refuſed to affix the great ſeal to the pardon extended to him by the king. His age and growing infirmities induced him to ſolicit his diſmiſſion from the office of chancellor, with which the king complied, though with much regret; at the ſame time raiſing him to the ſtyle and title of viſcount Brackley. He died at York-houſe in the Strand, March 15, 1617, in the 77th year of his age: and the earldom of Bridgewater was conferred on his ſon as a reward of his father's virtues. This worthy man, and excellent lawyer, was in his diſpoſition open and ſincere; in his adminiſtration honeſt and upright. He was a zealous and faithful ſervant of the crown, and did not ſcruple to give his ſovereign James the moſt wholeſome advice on many very important topics. His private character was virtuous and honourable. In his life-time was printed a ſpeech which he delivered in the Exchequer chamber, in Robert Calvine's cauſe; and after his death appeared his "Privileges and Prerogatives of the high court of Chancery"; and his "Obſervations concerning the Office of lord chancellor." He left his chaplain, Mr. (afterwards biſhop) Williams, four MS. collections, relating to the prerogative royal;—the privileges of parliament;—the proceedings in chancery;—and the power of the ſtar-chamber: which are ſuppoſed to have been the chief ſource of that prelate's legal and political knowledge. He was thrice married, and left behind him John, afterwards earl of Bridgewater, and Mary, married to ſir Francis Leigh. Biog. Brit.

EGESTION, from *egero*, *I caſt out*, in *Medicine*, the ſame with dejection.

EGG, in *Comparative Anatomy*. Under this term might be deſcribed, without impropriety, the parts immediately ſubſervient to the developement and growth of the embrio in all animals, even in thoſe which are called viviparous; but as the Engliſh word *egg* is only in common uſe for the ovum of *birds*, we ſhall at preſent confine ourſelves to a deſcription of it in that claſs of animals, and refer our readers for a more general account of the ſubject to the article Ovum, in *Comparative Anatomy*.

The parts entering into the compoſition of the egg of birds are, the *ſhell*, the *membranes*, and the *humours*, or rather *ſemi fluid ſubſtances*.

The *form* of the egg in moſt birds is not an exact oval, although that figure appears to have derived its name from its cloſe reſemblance to the ſhape of the ovum in birds. Eggs, having one of the ends ſmaller, or more pointed than the other, allow a larger number of them to be placed in the neſt, than if each were a perfect ellipſis, the variety in the ſhape of the ends being applicable to the different ſized angles left by the irregular appoſition of a number of round ſurfaces to each other. The uſual form of eggs would ſeem to be deſigned to render this arrangement in the neſt more compact during incubation, as, where the bird lays but few eggs, they commonly poſſeſs more ſtrictly the oval figure; and the eggs of the oſtrich, which, from the temperature of the climate, do not require the conſtant incubation of the parent, are of a ſhape between a ſphere and an ellipſis.

The moſt prevalent *colour* of birds' eggs is a milk white; but to this there are numerous exceptions, eſpecially amongſt the *paſſerine* tribes. Eggs are often beſpeckled with red, brown, &c. on grounds of different colours, and ſometimes are of one ſtrong plain tint, as green, &c. but a deſcription of the varieties in the colour and form of eggs belongs to the department of natural hiſtory.

The *ſhell*, or *calcareous inveſtment*, (*cortex* or *putamen* of the older anatomiſts,) is ſecreted from the internal ſurface of that part of the oviduct which is called the uterus, as already mentioned in the *Anatomy of* Birds. It adheres ſtrictly to the external membrane of the egg, with which it appears to be in a degree intermixed, by being incruſted in the interſtices of its external ſurface.

The ſhell varies very much in thickneſs according to the ſize of the bird. In the eggs of very ſmall birds the ſhell is thinner than the fineſt paper, while in the oſtrich it is one-eighth of an inch thick; but in every inſtance the ſhell is porous in its texture, and always light and fragile in proportion to its thickneſs.

Ariſtotle, Pliny, and ſome other older writers on the ſubject, ſuppoſed that the ſhell acquired its hardneſs after being laid, from evaporation, and the influence of external air. Fabricius ſpoke doubtfully on this point, and the opinion was not refuted until Harvey wrote. This error ſeems to have ariſen from the circumſtance of hens frequently laying their eggs before the ſhell is fully formed; in which caſes, the covering of the egg becomes much more firm after it is completely dry: but from the quantity of calcareous matter which the perfectly formed ſhell contains, it ſeems impoſſible that it ſhould poſſeſs any pliancy, or accommodate its ſhape to that of the paſſage through which it is ejected, as the older writers ſuppoſed:

ſuppoſed: the common mode of aſcertaining whether a hen be about to lay or not, by introducing the finger into the cloaca and touching the hard ſhell of the egg, ſufficiently proves that no material change is produced on the ſhell by expoſure to the air. The impreſſions, which frequently appear upon ſhells, and which ſome people imagine are occaſioned by the conſtriction of the anus, are formed in the oviduct at the time the calcareous matter is depoſited. It ſometimes happens, that a very ſmall egg is found included in another of a common ſize. Harvey mentions his having met with an inſtance of this kind, in which he found both the external egg, and the one it contained, inveſted with a hard ſhell.

The earthy matter of the ſhell is compoſed of carbonat and phoſphat of lime, which are ſaid to be held in connection by a ſmall quantity of gelatine. The analyſis given by Vauquelin is as follows:

89.6	carbonat of lime.
5.7	phoſphat of lime.
4.7	animal matter.
100.0	parts of egg ſhell.

In one experiment we made, of diſſolving the ſhell of the egg in vinegar, the animal ſubſtance which remained appeared only as a fine membrane, or cuticular covering, on the external ſurface of the ſhell; we conceive therefore that the calcareous matter of the ſhell is not depoſited in the ſame manner as the earth of bones, but as a cruſt on the external membrane of the egg, and that the animal ſubſtance is confined to the ſuperficies of the ſhell, from which ariſe its greater denſity and poliſhed appearance.

The *external membrane*, or *membrane of the ſhell*, (*membrana albminis* of Blumenbach) poſſeſſes exactly the form of the ſhell to which it ſerves as a lining; it is by far the ſtrongeſt membrane in the egg; it is ſmooth and gloſſy on the inner ſurface, and a little flocculent on that next the ſhell, to which, as has been before obſerved, it intimately adheres. This membrane is devoid of fibres, it has a degree of elaſticity which is equal in all directions. It has been long known to be compoſed of two layers; but we have been enabled to ſeparate it into a greater number of laminæ by boiling it, or by partially drying it.

The *folliculus aeris*, or *air cell*, is a circular ſpace left between two layers of the external membrane at the great end of the egg. This ſeparation of the membrane exiſts before the egg leaves the oviduct; it is, however, originally very inconſiderable; in a recently laid hen's egg it is about a quarter of an inch in diameter, but in ſtale eggs it is frequently found to meaſure an inch across, and in the later ſtages of incubation the external membrane is ſeparated almoſt throughout into two layers by means of the air of the folliculus. The increaſe of the air before incubation depends upon the evaporation of the moſt fluid parts of the egg, which proceeds more rapidly than is commonly ſuppoſed; we have aſcertained by experiment that an egg by evaporation alone loſes ſeveral grains of its weight every day. The diminution of the fluids of the egg is more conſiderable during incubation, both from the expoſure to a high temperature, and the conſumption of theſe ſubſtances in the formation of the chick, and hence the neceſſity of the admiſſion of ſo large a portion of air into the egg during the period of incubation. This air is commonly ſuppoſed to be deſigned for the reſpiration of the fœtal chick: the arguments for ſuch an opinion, with thoſe againſt it, will appear more properly in the article INCUBATION *of the Egg*, which ſee. It is ſufficient at preſent to account for the exiſtence of air in the egg, without diſcuſſing its uſes.

The chemical properties of the air contained in unincubated eggs have not heretofore been exactly aſcertained. It has been ſuppoſed by ſome to be hydrogen. Coxe and others have thought it to be oxygen. Others again, as Hales, Blumenbach, &c. have conſidered it as atmoſpheric air; which laſt opinion we are led to adopt both from reaſoning and direct experiments made on the ſubject. It is univerſally allowed that the ſhell and external membrane of the egg are porous; if they were not ſo, evaporation of the humours could not take place to the extent we have ſtated; the ſame ſtructure which gives paſſage to the fluids may admit likewiſe air; it is to be ſuppoſed, therefore, that except the ſmall globule which exiſts before the ſhell is formed, the folliculus derives its air from the atmoſphere. It is further to be obſerved, that the organization of the external membrane does not permit its performing any office like ſecretion. It is itſelf an excretion from the oviduct, and even during incubation, when the other membranes are vaſcular, it does not acquire blood-veſſels, but remains unchanged in its ſtructure.

With the view of proving whether the air in the folliculus was received from without, or produced within the egg, we have covered the ſhell with varniſh, and, in ſeveral inſtances, in which this experiment was made, no ſenſible addition to the quantity of air originally contained in the air-cell took place: we have likewiſe eſſayed to analyſe the air of a number of unincubated eggs, by collecting it in a graduated glaſs tube, over mercury and over water, and expoſing it to the action of lime-water, phoſphorus, and nitrous gas; by which experiments ſimilar reſults were obtained, as, when atmoſpheric air was made the ſubject of inquiry. In ſome inſtances the air of eggs appeared to contain more carbonic acid gas, and leſs oxygen; but the deviation from common air, with reſpect to the quantity of theſe gaſſes, was ſo inconſiderable, that it could not always be detected. Some effect, with regard to the purity of the air of eggs, might be expected in conſequence of its remaining for a certain time in contact with the external membrane; if we may credit the aſſertions of Spallanzani, the air in the egg muſt be deprived of a conſiderable part of the oxygen. He ſtates that he found the ſhells of eggs and of teſtaceous molluſca abſorb oxygen freely. In order to ſatisfy himſelf if this gas was attracted by the calcareous matter, or the animal ſubſtance combined with it, he made correſponding experiments with ſnail ſhells which had been long deprived of their inhabitants, and had loſt by decay and expoſure almoſt all their animal ſubſtance, and with other ſhells which were in a more recent ſtate, and he found that the abſorption of oxygen was in proportion to the quantity of animal matter remaining in the ſhell. (Journal de Phyſique, Fructidor, an. 11.)

It is cuſtomary to judge of the freſhneſs of eggs by the degree of warmth which is felt upon the application of the tongue to the large end of them: the ſenſation of heat in this way is never abſolute, but comparative; that is to ſay, the temperature of the egg is not actually ſo high as that of the tongue; but the preſence of the air-cell behind the ſhell at the great end, prevents that part abſtracting the heat of the tongue ſo readily as the other portions of the egg.

The *whites* of the egg were deſcribed as a ſingle humour by the elder anatomiſts; they were called by Ariſtotle *ovi albitudo*; *ovi albus liquor* by Pliny; *ovi candidum* by Celſus; *ovi album et albamentum* by Apicius, and *albumen* by Fabricius ab Aquapendente: all of which appellations have ariſen from the appearance of this humour when boiled. Harvey was the firſt who made the diſtinction of two whites. Leveillé, a late French writer, divides the albumen into three

three portions; an external (*albumen cortical*), a middle (*albumen moyen*), and a central white (*albumen central*); the last, however, is merely a different name for those parts commonly described under the title of *Chalazes*.

The *external white* is the most superficial; lying immediately under the membrane which lines the shell; all the other parts of the egg are therefore included by it. This white is always most abundant in recently laid eggs; in those that have been long kept it is scarcely to be observed; it is at all times, however, much less in quantity than the middle white. It is a true albuminous fluid, but almost as liquid and transparent as water; two modes are employed for shewing the distinct existence of the superficial white; one is to open the shell and external membrane of a very fresh egg, when this humour will run off, leaving the principal white behind; the other mode is to boil a fresh egg, if gently, the external white will appear like milk, but if the boiling be long continued, the white will become hard, and the external one may be detached by a little pains from the other; it will then be obtained as a lamen diminished in thickness towards the two ends of the egg.

Harvey said that the external white was covered with a proper membrane, but we have failed to discover it.

The *middle*, or *principal* white, makes the chief part of that viscid, tenacious, transparent, semi-fluid mass which is commonly known under the name of the white of the egg: it is enveloped by the external white, and contains the yolk and the two chalazes; it is said to be inclosed by a membrane; this circumstance does not admit, however, of being clearly demonstrated before incubation, in the later periods of which the tunic of the white becomes exceedingly evident. If the contents of an egg be thrown unbroken into water, they become opake and slightly coagulated upon the superficies, which presents a smooth membranous-looking surface, but if the white be broken, every part of it that may be in contact with the water assumes the same membranous appearance, so that no conclusion can be drawn with respect to the existence of a membrane from this experiment, unless it be admitted that the white be composed throughout of an arrangement of albuminous fibres or membrane. This is the opinion of Maitre Jean, who was perhaps the most accurate writer on this subject: he says, that the white is a composition of glairy fibres, intermixed with aqueous parts; if, he observes, one beats for a long time the white of an egg, it becomes as fluid as water, which can only happen in consequence of these fibres being broken or attenuated by the motion, so that not possessing any longer their arrangement, the consistence of the whole mass is changed. If other mucilaginous or glutinous liquors be beaten in the same manner, they do not become more fluid, because they do not possess that peculiar arrangement of their parts which can be destroyed by motion: he further observes, that the white of the egg has a structure, and composition altogether peculiar, although from its transparency we cannot perceive it. In order to be convinced of this, it is only necessary to make the following experiment; let an egg be opened, and suffer a small quantity of the white to run out in order to introduce some distilled vinegar in its place, in a little time some parts of the white will be seen penetrated by the vinegar and coagulated, and others still preserve their transparency, by which there will be an opportunity of observing some large fibres differently situated, and many others forming a species of membrane. Observations sur la Formation du Poulet, par Maitre Jean, p. 20. 21.

The white of the egg does not float about promiscuously through the egg; it adheres to the membrane, lining the small end of the egg, and always preserves its proper relative position to the yolk; this may be considered as an additional argument for the existence of solid albuminous fibres in the white.

The albumen, in its natural state, has little taste or smell. When spread thin and slowly over any body, it forms a varnish similar to what is made by gum arabic; which it also resembles in taste. It may also be again dissolved in water, and brought back to its original state. Uncoagulated albumen soon putrifies, unless it be dried; after which it may be preserved for any length of time.

It is insoluble in alcohol and ether: acids do not dissolve it unless it be coagulated and heat employed.

When alkalies are mixed with the solution of albumen in water, no apparent change takes place; but if a concentrated solution of pure potash be triturated with albumen for some time, and then allowed to remain at rest, the albumen gradually coagulates, or rather gelatinizes; for the coagulum has a striking resemblance to jelly. It gradually hardens; and at a particular period of its drying, it resembles very exactly the crystalline lens of the eye. When quite dry, it is brittle and transparent. Thomson's Chemistry, p. 490.

None of the earths form insoluble compounds with albumen, in this respect resembling the alkalies.

In a number of experiments mentioned by Dr. Thomson, in which he tried the effects of a great variety of metallic salts upon a solution of albumen, obtained by mixing the white of one egg with a pint of water, every metal, except cobalt, occasioned a precipitate: but no precipitate ever appeared, when the oxyd was held in solution, by an alkali or an earth. The effect of the metallic salts on albumen form a striking contrast with their effect on gelatine.

A solution of tan forms, with an aqueous solution of albumen, a very copious yellow precipitate, of the consistence of pitch, and insoluble in water, which is a combination of tan and albumen. When dry it is brittle, like over tanned leather, and is not susceptible of putrefaction. Nicholson's Journal, i. 272.

According to the chemical analysis which has been made of the white of the egg, 100 parts of it contain 80 parts of water, 4.5 of uncoagulable matter, and 15.5 of pure albumen. By distillation it affords water, carbonat of ammonia and empyreumatic oil, a coal remaining in the retort which yields soda and phosphate of lime.

The white of the egg is well known to be coagulable by heat, acids, alcohol, and even by water in a slight degree.

It has been supposed by Fourcroy and other chemists, that the coagulation of the albumen was produced by a combination with oxygen. To determine if this supposition were well founded, M. Carradori exposed the fresh albumen of an egg to the heat of boiling water, having previously covered its surface with olive oil: he asserts that coagulation was effected as readily in this way as in open air; and that there was no escape of elastic fluid through the oil, which would have happened had the water undergone any decomposition during the experiment. M. Carradori likewise observed, that when he coagulated albumen in contact with oxygen gas, no absorption of this fluid took place; he therefore concludes that the coagulation of the albumen is not effected by the oxygen, but by the action of the caloric alone. Annali di Chimica di Brugnatelli.

Scheele attributed the coagulation of the albumen to its combination with the matter of heat, which opinion he supported by some ingenious experiments. Mr. Thomson, on the other hand, observes that, as we know when a fluid is converted into a solid, caloric is usually disengaged, it is extremely probable that the same disengagement

takes place here. But the opinion has not been confirmed by experiment. Fourcroy, indeed, relates that he saw the thermometer rise several degrees; but as others have not been able to perceive any variation of temperature during the coagulation of albumen, it cannot be doubted that this philosopher has been misled by some circumstance or other to which he did not attend. Thomson's Journal, iii. 271.

It is remarkable, that if albumen be diluted with a sufficient quantity of water, it can no longer be coagulated. Scheele mixed the white of an egg with ten times its weight of water, and then, though he boiled the liquid, no coagulum appeared. Acids, indeed, and alcohol, even then coagulated it; but they lose their power if the albumen be diluted with a much greater quantity of water, as has been ascertained by many experiments.

When albumen is coagulated either by heat, alcohol, or acids, it is an opake substance of a pearl white colour, tough, and of a sweetish mucilaginous taste; it is no longer soluble in water, and is less susceptible of decomposition than uncoagulated albumen. Mr. Hatchet kept it for a month under water without its becoming putrid. By drying it in the temperature of 212°, he converted it into a brittle hard, yellow, substance, semi-transparent like horn.

When this substance was digested for some hours in water, it softened and became white and opake, like newly coagulated albumen.

When coagulated albumen is steeped in diluted nitric acid for some weeks, it communicates a yellow tinge to the acid, and becomes itself opake, but does not dissolve: when the albumen, thus treated, is immersed in ammonia, the liquid assumes a deep orange colour, inclining to blood red, the albumen is slowly dissolved, and the solution has a deep yellowish brown colour. If the albumen, after being steeped in nitric acid, be washed, and then boiled in water, it is dissolved, and forms a pale yellow liquid which gelatinizes, when properly concentrated. If the gelatinous mass be again dissolved in boiling water, the solution is precipitated by tan and by nitro-muriat of tin. Hence we see that that nitric acid has the property of converting coagulated albumen into gelatine. For this important fact we are indebted to Mr. Hatchet.

Coagulated albumen is readily dissolved by a boiling lixivium of potash, ammonia is disengaged, and an animal soap is formed. Hatchet, Phil. Trans. 1800. Thomson's Chemistry, p. 494. &c.

The *albuminous cords*, which connect the yolk with the white were called, from a fancied resemblance to hail, by the older writers, *Chalazes*, *Grandines*, &c. From the use which Vic D'Azir ascribed to them, he named them *Ligamens suspenseurs du jaune*. Leveillé has described them as a third white, *albumen central*; and in this country they are popularly known, in consequence of a vulgar error, by the name of *the tread* or *treddle*.

These parts are two substances of a much more firm texture than any other portion of the white: they appear to be composed of an opake albuminous membrane coiled upon itself, so as to form a cord; this cord is again convoluted or doubled upon itself, to which some thick greenish semi-transparent albumen adheres, so as to give the whole a knotted or granulated figure; from which it was formerly compared, though not very aptly, to hail. These cords are each attached by one of their extremities to the membrane of the yolk, at which place the cord is dense and compact; the other extremity is lost in the white, and is loosely formed, and ends in membranous folds; the attachment of the cords to the yolk membrane is at the two poles of the yolk, corresponding to the two ends of the egg. The chalazes are not generally of the same magnitude; one is larger and more knotted than the other, and extends towards the great end of the egg: the smaller one lies next the small end, and makes a turn to one side of the egg. Sometimes one of these cords is wanting, and this happens more frequently in the eggs of the *guinea fowl*, than in those of the common *hen*.

The above description of the chalazes corresponds with that generally given by authors, and with what we have observed in nature, but differs very materially from the account of these parts which Leveillé has published.

He considers the chalazes not as separate bodies; he says, they are conjoined by means of a light train of albuminous substance, and thence looks upon them as a distinct white. He asserts, that their relation to the yolk is not the same that has been described even by the most modern authors; they are not, he says, situated at the two opposite poles of this globe; but divide its circumference in two segments, of which the difference in extent is very remarkable, and is in the proportion of 24 to 100.

In speaking of the cords themselves, he says, they never have been described but by him; although, in his own language, he had before him the description of Maitre Jean, who says, "Ils semblent naitre l'un & l'autre de la membrane, qui recouvre le jaune, par un pedicule qui semble composé de *deux petit cordons*, ou boyaux entortillés *comme une corde*." (Observations sur la Formation du Poulet, p. 15.)

Leveillé proceeds to say of these two cords, one is purely membranous, twisted upon itself, and joined to the membrane of the yolk, from which it is easily detached by dissection or the staleness of the egg; this cord is often wanting. The other is truly vascular, twisted on itself, and formed like an umbilical cord; it is continuous and incorporated with the membrane of the yolk, one cannot separate it without breaking this particular tunic, and opening the cavity which contains the yolk. It is always to be observed in fresh eggs; but in those long kept, it is, as it were, macerated and detached. It is to this detachment and disorganization produced by time, that we attribute the want of success in incubation; it is this conduit which explains the point of communication between the yolk and the white. Its vascular structure is not equivocal, if after having divided it in a transverse direction it be observed with the naked eye, as we have done in the presence of Cuvier, or examined with a magnifying lens of small powers. Sometimes we have seen it injected with a yellow fluid, and upon this point we claim the testimony of Déyeux. The free extremity of this cord is pencillous and divided into an infinite number of very small filaments, which may be considered as the ramifications of the principal trunk, intended to form so many suckers calculated to absorb the most fluid part of the albuminous substance. (Dissertation Physiologique sur la Nutrition des Fœtus considérés dans les Mammiferes & dans les Oiseaux, par J. B. F. Leveillé, &c. &c. Journal de Physique, tome v. Floreal, an. 7.) M. Leveillé assumes this explanation of the usea of the albuminous cords, as an original discovery; although Maitre Jean had long since declared a similar opinion in these words: "Quoique j'appelle ligamens ces deux appendices qui sont aux deux côtes du jaune, je n'estime pas que leur seul usage soit d'attacher le blanc au jaune, mais qu'ils servent encore à préparer le blanc ou à le filtrer & le conduire dans le jaune."

With respect to the points of attachment of the two albuminous cords to the membrane of the yolk, we have no hesitation in saying, that Leveillé has mis-stated the fact, and that they are placed at the poles of the yolk, and as

near as may be, in the words of Maitre Jean, diametrically opposite (diametralement opposés.)

We have repeatedly examined the albuminous cords with the view of discovering the vascularity of one of them, as stated by Leveillé, but have never been able to perceive it; although the observations were conducted with much care and attention, and made under a variety of circumstances, and with glasses of different magnifying powers; we have also made several attempts to inject the cords with coloured fluids, in both directions, but without success. We are, therefore, led to conclude, that there is no vessel in either of the chalazes; for we entertain but little inclination to credit the evidence of Leveillé respecting this circumstance, from finding his representations so erroneous in general, so much so indeed, that we should not have thought it necessary to have noticed his opinions at all, had he not associated with them the respectable names of Cuvier and Déyeux.

Leveillé has said likewise, that the chalazes are covered with a membrane; this, however, is not visible even during incubation, although at that time the membranes become so much stronger; and its existence does not seem probable, as the dense albumen of which the chalazes are composed is gradually lost in the common substance of the principal white.

The yolk, or *vitellus*, is that well known spherical yellow mass which occupies the centre of the egg; it is inclosed in an extremely thin but dense membrane, which is apparently without fibres, and is inelastic; this membrane is at all times really double, but it is extremely difficult to demonstrate the internal layer previous to incubation.

The globe of the yolk, as before stated, is enveloped by the white; it is not, however, situated exactly in the centre of the albumen, but somewhat nearer the great than the small end of the egg; and it is always found near the superior surface of the albumen in whatever way the egg may be placed.

The yolk varies a good deal in size, it is occasionally found double. It is always a smaller mass in the egg of birds than the white, which was observed by Aristotle, although some late writers have expressed doubts with respect to this circumstance. Its absolute weight is considerably less than that of the white. An entire egg weighs usually about two ounces. In one instance, where we weighed the parts separately, the white was found to be one ounce one drachm and five grains, and the yolk only five drachms and fifty-seven grains; the white, therefore, was three drachms and eight grains heavier than the yolk. When a given portion of the white and the yolk are compared, the latter is found to possess less weight than the former. It is in consequence of the greater specific gravity of the white that the yolk is always seen near its upper surface. If a yolk of an egg be thrown into a vessel containing a quantity of albumen, it will be found to descend a little farther than it is observed to do in the white while in the egg; the circumstance of its rising so near the surface of the white in the egg, depends, therefore, probably in part, upon the manner in which these two substances are there connected with each other. If the covering of the yolk be ruptured, and the contents poured upon some albumen, it floats entirely on the surface, which seems to prove that it is the concentrated and globular form which preserves the yolk under the surface of the white while in the egg.

The yolk is usually of a bright yellow colour; but in some birds it is pale, in others it is a saffron colour, and a red-yellow in some others; it is always a much more fluid humour than the white.

The yolk has not the same structure or composition throughout; the external part is of a deeper colour; it is less tenacious, and contains more oil. The centre is a clear yellow, is viscid, and resembles cream. When the yolk is boiled, the external part appears pale-coloured, porous, dry, and of a farinaceous texture, while the centre forms even a more firm coagulum than the albumen.

The substances into which the yolk is resolvable, are water, oil, albumen, and gelatine; if after being boiled the yolk be heated in a pan, it softens, and when squeezed between the fingers, drops of oil exude; if put into linen in this state, and pressed, an oil may be forced out. This oil is of a yellow colour, and insipid, unless too much heat has been employed in preparing it. Its properties are those of fixed oil, or rather of semi-fluid fat. Chandelier obtained this oil without the assistance of heat.

The residue, after the separation of the oil, possesses the properties of albumen, though it is still a little coloured by the remains of the oil; hence, when washed with water, a kind of emulsion is obtained. It is owing to the presence of albumen that the yolk hardens when heated.

When this albumen is boiled in water, the liquid is said to separate a little gelatine. (Thomson's Chemistry.)

Mr. Hatchet found, that when he boiled potas with yolk he obtained a pale olive-coloured concrete animal soap, which being dissolved in water, and saturated with muriatic acid, was thrown down in the state of fat; when burnt, the yolk left a small residuum of phosphat of lime and phosphat of soda. (Phil. Trans. 1800.)

Maitre Jean has observed, that if we harden in boiling water the eggs of young hens, in which the yolk is usually a pale yellow; those of a guinea hen, which have the yolk of a saffron colour; and some duck eggs, in which the yolk is a deep red-yellow: and if we afterwards take equal weights of each of these yolks, and extract the oil from them in the usual manner, we shall obtain more oil from the yolks of the guinea hen than from those of the pullet, and most of all from the yolks of the duck: from which experiment it may be concluded, that the yolk owes its colour, in a great measure, to the oil it contains.

Leveillé relates an experiment on the yolk, which he considers very curious and inexplicable. He states, that he repeated it several times before Déyeux, Fourcroy, and Cuvier. He took the yolk of an egg, divested of its membrane, and agitated it in some water, which became, in consequence, turbid and milky. Being suffered to stand for a few instants, the liquid became a very delicate red; this rose-coloured tinge disappeared as soon as all the yolk was dissolved, and seemed to depend entirely upon the solution of the yolk in the water. (Journal de Physique, p. 395.)

It is well known, that the yolk of an egg acquires a reddish hue by being broken and exposed to the air: may not, therefore, this change of colour, in both cases, depend upon the absorption of oxygen?

There is always to be seen upon the centre of the superior surface of the yolk a *white spot*, which, when minutely examined, is observed to be formed of several concentric parts.

Maitre Jean describes this appearance on the yolk under the name of *la tache blanchâtre*; but it is most commonly called the *cicatricula*. The latter appellation was given to it by Fabricius ab Aquapendente, under the supposition, that the appearance was occasioned by the separation of the yolks from the peduncules which sustain the capsules of the eggs in the ovary, in the same manner as we see a mark left upon a fruit at the place where the stalk was attached to it. The explanation of Fabricius was, however, perfectly erroneous, for the pedicles of the capsules have no such connection with the ova; this was pointed out by Harvey, but the

the name of cicatricula has been ever ſince generally employed by writers on the ſubject notwithſtanding; Haller calls the central part of the white ſpot the *follicle of the yolk* (*follicule du jaune.*)

Maitre Jean gives the following deſcription of the cicatricula. Upon the ſuperficies, and uſually on the ſide of the large end of the egg, there is always to be obſerved a whitiſh ſpot, ſometimes round and ſometimes oblong and irregular; in the middle of which one may perceive another ſmall ſpot of an aſh-colour, which uſually correſponds in figure with the other; and in the centre of this laſt, and a little towards the ſide, there is a ſmall body of a little lighter colour than the other parts of the whitiſh ſpot, it is oblong, and a little folded, and ſeems to float in a liquor. Around the whitiſh ſpot there is a narrow grey circle, then another broader one of a yellowiſh colour, which is ſurrounded by another of a greyiſh hue, and laſtly, by a fourth circle, which is at firſt of a deep yellow, and becomes inſenſibly lighter, until it is loſt in the general colour of the yolk. The number of theſe circles is not always the ſame; it is ſometimes leſs, at others more, but whatever the number may be, the one diſtinguiſhed by the deep yellow colour always ſurrounds the others. (Obſervation du Poulet, p. 13.)

The obſcure aſh-coloured ſpot is the part which is particularly called cicatricula; becauſe, when the membrane is carefully removed, it is found to be a real depreſſion or cell in the ſubſtance of the yolk: this hollow, Maitre Jean deſcribes as being filled with a limpid fluid. Many authors have conſidered it as the amnios, and believed that it contained the rudiments of the chick. Haller was at great pains to prove that this follicle had no connection whatever with the amnios; and he aſſerts, that it does not even contain any fluid: we ſhall defer the diſcuſſion of theſe opinions until we treat of incubation; the changes which the cicatricula undergoes during that proceſs being highly illuſtrative of both the ſtructure and uſes of this part of the egg.

The *vital properties* of the egg muſt be neceſſarily obſcure before incubation has excited oſtenſible actions in the membranes and fluids; they muſt be confined to the maintenance of the proper organization of the ſeveral parts in oppoſition to the influence of temperature and ſome other external agents.

The power of generating heat was fully proved to exiſt in eggs, by ſome experiments of the late Mr. Hunter, which, as being highly intereſting, we ſhall quote at length.

"I had long ſuſpected," he ſays, "that the principle of life was not wholly confined to animals, or animal ſubſtance endowed with viſible organization and ſpontaneous motion; but I conceived, that the ſame principle exiſted in animal ſubſtances, devoid of apparent organization and motion, when the power of preſervation was ſimply required.

"I was led to this notion twenty years ago, when I was making drawings of the growth of the chick in the proceſs of incubation. I then obſerved, that whenever an egg was hatched, the yolk (which is not diminiſhed in the time of incubation) was always perfectly ſweet to the very laſt; and that part of the albumen which is not expended on the growth of the animal, ſome days before hatching, was alſo perfectly ſweet, although both were kept in a heat of 103°; in the hen's egg for three weeks, and in the duck's for four: but I obſerved, that if an egg was not hatched, that egg became putrid in nearly the ſame time with any other dead animal matter."

To determine how far eggs would ſtand other teſts of a living principle, I made the following experiments.

"Having put an egg into a cold about 0, which froze it, I then allowed it to thaw; from this proceſs I imagined, that the preſerving powers of the egg muſt be deſtroyed. I next put this egg into the cold mixture, and with it one newly laid; and the difference in freezing was ſeven minutes and a half; the freſh one taking ſo much longer time in freezing.

"A new laid egg was put into a cold atmoſphere fluctuating between 17° and 15°, it took above half an hour to freeze, but when thawed, and put into an atmoſphere at 25°, it froze in half the time. This experiment was repeated ſeveral times with nearly the ſame reſult."

To determine the comparative heat between a living and a dead egg, and alſo to determine whether a living egg be ſubject to the ſame laws with the more imperfect animals, I made the following experiments.

"A freſh egg, and one which had been frozen and thawed, were put into the cold mixture at 15°, the thawed one ſoon came to 32°, and began to ſwell and congeal. The freſh one ſunk to 29½°, and in 25 minutes after the dead one it roſe to 32°, and began to ſwell and freeze.

"From theſe experiments it appears, that a freſh egg has the power of reſiſting heat, cold, and putrefaction, in a degree equal to many of the more imperfect animals; and it is more than probable, this power ariſes from the ſame principle in both." (Hunter's Animal Œconomy, p. 106.)

The above experiments are very important in different points of view. They prove that vital temperature is not neceſſarily dependent upon the function of reſpiration, or any one analogous to it; for eggs, ſo far from requiring expoſure to air, are beſt kept entirely excluded from it: hence, when varniſhed or covered with tallow, their vitality may be maintained for an indefinite period. Theſe experiments likewiſe ſhew, that the humours of the egg are endowed with life as well as the membranes; for it is not to be ſuppoſed that any power of regulating temperature reſiding in the membranes alone could account for the phenomena related by Mr. Hunter. Had Blumenbach reflected upon theſe experiments, he would not have referred all the vital properties of the egg to the membranes. (Blumenbach's Lectures, M.S.)

Mr. Hunter's experiments further prove, that the evolution of animal heat does not require vaſcular action, for even ſuppoſing that inviſible veſſels exiſted in the membranes at all times, their influence could not be extended beyond theſe membranes.

It ſhould be added, that during the firſt hours of incubation, the fluid parts of the egg undergo certain changes in organic ſtructure, and that the membranes exhibit actions, and alter their form previous to the exiſtence of the veſſels. Every part, therefore, of the egg, except the external membrane and the ſhell, muſt be admitted to poſſeſs vital properties. See the articles Ovum, and Incubation *of the Egg.*

EGGS, *Analyſis of*, in *Chemiſtry* and *Pharmacy*. The *egg-ſhell* is carbonat of lime in a ſtate of very conſiderable purity, being mixed only with a little animal matter and a minute portion of phoſphat of lime. When egg-ſhells are digeſted with very dilute nitric acid, the whole diſſolves except a few flocculi of animal matter. If the clear ſolution be ſuperſaturated with pure ammonia, the ſmall trace of phoſphat of lime which was taken up by the acid is precipitated ſingly, after which, the carbonat of lime may be thrown down by any carbonated alkali.

The *white of the egg* has been generally conſidered as very pure *albumen*, the properties of which have been deſcribed under that article. It is, however, not perfectly pure albumen, as a more accurate chemical analyſis has detected ſeveral other ſubſtances. The lateſt and moſt exact is that of Dr. Boſtock.

The

The white of egg, even when quite freſh, turns ſyrup of violets to green, whence it is inferred to contain a ſmall portion of naked alkali, which (as in the bile, in ſerum, and ſome other animal fluids) is probably ſoda, and the quantity appears to be no more than about $\frac{1}{1000}$th of the whole. The oxalic acid ſhews a ſmall proportion of lime in white of egg, which is probably contained in the form of phoſphat. When white of egg is heated it coagulates, and the properties of this coagulum, which may be conſidered as nearly pure *albumen*, have been deſcribed under this article.

It does not all coagulate however, for a portion, which is eſtimated by Dr. Boſtock at about a fourth of the whole, eſcapes this change. This part is entangled with the coagulum, but may be ſeparated by cutting the latter in ſlices, and digeſting it in boiling water, by which the uncoagulated portion is extracted. On adding to this watery ſolution ſome Goulard's extract, (or litharge diſſolved in vinegar,) a copious precipitate is formed, but no effect is produced either by infuſion of galls or corroſive mercurial muriat. If the watery ſolution be ſlowly evaporated, it does not gelatinoze on cooling when concentrated, as the watery ſolution of jelly does, but gradually inſpiſſates as the water eſcapes, and at laſt a hard brittle tranſparent matter is left behind, which more correſponds with the properties of animal mucilage than any other ſingle animal principle.

A faint ſmell of ſulphuretted hydrogen eſcapes from the watery ſolution of the white of egg when boiling, and the vapour blackens ſilver; whence ſulphur is inferred to be contained in the egg, though in an extremely minute quantity.

When the coagulated white of egg is kept for ſome days by a fire ſide, or in a temperature rather higher than that of a ſummer atmoſphere, it ſhrinks, hardens, becomes tranſparent, and of an amber yellow colour, and the conſiſtence of tough horn. In this ſtate it may be kept unchanged for an indefinite length of time. White of egg loſes by this drying proceſs no leſs than four-fifths of its weight on an average, which loſs is merely water.

Owing to this deſiccation of white of egg into a clear yellow hard ſubſtance, it is often uſed for varniſhing, and with very good effect.

The *yolk* of the egg is a ſtill more compounded fluid than the white. Its colour is yellow, and the taſte is bland and rich. It contains a large portion of albumen, whence it coagulates firmly, by the ſame heat which is ſufficient to harden the white, but it alſo contains a conſiderable portion of a clear inſipid oil, that may be extracted from the hardened yolk by preſſure. This oil (oleum ovorum) has been in ſome uſe in pharmacy, but is now obſolete. It is thus prepared. Take the yolks of any number of hard-boiled eggs, put them in a glazed earthen pan over a moderate fire, cruſh them to a paſte, and beat them with conſtant ſtirring, avoiding that degree of heat which would turn them red, till an oily matter ſweats out from their ſurface, and they ſwell prodigiouſly; then put them while ſtill hot into a hair bag under a preſs, the plates of which are heated by boiling water, and the clear oil will flow out, which is of a golden colour, a pleaſant ſmell, and a ſweet agreeable taſte. From fifty yolks of eggs, about five ounces of oil may be obtained.

The yolk of egg, when rubbed with any watery fluid, mixes with it uniformly into a ſmooth emulſion, and in this way alſo it ſerves as an intermede in pharmacy, to unite oily and reſinous ſubſtances with water for more convenient exhibition. See the preceding article.

Eggs, in *Diet*, ſerve for an agreeable and nouriſhing aliment; but it is neceſſary, that they ſhould be freſh and moderately coagulated by heat. If, upon holding them to a candle, they appear of a turbid colour, they are uſually reckoned ſtale; or if, upon preſenting them to the fire, they exhale a moiſture, they are freſh. As the ſubſtance of eggs affords a matter peculiarly ſuited to the formation of the young animal, it muſt be conſidered as containing a large proportion of nutritious matter; and, conſequently, any quantity of it taken into an animal body muſt be ſuppoſed to introduce a large proportion of ſuch matter. But as the white of egg is generally taken into the ſtomach in its coagulated ſtate, or even if it be taken in its liquid ſtate, the firſt change that happens to it there is its being coagulated, it muſt in all caſes be again diſſolved by the peculiar power of the gaſtric juice, probably for the purpoſe of its being mixed with other matters neceſſary to conſtitute the proper animal fluid. Dr. Cullen obſerves, (Mat. Med. vol. i.) that although it is ſurpriſing what a quantity of egg may be digeſted by ſome perſons, yet this power is in moſt caſes ſo limited, that a ſmaller bulk of this than of any other food, will ſatisfy and occupy the digeſtive powers of moſt men. He obſerves, at the ſame time, that egg ſeems to be a leſs alkaleſcent food than almoſt any other animal ſubſtance, and during its digeſtion to be leſs ſtimulant. With reſpect to the particular qualities of the eggs of different birds, he is diſpoſed to think, that they are not very different; and he is certain, that in many inſtances, the peculiar odour and taſte of the fleſh of the bird, are in no degree communicated to their eggs. He adds, however, that in certain different birds the colour of the yolks and the denſity of the coagulated whites are ſomewhat different from one another. The yolk is uſed in many medicinal preparations, as emulſions, &c.

Eggs, *Albumina*, or *whites of*, are of ſome uſe in medicine, though rather externally, in the preparation of collyriums for the eyes, and anacollemata, on account of their cooling, agglutinating, and aſtringent quality, than internally.

Albumina are uſed for burns, and in ſome mixtures with bole armenic, &c. for conſolidating freſh wounds, and under bandages, and compreſſes to prevent the luxation of bones after reduction. A late writer recommends them as a ſecret in the jaundice. Junc. Conſ. Therap. tab. xiii. p. 379. Quinc. Diſpenſ. part ii. § 12. p. 204. Ephem. Germ. dec. 3. an. 2. obſ. 35. p. 43.

Beſides medical, the whites of eggs have alſo their chemical uſes, *e. gr.* for the clarifying of liquors; to which purpoſe being mixed, and incorporated with the liquors to be clarified, and the whole afterwards boiled, the whites of eggs are by this means brought together, and hardened, and thus carry off the groſs parts of the liquor along with them. They likewiſe form a very white and ſhining varniſh, which is applied to ſeveral kinds of work, and particularly to pictures.

Egg *ſhell white*, in *Painting*, is ſometimes uſed in water-colours, and preferred to ſlake or the Troy-white: it is prepared by peeling off the inner ſkins, and levigating the ſhell to a proper fineneſs, and waſhing over the powder.

Egg, what is termed *centeninum ovum*, among *Naturaliſts*, denotes a ſort of hen's egg, much ſmaller than ordinary, vulgarly called a "cock's egg," from which it has been fabulouſly held, that the cockatrice or baſiliſk was produced. Brown, Vulg. Err. lib. iii. cap. 7.

The name is taken from an opinion, that theſe are the laſt eggs which hens lay, having laid a hundred before; whence centeninum, *q. d.* the hundredth egg.

Theſe eggs have no yolks, but in other reſpects are like common eggs, having the albumen, chalazes, membranes, &c. in common with others.

In the place of the yolk is found a body reſembling a little ſerpent,

ſerpent, coiled up, which doubtleſs gave riſe to the tradition of the baſiliſk's origin from hence.

Their formation is probably aſcribed by Harvey to this, that the yolks in the vitellary of the hen are exhauſted before the albumina. Harvey De Generat. Animal. Exerc. 12.

M. La Peyronie has carried the hiſtory of the ova centenina to a greater length, as well as certainty; a hen was brought to him, which, for a conſiderable time, laid no other eggs. The ſame hen was alſo obſerved to crow like a cock, and to render by the cloaca a thin yellow matter, much like the yolk of an egg diluted in water. Upon opening her, ſhe was found hydropical; a bladder as big as the fiſt, full of water, was found contiguous to the oviduct, which it preſſed and crowded in ſuch manner, as not to leave the cavity thereof above five lines in diameter; ſo that a common egg, ſuch as it is when it falls from the ovary into the tube, could not paſs without burſting, by which the yolk was let out, and diſcharged another way. Mem. Acad. Scienc. an. 1710. p. 730.

Eggs, *preſervation of.* M. de Reaumur, of the Paris academy, thinking nothing that could be a public benefit beneath the cognizance of a philoſopher, beſtowed conſiderable pains on finding a method of preſerving eggs for a long time, and ſucceeded at length ſo far in it, as to be able to produce eggs of months, nay years old, which taſted as freſh and well as if they had been laid but the day before. The egg always is quite full, when it is firſt laid by the hen, but from that time it gradually becomes leſs and leſs to its decay; and however compact and cloſe its ſhell may appear, it is nevertheleſs perforated with a multitude of ſmall holes, though too minute for the diſcernment of our eyes. The effect of theſe, however, is evident, by the daily decreaſe of matter within the egg, from the time of its being laid, a fluid matter is continually perſpiring through theſe perforations of the ſhell, which occaſions the decay; and this is carried on in a much quicker manner in hot weather than in cold. To preſerve the egg freſh, there needs no more to be done than to preſerve it full, and ſtop its tranſpiration; and the plain and rational method of doing this, is by ſtopping up theſe pores through which the matter tranſpires, with a matter which is not ſoluble in watery fluids, and therefore cannot be waſhed away by the matter perſpired by the egg; and on this principle, all kinds of varniſh, prepared with ſpirit of wine, will preſerve eggs freſh for a long time, if they are carefully rubbed all over the ſhell. This might ſeem to moſt people a very common and cheap ſubſtance for this purpoſe; but the misfortune is, that in country places, where it ſhould be put in practice, no ſuch thing is to be had: and the poorer ſort of country people are not eaſily brought into the uſe of any thing to which they are not accuſtomed.

To obviate the difficulty ariſing from this, Mr. Reaumur thought of ſubſtituting in the place of varniſh ſome other ſubſtance more common; and ſoon found, that another ſubſtance, which is very cheap, and every where to be had, would very well ſupply the office of varniſh; for experiments proved, that any hard fat would have the ſame effect. The beſt of all fat for this purpoſe, is found to be a mixture of that of mutton and of beef; theſe ſhould be melted together over the fire, and ſtrained through a linen cloth into an earthen pan; and when thoroughly melted, an egg is to be dipped into it, and immediately taken out again; and it is then in a ſtate to keep perfectly freſh more than a twelvemonth. Memoirs Acad. Scienc. Par. 1735.

The only difficulty attending this method is, that the eggs cannot be ſo eaſily plunged into the fat, as that all their ſurfaces ſhall be covered by it; for if they are held in a pair of pincers, the parts of the egg where the pincers touch will be bare; but the eggs may be ſuſpended by a loop at the end of a thread, and by that means plunged in; and the thread being then coated over with the fat, as well as the ſurface of the egg, will preſerve that part which it covers as well as the coat of fat will the reſt. The great care is to uſe this means while the eggs are perfectly freſh; it ought indeed to be done on the very day when they are laid; for if the evaporation is begun, and the empty ſpace once made, there is room for a fermentation, which never terminates but in the deſtruction of the egg.

There is one advantage in this uſe of fat rather than varniſh, which is, that the eggs rubbed over with it boil as quick as if nothing had been done to them. the fat melting off as ſoon as they touch the hot water; whereas the varniſh not being ſoluble even in hot water, only becomes moſtened by it, and ſtill hanging about the egg, prevents the tranſpiration of juices, neceſſary to bring the egg to that ſtate in which it is to be eat. When the egg, which has been preſerved by fat, is taken out of the water, there remains very little fattineſs upon it, and what there does is eaſily wiped off with a napkin, the egg is as nicely freſh as if laid but the day before, and no palate can diſtinguiſh the leaſt difference.

The method of preſerving them by means of fat, is greatly preferable alſo to that by varniſh, when they are intended for putting under a hen to be hatched; as the fat eaſily melts away by the heat, while the varniſh remains and impedes the hatching. By this means the eggs of foreign fowl might be ſent over and hatched here, whereby many beautiful and valuable birds may be naturalized among us.

At Tonquin they are ſaid to keep eggs entire for three years, by covering them up in a paſte made of aſhes and brine.

Eggs, *Ant.* See Ant.

Eggs *of Flies.* After the congreſs with the male, the female fly is ſeldom ſo much as twenty-four hours before ſhe begins to depoſit her eggs on ſome ſubſtance proper to give nouriſhment to the worms that are to be produced from them.

The eggs are but a little time in hatching; and the growth, and all the changes of the animal, take up but a little time. The creature is found to make its way out of the upper part of the egg; and it is not more than three weeks from the laying of the egg that is taken up, before the creature is ſeen in the form of a perfect fly, if a female, and ready to depoſit hers.

Among the butterfly claſs the female has but one congreſs with the male by which the eggs are fecundated, and immediately after it begins to depoſit her eggs, and continues ſo doing, without interruption, till ſhe has finiſhed; but it is much otherwiſe with the two-winged flies; for they, after having laid one ſet of eggs, have repeated congreſſes with the male for ſeveral days; and after every one of theſe, lay a new ſet.

The female of the butterfly claſs does not depoſit her eggs on any plant at random, on which ſhe happened to be placed when the male coupled with her, but ſearches out ſuch a ſpecies of plant for leaving them on, as is what ſhe loved when in the caterpillar ſtate, and what the young caterpillars to be hatched from them will be able to feed on, that they may find food ready for them at the moment of their birth. She does not ſcatter them about irregularly, and without order, but ſhe diſpoſes them with perfect ſymmetry, and faſtens them one to another, not by their own glutinous nature, but by a viſcid liquor, which ſhe ſeparates for that purpoſe. In many ſpecies alſo, where the hinder part of the body of the female is covered with long hairs, ſhe by degrees

degrees throws off all those hairs, and with them makes a nest for the eggs she is laying, where they are kept very soft and safely till the time of their hatching. This, indeed, is the whole business of her life; and when the eggs are all laid, she dies. Memoirs Acad. Scienc. Par. 1736.

The eggs of butterflies are of very different sizes, according to the species; they are also of many different figures, some are spheric, others segments of spheres, others conic, in different forms and degrees: nor is this all, their surfaces are very different also in the different kinds. Some are elegantly wrought, as it were; some dented, and others more deeply notched at the sides; and others channelled or furrowed all over. In short, the most ingenious artist could scarcely contrive so many various ornaments as there are on these eggs, all which also are invisible to the naked eye, being discoverable no way but by the microscope.

The eggs of the different species of the two-winged flies are also of very different figures.

There are some species which fasten their eggs to the sides of vessels of water: these all lay oblong eggs: some of them, however, are perfectly smooth in all parts; and those of other species smooth only in their inner surface, and ridged longitudinally on the other. What is also the more remarkable in these, is, that they all have a fine thin flake running down all along the two sides, diametrically opposite; and these two bands surrounding the whole egg in this manner, have much the appearance of a case, and give the egg the appearance of being enclosed in a paper frame. It is probable that the use of this frame is to hold the body of the egg the better fastened against the vessel; and probably those eggs which have it not, are deposited from the body of the female fly with a viscous matter about them, in sufficient quantity to fasten them on without this assistance.

There are some eggs of the fly kingdom which must necessarily be held fast to some other body, in order for the worm to be able to make his efforts towards the opening of them, without carrying them away; and some of the species require much more strong attachments of this kind than others.

On the stalks of the common meadow grasses there are also frequently found the eggs of flies deposited in great numbers. On other stalks of grass, one may often see also yellow spots and blotches, which may naturally enough pass with an incurious observer for maladies of the plants; but when examined with the microscope, they appear to be, in reality, clusters of eggs, and amassed in different numbers: sometimes also they are formed perfect and whole, and at others, with their ends eaten. These last are such eggs from which the worms have made their way. These worms are white, and have a variable head, armed with two hooks, but their changes are not known. Reaumur, Hist. Insect. vol. iv. p. 376—383.

Eggs *of Gnats*. There are few creatures in the winged kingdom more prolific than the gnat. Its whole series of changes, from the egg to the perfect animal, is usually accomplished in three weeks or a month; and there are commonly seven generations of them in a year, in each of which every female is the parent of two or three hundred young ones; if all the eggs come to proper maturity. These eggs are arranged by the animals in the form of a small boat, and each separate egg is of the shape of a ninepin. The thicker ends of these are placed downwards; they are all firmly joined to one another by their middles; and their narrower, or pointed parts, stand upwards, and make the upper surface of the boat of eggs, as it were, rough or prickly.

When these eggs are examined singly by the microscope, they appear not exactly of the ninepin shape: the larger end is rounded, and terminated by a short neck, the end of which is bordered with a ridge, which makes a kind of mouth. The neck of each of these is sunk within the water on which the boat swims; for it is necessary that it should keep on the surface, since, if wholly submerged, the worms could never be hatched.

It is only in the morning hours that the gnats are to be found laying their eggs; and then they will frequently be found about the surfaces of such waters as are in a proper condition to give support to their young. The female gnat here places herself on a small stick, the fragment of a leaf, or any other such matter, usually near the water's edge, and places her body in such a manner, that the last ring but one touches the surface of the water; the last ring of all, where there is the passage for the eggs, is turned upward, and every egg is thrust out vertically: and the creature, when it is almost disengaged, applies it against the sides of the already formed clusters, to which it readily adheres, by means of mucilaginous sticking matter with which it is naturally covered, like the eggs of many other insects. The greatest difficulty to the creature is, the placing of the first laid eggs in a proper position to receive the rest, and sustain themselves and them in a proper direction; these she with great precaution places exactly by means of her hinder leg; and when a sufficient number of them are thus arranged together, the rest is easy, because they serve as a support to all the following. Reaumur, vol. iv. p. 615, &c.

Eggs, *Hatching of*. See Hatching.

Egg, *Wind*. See Wind-*Egg*.

Egg, *Sea*, *Echinus Marinus*. See Echinoderma.

Egg, *Cows*, is a name which some authors give to a kind of bezoard, found in the stomach of the cow kind.

Egg, in *Architecture*, an ornament of an oval form, cut in the echinus, or quarter round of the Ionic and Composite capitals. The profile, or contour of the echinus, is enriched with eggs and anchors, alternately plated.

Egg, in *Geography*, a town of Norway; 48 miles E.N.E. of Drontheim.

Egg, one of the western islands of Scotland, about 10 miles in circumference; 4 miles S. of Sky. This island and Canna are the only popish islands.

Egg *Harbour*, a town of America, in Gloucester county, New Jersey, on Great Egg harbour, famous for the exportation of pine and cedar.

Egg *Harbour river*, *Great*, a river of America, which rises between Gloucester and Cumberland counties, in New Jersey; and which, after running E. S. E. a few miles, becomes the line of separation between cape May and Gloucester counties, and falls into a bay of its own name. The inlet from the Atlantic ocean lies in 39° 22′. This river is navigable 20 miles for vessels of 40 tons, and abounds with various kinds of fish, adapted to the market at Philadelphia.

Egg *Harbour inlet*, *Little*, lies about 17 miles N. E. of Great Egg harbour inlet. It receives Mulicus river, which rises in Gloucester and Burlington counties, and forms part of the separating line, a few miles from the bay. It is navigable 20 miles for vessels of 60 tons. The township of "Little Egg harbour," in Burlington county, consists of about 23,000 acres of barren and unimproved land. The compact part of the township is called "Clam Town." It has a small trade to the West Indies.

Egg *Island*, an island on the N. E. side of Delaware-bay, in Cumberland county.

Egg *Bird*, in *Ornithology*, the Sterna *fuliginosa*; which see.

Egg-*Plant*, in *Botany*. See Solanum.

EGGE, in *Geography*, a river of Germany, which runs into the Danube, between Dettingen and Hockftet.

EGGENBERG, a town of Germany, in the duchy of Stiria; three miles W. N. W. of Graz.

EGGERON, a town of Egypt; feven miles S. of Atfieh.

EGGYNA, in *Ancient Geography*, a town of Sicily, mentioned by Cicero.

EGHAM, in *Geography*, a parifh in the hundred of Godley and Chertfey, Surry, England, is fituated on the fouth bank of the river Thames, at the diftance of 18 miles from London. In 1801, the parifh contained 363 houfes, and 2190 inhabitants. The place is a great thoroughfare between the metropolis and the fouth-weftern counties of England. In the vicinity of Egham is Runnymead, a place memorable in the Englifh annals, for the ratification of Magna Charta by king John. The fame field or meadow is now occafionally ufed as a race-courfe. Near the weftern extremity of this parifh is Camomile-hill, a place fo named from the quantity of camomile which has been cultivated here, and now grows wild.

EGILSHA, one of the Orkney iflands, about fix miles in circumference, E. of Ronfa.

EGINA, in *Ancient Geography*. See ÆGINA.

EGINHART, in *Biography*, the moft ancient German hiftorian, who flourifhed in the ninth century, was educated with the fons of Charlemagne. To this great fovereign he afterwards became fecretary and fon-in-law. He appointed him fuperintendant of his buildings, and fent him to Rome in 806, as his agent with pope Leo III. Upon the death of Charlemagne he was taken into the confidence of Lewis le Debonnaire, who entrufted him with the education of his fons, and fettled upon him ample eftates. Eginhart, being now well provided for, devoted himfelf to religious concerns, was placed at the head of the monafteries, and became abbot of Selingeftadt. Notwithftanding the partiality which he had for retirement, he was frequently called to the court of his fovereign, to give advice and direction in affairs of moment. At length, he was permitted to renounce all fecular affairs, and fhut himfelf up in his monaftery, maintaining no other correfpondence but with a few men of letters in foreign countries. He died in the year 839, leaving behind him a life of Charlemagne, written in the Latin language, and with a purity of ftyle which was uncommon in that age. Its impartiality and veracity have been called in queftion, but the editor, it is faid, took unwarrantable liberties with it in altering the language. Suetonius was the model which our hiftorian chiefly looked to in the compofition of his work. Eginhart compiled the annals of France from the year 741 to 829: thefe, and his memoir of Charlemagne, were inferted by Bouquet in his collection of French hiftorians. He left behind him likewife 62 epiftles, which relate to the hiftory of the times in which he flourifhed, and which were publifhed at Frankfort in the year 1714. Moreri. Bayle.

EGLANTERIA, EGLENTERIA, *Englanteria*, or *Eglanterium*, in *Botany*, the name of a fpecies of Rofe, corrupted, as it appears, from the French Eglentier, or Eglantier, of whofe derivation we are ignorant. In Englifh Eglantine or Eglentine. Turner's herbal. 103. Thefe names unquefticnably belong to the common Englifh Sweet Briar, or *Rofa fylveftris foliis odoratis*, Bauh. Pin. 483; *R. foliis odoratis, Eglentina dicta*, Bauh. Hift. v. 2. 41. *R. rubiginofa*, Linn. Mant. 2. 564. Sm. Fl. Brit. 540. Engl. Bot. t. 991. This therefore is what moft authors have taken for *R. Eglanteria* of Linnæus, all whofe fynonyms in the firft edition of Sp. Pl., and confequently the fpecific character taken from Haller, belong to it. We learn alfo from Dr. Afzelius's Differtation on Swedifh Rofes, in Sims and Konig's Annals of Botany, v. 2. 213, that this is the true Swedifh plant, *R. Eglanteria*, Linn. Fl. Suec. ed. 2. 171. except that the defcription following the place of growth, is accidentally made from another fpecies, not found in Sweden, the Yellow Briar, or *R. lutea fimplex* of Bauhin's Pinax. Now it unfortunately happened that Linnæus originally confounded this Yellow Briar with our Sweet Briar, both having highly fragrant leaves, and he being really, at that time, very flightly acquainted with Rofes at all. Accordingly the original marked and numbered fpecimens of *R. Eglanteria* in his herbarium, are this Yellow Briar, of which an excellent figure may be feen in Curtis's Magazine, t. 363. Long afterwards he received from Mygind fpecimens of our Sweet Briar, which he defcribed at the end of his fecond Mantiffa, by the very apt name of *R. rubiginofa*, derived from its fpecific character and Haller's fynonym. He takes care to diftinguifh it from his *Eglanteria*, though by a ftrange fatality he quotes Bauhin's *R. lutea* as a fynonym, confounding, moreover, the fingle and double yellow rofes of that author together, though none can be more diftinct.

Of all this we have long ago been fufficiently aware, though entirely obliged to our learned friend for afcertaining the Swedifh plant, nor was it without due confideration that we determined to abide by the decifion of the able authors and editors of the Hortus Kewenfis, to which we ftill beg leave to adhere. We therefore retain the name of *Rofa rubiginofa* for our Sweet Briar, as being indifputably certain, peculiarly expreffive, and now fanctioned by Jacquin, Roth, Willdenow, indeed by general ufe. Lightfoot named it *R. fuavifolia*, which is at leaft equally applicable to the Yellow Briar, and has been followed in the Flora Danica only. But on the other hand, we do not follow even Linnæus in his errors, nor apply the word *Eglanteria* to a wrong plant. The Yellow Briar is beft named *Rofa lutea* after all the old authors, an appellation firft adopted by Miller, nor is there any occafion to call it *foetida* with Allioni, though we agree with thofe who think the fmell of its flower unpleafant; efpecially as the foliage is fo very fweet. Neither can any ambiguity arife between it and the Double Yellow Rofe, fo well named *fulphurea* in the Hortus Kewenfis, where it was firft properly difcriminated. Ehrhart indeed called this laft *glaucophylla* and our Yellow Briar *chlorophylla*, expreffive names, but altogether fuperfluous. Even the confufion of Englifh names, which Mr. Curtis dreaded, fee his Magazine, t. 363, is avoided by terming one a Briar the other a Rofe, which is perfectly correct. On turning to Lamarck's Flore Francoife in hopes of learning fomething of the derivation or meaning of the word églantier, but in vain, we perceive he has taken the orange-coloured variety of *R. lutea*, or Auftrian Rofe, Curt. Mag. t. 1077, for Linnæus's *rubiginofa*, an error as remarkable as his making the Apple Rofe, or *R. villofa*, a variety of the Sweet Briar. For the ufe of thofe who may hereafter write in this work the difficult article ROSA, we muft proteft againft a miftake of our excellent friend Afzelius, in making our *R. tomentofa* the real *villofa* of Linnæus. The latter fpecies depends altogether on his fynonyms, and is the large Apple Rofe fo common in gardens, and wild in the north of England, from which we firft, in Fl. Brit., diftinguifhed this *tomentofa*. We know our friend's candour will excufe us, and we look with anxiety for the fequel of his remarks, to confirm the fuggeftions, or difpel the doubts, in his admirable effay.

Ambiguity refpecting the Eglantine is not confined to fyftematic botanifts. Our great poet in his Allegro has confounded

confounded it with the Woodbine or Honeysuckle, as Mr. Curtis has well remarked in his Flora Londinensis, fasc. 1. t. 15.

"Through the sweet-briar, or the vine,
Or the twisted eglantine."

We have not been able to find any thing in the old herbals to account for this mistake in a writer usually so supremely accurate, nor do the Italians, with whom he was so conversant, throw any light upon this matter. They seem not even to have adopted the word eglantine in any shape, but have appropriate names for the Sweet Briar and Woodbine. Shakespear, in his Midsummer Night's Dream, and Cymbeline, evidently uses the word in question according to its common acceptation. S.

EGLANTINE. See Eglanteria.

EGLETONS, in *Geography*, a small town of France, in the department of the Correze, chief place of a canton in the district of Tulles; 18 miles N. E. of Tulles, 12 miles W. of Neuvic, with a population of 886 individuals. The canton contains seven communes, and 5331 inhabitants, on a territorial extent of 145 kiliometres.

EGLISAU, a small town of Switzerland, in the canton of Zurich, on the north side of the Rhine, in the district of the same name, remarkable for being more subject to earthquakes than any other part of Switzerland. It is a great thoroughfare from Switzerland to Germany.

EGLISE neuve sur Billon, a small town of France, in the department of the Puy-de-Dôme; 18 miles S. E. of Clermont.

EGLON, in *Ancient Geography*, a royal town of Palestine, in the tribe of Judah, which, in the time of Eusebius, was merely a village. E. of Eleutheropolis.

EGMONT, Justus Van, in *Biography*, a painter of history, born at Leyden, but mostly employed in France by Lewis XIII. and XIV. in the establishment of the royal academy of painting and sculpture at Paris. He assisted Vouit in many of his historical works, and painted many of his own composition in large and small, for which he was highly esteemed and liberally rewarded by the French monarch. He died in 1674, aged 72.

Egmont, Lamoral, *Count of*, a nobleman of great distinction in Flanders, was born in 1522, and at an early age devoted himself to the profession of arms. He accompanied Charles V. into Africa in 1541, and was made captain-general of the lances. In 1546 he went to the emperor's assistance against the protestant princes of Germany, and attended him to the diet of Augsburg. He next came to England, as ambassador, to conclude the marriage between queen Mary and Philip II. By this sovereign he was appointed governor of Flanders and Artois, and general of the cavalry. From his conduct in war, and in negociation, he was very highly esteemed at the commencement of the troubles in the Low Countries; and from his services to the crown, and his attachment to the Roman catholic religion, might have been supposed to possess the favour of the court. But his devotedness to the sovereign did not make him less the advocate of the rights of the people, which excited against him cruel enmities. Egmont united with the prince of Orange in opposition to the Spanish councils, by which the Low Countries were now to be governed: they, with count Horn, wrote letters to the king, charging cardinal Granvelle with a mal-administration of affairs, who by their representations was removed, but still the same plans were adopted by the council. Egmont then went to the court of Spain, to lay before the king full information of the state of affairs, and was received with every mark of confidence and outward esteem: but his destruction was at the same time secretly determined on. He had vindicated the people's rights, a crime not to be forgotten, and when the duke of Alva was sent over for the express purpose of quashing by force all opposition, the prince of Orange in vain endeavoured to persuade count Egmont to withdraw from the storm. One of the first measures of the duke was to seize the counts Egmont and Horn, and to send them out of the province, contrary to the privileges of the meanest subjects, where they were kept in custody, till a special commission was made out to bring them to trial at Brussels. Trial and condemnation, in their case, were terms of the same import, and they were both publicly beheaded in June 1568, to the grief of the whole Flemish people. Egmont was only in his forty-sixth year. The French ambassador wrote on the occasion to his court, "I have seen that head fall which twice made France to tremble." Nouv. Dict. Hist.

Egmont, in *Geography*, a town of Holland, on the sea-coast; three miles S.W. of Alcmaer.

Egmont *Bay*, a bay on the S.W. of the island of St. John, in the gulf of St. Lawrence. N. lat. 46° 30'. W. long. 64°.

Egmont *Island*, an island in the South Pacific ocean, discovered by Capt. Byron in 1767, and so called by him. S. lat. 19° 20'. W. long. 138° 30'.

Egmont, *Mount*, a lofty peak on the coast of New Zealand, situated in S. lat. 39° 16'. W. long. 185° 15'; and so called by Cook in 1770. It appeared to tower above the islands, and was covered with snow. Its base seemed large, and it rose with a gradual ascent. Being near the sea, surrounded by a flat country, and clothed with verdure and wood, it was the more conspicuous. To the shore under it, which forms a large cape, he gave the name of "Cape Egmont."

Egmont, *Port*, is situated in Falkland island, and was so called by commodore Byron in 1765, who represents it as one of the finest harbours in the world. The mouth of it is S.E. distant seven leagues from a low rocky island, which is a good mark to know it by. Within inland, and about two miles from the shore, there is between 17 and 18 fathom water; and about three leagues to the westward of the harbour there is a remarkable white sandy beach, off which a ship may anchor till there is an opportunity for running in. The whole navy of England, says the Commodore, might ride here in perfect security from all winds. In every part of port Egmont there is fresh water in the greatest plenty. Geese, ducks, snipes, and other birds, are very numerous; wild celery and wood-sorrel may be obtained in great abundance; nor is there any want of muscles, clams, cockles, and limpits. Seals and penguins are innumerable, and the coast swarms with sea-lions, many of which are of an enormous size.

EGNATIA, in *Ancient Geography*, a town of Italy, in the part called Peucetia, situated on the sea-coast E. of Bœium, now called Agnazzo.—Also, an episcopal town of Africa, in the Byzacene territory.

EGNAZIO, Batista, in *Biography*, a learned Italian, was born at Venice of poor parents about the year 1478. Having received a good education, he opened a private school, at which the belles lettres were to be taught, when he was only eighteen years of age. The success and reputation which attended the labours of Egnazio excited the jealousy of Sabellico, a public professor of the same city; they became violent enemies, but on the death-bed of Sabellico a full reconciliation took place. Finding himself near his end, he sent for Egnazio, besought his forgiveness, and entrusted to his care his ten MS. books of "Examples." These he published,

liſhed, and pronounced the funeral oration over the aſhes of Sabellico. Egnazio had now conferred upon him the right of citizenſhip, and was afterwards preſented with eccleſiaſtical preferment. In 1515 he was ſent with others to Milan, to compliment king Francis I. to whoſe honour Egnazio compoſed a panegyric, for which he was rewarded with a gold medal. In 1520 he was elected public profeſſor of eloquence at Venice, in oppoſition to many rival competitors. So high was his reputation in this department of literature, that he had frequently five hundred auditors to hear him daily. He was conſulted upon important affairs by the ſenators, who had a great opinion of his wiſdom. Towards the decline of life he was deſirous of reſigning his employment, but was perſuaded by the ſenators to continue, and his ſalary was augmented. He at length obtained his diſmiſſion, but enjoyed the emoluments of his office without any deduction. He died in 1553, at the age of 75. He was the author of many works, *viz.* "Orations," "Epiſtles," a treatiſe "De Romanis principibus vel Cæſaribus," containing the lives of the Roman emperors from Julius Cæſar to Palæologus, and from Charlemagne to Maximilian I.; a treatiſe "On the Origin of the Turks," and a work in nine books, "De exemplis Virorum illuſtrium." He was, as he grew old, very irritable; againſt Robertello, the perſon who had cenſured his writings, he drew his ſword, giving him a wound which had nearly proved fatal. Moreri.

EGOISTS, in the hiſtory of *Philoſophy*, a ſect of philoſophers in France, who ſprung up after Des Cartes, and who maintained that we have no evidence of the exiſtence of any thing but ourſelves. Theſe philoſophers are mentioned by many authors, and particularly by Buffier, in his "Treatiſe of Firſt Principles;" and they have followed the method of Des Cartes, in reſting upon the truth of their own thoughts as a firſt principle, agreeably to his maxim, "Cogito, ergo ſum," but requiring arguments for the proof of every other truth of a contingent nature; but none of them, excepting Mr. Locke, has expreſsly treated of firſt principles, or given any opinion of their utility or inutility. Their general opinion may be collected from their following Des Cartes in requiring proof, or pretending to offer proof of the exiſtence of a material world, which ſurely, ſays Dr. Reid, (Eſſays on the Intellectual Powers of Man, p. 642,) ought to be received as a firſt principle, if any thing be, beyond what we are conſcious of.

EGOITOS, a term uſed by Van Helmont to expreſs the light of underſtanding, by which we reflect and reaſon within ourſelves.

EGONA, in *Ancient Geography*, a river of Gaul.

EGORBEUSK, in *Geography*, a town of Ruſſia, in the government of Riazan; 28 miles N. of Riazan.

EGOREVSKOI, a town of Ruſſia; 40 miles N.E. of Kologrin.

EGOSA, in *Ancient Geography*, a town of Spain, in the Tarragoneſe territory.

EGRA, a town of Arabia, near the gulf of Aila.

Egra *Water and Salt*, the celebrated mineral ſpring near Egra, in Bohemia, appears to be a clear ſparkling water, chalybeate when freſh taken from the ſpring, and which beſides contains a conſiderable quantity of a vitriolic ſalt, which is doubtleſs Glauber, and not Epſom ſalt, as it does not become turbid by an alkali. Beſides the great conſumption of the water at the ſpring head, much of it is evaporated on the ſpot, and the reſiduary ſalt, which is probably almoſt entirely ſulphat of ſoda, is ſold in Germany and Bohemia under the title of Egra ſalt. Both the water and ſalt are much extolled by Hoffmann, and they probably effect all that can be expected from a powerful ſaline chalybeate.

Egra, in *Geography*. See Eger.

EGREMONT, a townſhip of America, in Berkſhire county, Maſſachuſetts, and incorporated in 1760, and containing 835 inhabitants; 145 miles W. of Boſton.

Egremont, a market town, and formerly a borough, in the ward of Allerdale, and county of Cumberland, England, is ſeated on a ſmall river which falls into the Iriſh ſea, near the promontory of St. Bee's. It is five miles from Whitehaven, and 289 from London, has a ſmall weekly market on Saturday, and one annual fair. In 1801 the town conſiſted of 319 houſes, which were occupied by 1515 inhabitants. Many of the houſes appear ancient, and ſome of them have piazzas in front. On a conſiderable eminence are the remains of an old caſtle; a part of which has been fitted up as a court, for the ſteward of the earl of Egremont, who is lord of the manor, and receives his title from the place. Hutchinſon's Hiſtory, &c. of Cumberland, 2 vols. 4to.

EGRET, in *Ornithology*, a ſpecies of Ardea. See Heron.

EGREVILLE, in *Geography*, a town of France, in the department of the Seine and Marne, and diſtrict of Nemours; three leagues S.E. of Nemours.

EGRISELLES, a town of France, in the department of the Yonne, and diſtrict of Sens; ſeven miles S. of Sens.

EGUILETTE, in the *Manege*. See Yerking.

EGUILLES, in *Geography*, a town of France, in the department of the mouth of the Rhone, and diſtrict of Aix; two leagues N.W. of Aix.

EGUIMUHA, or Elgimuha, a town of Africa, in the empire of Morocco, at the foot of mount Atlas, near which is an iron mine.

EGUISCE'. See Aiguisce.

EGUISHEM, in *Geography*, a ſmall town of France, in the department of the Upper Rhine; three miles ſouth of Colmar, and ſix miles N. of Rouffach.

EGUIZENSIS, in *Ancient Geography*, an epiſcopal ſee of Africa, in the pro-conſular province.

EGURENDE, in *Geography*, a town of France, in the department of the Correze, and diſtrict of Uſſel; four leagues N.E. of Uſſel.

EGUZON, a ſmall town of France, in the department of the Indre, chief place of a canton in the diſtrict of La Châtre, with a population of 1056 individuals. The canton has a territorial extent of 152½ kiliometres, 10 communes, and 6199 inhabitants.

EGYPT, a country of Africa, called by its ancient inhabitants Chemia, and by the Copts Chemi, from Ham, the ſon of Noah, as ſome have ſuppoſed, and in ſcripture denominated the land of Mizraim, whence the Arabians, and other oriental nations, ſtill call it Meſr. The Greek name Egypt has been derived by ſome from one of its kings, denominated Egyptus; by others from *aia*, ſignifying in Greek *a country*, and *Æcoptos*, ſoftened into Egyptus, and thus denoting "the land of the Copts;" and by others again from the blackneſs of its ſoil and the dark colour both of its river and inhabitants, ſuch a blackiſh colour being called by the Greeks *egyptios*, from *gyps* and *egyps*, a vulture, which is a bird of that hue. Egypt is bounded on the north by the Mediterranean ſea, on the ſouth by a chain of mountains, which ſeparates it from Nubia, on the eaſt by the Red ſea and the iſthmus of Suez, and on the weſt by the deſerts of Libya, in the midſt of which ſtood the temple of Jupiter Ammon. Its greateſt length, according to Savary's ſtatement, is from Sienna or Syene, ſituated almoſt under the tropic of Cancer, to cape Burlos, which, forming the moſt advanced point of the Delta, almoſt terminates the 32d degree of latitude. This diſtance is about 225 leagues. Its

greatest breadth is 68 leagues, drawing a right line from the ruins of Pelusa to the tower of the Arabs, formerly called Taposiris. This measure agrees with that of the ancients, which made the breadth of the Delta 54 leagues from Pelusium to Canopus, and 14 from Canopus to Taposiris. Accordingly Diodorus Siculus and Strabo allow the base of the Delta, extending from Pelusium to Canopus, now called Abouk'r, 1300 furlongs, which may be estimated at 54 leagues, to which if we add 14 leagues from Canopus to the tower of the Arabs, we shall have 68 leagues. Herodotus reckons 60 schœni or 80 leagues from mount Casius to the gulf of Plintine, where Taposiris was situated; but mount Casius being 12 leagues to the eastward of Pelusium, by subtracting this number from the former, we obtain 68 leagues from Pelusium to Taposiris. Ancient and modern geographers have not been agreed as to the precise limits of this country. Accordingly some have assigned to its length from north to south 500 miles, and to its breadth, including the greater and lesser Oasis, about half that measure. Egypt, however, is in reality a narrow vale on both sides of the river Nile, bounded by parallel ridges or mountains or hills. Some of the ancient geographers have even hesitated to what portion of the globe they should ascribe Egypt. Ptolemy and Strabo, with the modern geographers, fix the isthmus of Suez as the boundary of Asia and Africa. Dionysius, Mela, Pliny, Sallust, Hirtius, and Solinus, have preferred for that purpose the western branch of the Nile, or even the great Catabathmus, or descent, which last would assign to Asia, not only Egypt, but part of Libya.

Ancient Egypt is divided by some into two parts, the Upper and the Lower Egypt, and by others into three parts, viz. the Upper Egypt, properly so called, or Thebais, now called Said; the Middle Egypt, or Heptanomis, now Vostani; and the Lower Egypt, the best part of which was the Delta, now called Bahira or Rif. (See THEBAIS, HEPTANOMIS, and DELTA.) Besides this larger division, Egypt was also distributed into several governments or prefectures, called by the Egyptians "Tabir," and by the Greeks "Nomes;" the number of which is uncertain, as they depended upon the pleasure of the reigning prince. In general they were about 36 and were named from the chief city of each nome. This division is attributed to Sesostris.

Upper Egypt, according to the modern and commonly received division of the country into Upper and Lower Egypt, is a long valley, commencing at Sienna or Syene, (Asouan,) and terminating at Grand Caire. Two chains of mountains, taking their rise from the east cataract, form the limits of that country. Their direction is from south to north, until they reach the latitude of Cairo, where they separate to the right and to the left; one of them taking the direction of mount Co'zoum, and the other ending in banks of sand near Alexandria. The former is composed of high and steep rocks; the latter of sandy hillocks, over a bed of calcareous stone. Beyond these mountains are deserts, bounded by the Red sea on the east, and on the west by Africa, in the midst of which is that long plain, which is no more than seven or nine leagues broad, where it is the widest. Here the Nile flows, between two insurmountable barriers, with varied current, sometimes smooth and tranquil, and at other times impetuous and overflowing the country, which it covers with its waters and fertilizes for the space of 150 or 200 leagues (See NILE.) This valley, in which the sciences were first cultivated, and whence they were diffused through Greece and other parts of the world, is still as fertile as it was in ancient times; but it is less cultivated, and many of its former cities, overwhelmed by despotism and ignorance, are laid level with the dust, and their former celebrity is now chiefly known by their magnificent ruins. (See THEBAIS.) The capital of Upper Egypt is *Girge*, which see.

Lower Egypt comprehends the whole country between Cairo, the Mediterranean, the isthmus of Suez, and Libya. This immense plain presents, on the borders of its parching sands, a strip of land cultivated along the canals of the river, and in the middle the triangular island, to which the Greeks gave the name of Delta. (See DELTA.) To describe Egypt in two words, says Volney, let the reader imagine, on one side, a narrow sea and rocks; on the other, immense plains of sand; and in the middle, a river flowing through a valley of 150 leagues in length, and from three to seven wide, which, at the distance of 30 leagues from the sea, separates into two arms, the branches of which wander over a country, where they meet no obstacles, and which is almost without declivity. We do not really enter Egypt, says this writer, until we arrive at Rosetta (Reschid). There the sands peculiar to Africa end, and a black, fat, and loamy soil, the distinguishing characteristic of Egypt, begins; and there also, for the first time, we behold the waters of the celebrated Nile, which, rolling between two steep banks, considerably resembles the Seine, between Auteuil and Passy. The basis of Egypt, from Syene (Asouan) to the Mediterranean is a continued bed of calcareous stone, of a whitish hue, and somewhat soft, containing shells, analogous to those found in the two neighbouring seas, and principally consisting of echini, volutes, bivalves, and a species in the form of lentils. The same kind of stone is discoverable in the pyramids, and in the Libyan rock on which they stand. It is likewise found in the cisterns, in the catacombs of Alexandria, and in the projecting shelves upon the coast. It is also seen in the eastern mountain, in the latitude of Cairo, and in the materials with which that city is built. This calcareous stone forms the immense quarries that extend from Sawadi to Manfalout, for the space of more than 25 leagues, as we learn from father Sicard; who also informs us, that marble is found in the valley of Carts, at the foot of the mountains bordering on the Red sea, and in the mountains to the north-east of Asouan. Between that place and the Cataract are the principal quarries of red granite, which are continued lower down; because, on the opposite shore of the Red sea, the mountains of Oreb, of Sinai, and their dependencies, at two days' journey towards the north, are formed of this substance. Not far from Asouan, to the north-west, is a quarry of Serpentine stone, employed in its native state by the inhabitants for the manufacture of vessels, which will stand the fire. In the same parallel, on the Red sea, was formerly a mine of emeralds, the traces of which are now lost. Copper is the only metal of this country mentioned by the ancients. In the road to Suez is found the greatest quantity of what are called Egyptian flints, or pebbles, lying on calcareous stone, that is hard and sonorous; and here are likewise discovered those stones, which, from their form, have been taken for petrified wood. The two lakes of Natron are situated in the desart of Shayat, or St. Macarius, to the west of the Delta. (See NATRON.) In the midst of these minerals, of various qualities, and in the midst of that fine and reddish-coloured sand peculiar to Africa, the earth of the valley through which the Nile flows, manifests properties, which prove it to be of a distinct class. Its blackish colour, and its clayey cementing quality, evince its foreign origin, and indicate its descent with the river from the heart of Abyssinia. Without this fat and light mud, Egypt must have been altogether unproductive. This alone seems to contain the seeds of vegetation and fecundity, and these are owing to the river, by which they are deposited.

The

The fertility of Egypt, and the excellence of its productions and fruits, are highly celebrated by ancient writers, and even by Moſes, who was well acquainted with this country. It abounds in grain of all ſorts, but particularly rice; inſomuch that it was formerly the granary of Rome and of Conſtantinople. The exports of rice are ſtill very conſiderable, and alſo great quantities of wheat from Upper Egypt, in favourable years. No oats are ſeen in Egypt; and the barley is conſumed by the horſes. The moſt plentiful parts of Egypt are the *Delta*, (which ſee,) and the province of Faïoum, (ſee FAIOUM,) ſuppoſed to be the ancient Heracleæotic nome; the capital of which, of the ſame name, is thought to have been Heracleopolis, Nilopolis, or Arſinoe, and is ſaid by the natives to have been built by Joſeph, to whom they own themſelves obliged for the improvements of this territory. Being the loweſt part of Egypt, they ſay that it was nothing but a ſtanding pool, till that patriarch, by making drains, and particularly the great canal, which extends from the Nile to the lake Moeris, diſcharged the water, and clearing it of the ruſhes and marſhy weeds, rendered it fit for tillage. It is now the moſt fertile and beſt cultivated land in the whole kingdom, containing, as it is ſaid, above 360 villages, and yields linen, grapes, and other fruits in abundance; and it fails not bearing even in thoſe years, when the Nile's not riſing to its uſual height occaſions a ſcarcity in the other parts of Egypt. The flouriſhing ſtate of agriculture amongſt the ancient Egyptians ſufficiently appears from the immenſe works which they conſtructed for the diſtribution of their canals, and for watering the lands. At preſent there are reckoned 80 canals, like rivers, all dug by manual labour, ſeveral of which are 20, 30, and 40 leagues in length. Theſe receive the inundation, and circulate the waters through the country. The others, nearly choaked up, are dry, upon the fall of the Nile. The large lakes of Mœris, Behire, and Mareotis formed vaſt reſervoirs for containing the ſuperfluous waters, and for ſpreading them over the adjacent plains. They were raiſed upon the elevated grounds by means of vertical wheels, the invention of which is owing to the ſkill of the Egyptians. One ox was ſufficient to turn them, and to water an extenſive field. Beſides theſe reſervoirs, all the towns, at ſome diſtance from the Nile, were ſurrounded by ſpacious ponds, to ſupply the wants of the inhabitants, and for the advantage of cultivation. Some great dykes, the ruins of which are ſtill to be ſeen, ſerved to keep in the river; others were oppoſed to the torrents of ſand, which have a continual tendency to cover the face of Egypt. The waters are conveyed by aqueducts to the very ſummits of the hills. There they were received in immenſe baſons hewn out of the rocks, from which they flowed into the midſt of deſerts, and converted them into fruitful fields. However, in the period of 1200 years, during which this country has been ſubject to nations that have not directed their attention to cultivation, nor beſtowed much labour upon it; the greateſt part of the noble works of antiquity has decayed and gone to ruin; and the barbariſm of the preſent government tends to accelerate and complete their deſtruction. The limits of cultivated Egypt are encroached upon annually, and barren ſand is accumulating from all parts. In 1517, the era of the Turkiſh conqueſt, lake Mareotis was at no diſtance from the walls of Alexandria and the canal which conveyed the waters into the city was ſtill navigable. At this day, the lake has diſappeared, and the lands watered by it, which, according to hiſtorians, produced abundance of corn, wine, and various fruits, are changed into deſerts, in which are found neither ſhrub, nor plant, nor verdure. The canal itſelf, the work of Alexander, neceſſary to the ſubſiſtence of the inhabitants of the city, which he built, is nearly choaked up, and preſerves the waters only when the inundation is at its greateſt height, and for a ſhort time. About half a century ago, part of the mud depoſited by the river was cleared out of it, and it retained the water three months longer. Schemes have lately been adopted for opening and perfecting this canal. The Peluſiac branch, which diſcharges itſelf into the eaſtern part of the lake of Tanais, or Menzalé, is utterly deſtroyed. With it periſhed the beautiful province which it fertilized, and the famous canal begun by Necos, and finiſhed by Ptolemy Philadelphus. The famous works, executed by kings, who ſought their glory and happineſs in the proſperity of the people, have not been able to reſiſt the ravages of conquerors, and that diſpotiſm, which deſtroys every thing, till it buries itſelf under the wreck of the kingdoms, whoſe foundation it has ſapped. The canal of Amrou, the laſt of the great works of Egypt, and which formed a communication between Foſtat and Colzoum, reaches at preſent no farther than about four leagues beyond Cairo, and loſes itſelf in the lake of Pilgrims. Upon the whole, it may be confidently aſſerted, that upwards of one-third of the lands formerly in cultivation is metamorphoſed into dreary deſerts. For the cauſe and the fertilizing effects of the annual inundation of the Nile, we refer to the article NILE. This river, in Upper Egypt, is confined by high banks, which prevent any inundation into the adjacent country; and the caſe is the ſame in Lower Egypt, except at the extremities of the Delta, where the Nile is never more than a few feet below the ſurface of the ground, and where, of courſe, inundation takes place. Egypt is indebted for its fertility to the aſſiſtance of human art. The lands near the river are watered by machines; and if they extend to any breadth, canals have been cut; and, by means of canals, the Nile becomes the ſource of fertilization. The ſoil in general is ſo rich as to require no manure. One of the principal articles of cultivation in Lower Egypt is rice; which is ſown from the month of March to that of May. During the inundation of the Nile, the fields are covered by its waters, and for the purpoſe of retaining them, ſmall dikes or raiſed embankments are thrown up, round each field, to prevent their running off. Trenches are alſo dug in order to convey thither a freſh ſupply, in order to give the plant a conſtant watering. Rice is nearly ſix months before it arrives at maturity, and it is generally cut down before the middle of November. As the uſe of the flail is unknown in Egypt, the rice plants are ſpread in thick layers on floors, formed of earth and pigeons' dung, which are well beaten and very clean; and then, in order to ſeparate the grain from the ſtraw, they make uſe of a ſort of carts, conſtructed like our ſledges, with two pieces of wood joined together by two croſs bars. Between the longer ſides of this ſledge are fixed tranſverſely three rows of ſmall wheels, made of ſolid iron, and narrowed off towards their circumference. On the fore part is fixed a high ſeat, on which a man ſits, for the purpoſe of driving two oxen that are harneſſed to the machine, and thus moving it in a circular direction over every part of the heap of rice, till the grain is completely ſeparated from the ſtraw; the grain is then ſpread in the air to be dried. The dried rice is carried to the mill, where it is ſtripped of its chaff or huſk. This mill conſiſts of a wheel turned by oxen, which ſets ſeveral levers in motion; and at their extremity is an iron cylinder, about a foot long, and hollow underneath. Theſe cylinders beat in troughs which contain the grain; and at the ſide of each trough there ſtands a man, whoſe buſineſs it is to place the rice under the cylinders. The next operation is to ſift the rice in the open

air, by filling a small sieve, which a man lifts over his head, and thus lets fall, with his face turned to the wind, which blows away the small chaff or dust. This cleaned rice is put a second time into the mill, in order to bleach it; it is afterwards mixed up in troughs with some salt, which contributes very much to its whiteness, and also to its preservation; and in this state it is sold. Rice is furnished in great quantities in the Delta; and that which is grown in the environs of Rosetta is more esteemed, on account of its preparation, than that which is produced in the vicinity of Damietta. The produce of the one and the other is equally wonderful. In a good season, that is, when the rise of the Nile occasions a great expansion of its waters, the profit of the proprietors of rice fields is estimated at 50 per cent. clear of all expences. Savary says, that it produces eighty bushels for one. As soon as the ground is cleared of the rice, the Egyptians sow a fine variety of trefoil, (Trif. Alexandrinum of Forskal,) which they call "barsim". Its seed is scattered without ploughing, or even turning up the ground, and it sinks to a sufficient depth in the moist soil. This trefoil produces three crops before the time for again sowing the rice; and in its dry or green state it is the most common and the most succulent food for cattle; both at pasture and in stalls. Of the various plants which have rendered Egypt celebrated for its superior abundance, wheat claims the pre-eminence. We have already said, that it was formerly the granary of Rome and Constantinople, and by their means, of neighbouring nations. At this day, Arabia derives from it the means of subsistence. The numerous caravans which set sail from Upper Egypt for Cosseir, a port on the Red sea, carry nothing but corn. It is thence conveyed to Dsjedda, and distributed over part of Arabia. Wheat is sown as soon as the waters of the Nile have retired from the lands appropriated to it; the seed-time varies with the latitude, and also the harvest, which are earlier in Upper than in Lower Egypt. Near to Syene they sow the barley and the corn in October, and reap it in January. Towards Girgé they cut it in February, and in the month of March in the vicinity of Cairo. This is the usual progress of the harvest in the Said. There is also a number of partial harvests, as the lands are nearer or at a greater distance from the river, lower or more elevated. In the Lower Egypt they are sowing and reaping all the year. Wherever the waters of the river can be procured, the earth is never idle, and furnishes three crops annually. In descending from the cataracts in January, the corn is seen almost ripe; lower down it is in ear, and advancing further, the plains are covered with verdure. The cultivator, in general, merely casts the seed upon the moistened earth; the corn soon springs up from the mud, its vegetation is rapid, and four months after it is sown it is fit to be reaped. In performing this operation, the sickle not being used, the stalks are pulled up by the roots, and carried to large floors, like those which are used for treading out rice; and by a similar operation the corn is separated from the ear. Unripe ears of corn are dried and slackly baked in an oven, and being afterwards bruised and boiled with meat, form a common dish in Lower Egypt, called "férik." As they have neither water-mills nor wind-mills in Egypt, the useful arts of the miller, and also of the baker, are here in the rudest state of infancy. Their bread is made in small thin cakes, and is unleavened; and is very slightly baked, so that it is heavy and difficult of digestion. In the towns they have a kind of loaves or cakes, some of which are covered with fennel-flower seeds, procured from Upper Egypt, which give them an aromatic flavour, and others are soft, pierced with holes, and sprinkled with sesamum, or oily grain, which gives them an agreeable taste. The culture of barley occupies a considerable portion of land throughout all Egypt: it is ripe a month earlier than the wheat, and its harvest is equally abundant. This is the common food of horses in Egypt, as it is in all parts of the East, where oats and rye are unknown. From the most remote periods flax has been in general use in Egypt; and it is a considerable article of cultivation and commerce. Its thread has been employed in the fabrication of the garments of a numerous people. A considerable quantity of cloth is manufactured from it at this day; and the plant, from which indigo is extracted for dyeing it, grows also in this country, where it is called "Nile." Of the hemp, which is abundantly cultivated in this country, the inhabitants prepare intoxicating liquors, and also by pounding the fruits into thin membranous capsules, they form a paste, which answers a similar purpose; and they also mix the capsules with tobacco for smoking. The sugar-cane is also one of the valuable productions of Egypt. The common people do not wait for the extraction of the sugar, but eat the canes green, which are sold in bundles in all the towns. They begin to ripen in October, but are not, in general, fit to be cut till November or December. The sugar refineries are in a very imperfect state. Fruit trees of various species abound in this country. Among these we may reckon the olive-tree, fig-trees which yield figs of an exquisite flavour, and the date-tree, which is to be found every where in the Thebais and in the Delta, in the sands as well as in the cultivated districts, requiring little or no culture, and yielding a very considerable profit, on account of the immense consumption of its fruit. The species of palm tree that furnishes dates produces also a bark; which, together with its leaves and the rind of its fruit, afford filaments, from which are manufactured ropes and sails for boats. The leaves are also used for making baskets and other articles. The very long rib of the branches is employed, on account of its lightness and solidity, by the Mamaluks, in their military exercises, as javelins, which they throw at each other from their horses when at full speed. A species of Cyperus, which produces a fruit resembling the earth-nut, but of a much more agreeable flavour, is cultivated in the environs of Rosetta; and the small tubercles are sent to Constantinople and other towns of the Levant, where they are much valued. The Egyptians press from them a milky juice, which they deem pectoral and emollient; and give them to nurses, in order to increase the quantity of their milk. The banana-trees, though not natives of the soil of Egypt, are nevertheless cultivated in the northern parts of that country. The papaw, or custard apple-tree, is also transplanted into the gardens of Egypt, and yields a fruit equally gratifying to the taste and smell. In the shade of the orchards are cultivated various plants, the roots of which are refreshed by the water that is conveyed to them by little trenches; each inclosure having its well or reservoir, from which the water is distributed by a wheel turned by oxen. The mallow (malva rotundifolia) grows here in abundance; it is dressed with meat, and is one of those herbs that are most generally consumed in the kitchens of Lower Egypt. Two other plants, used as food, are the garden Jew's mallow, and the esculent hibiscus. Another tree, which appears to be indigenous in this country, is the "Atlé," a species of large tamarisk (tamarix orientalis, Forskal.) The wood of this tree serves for various purposes; and among others, for charcoal. It is the only wood that is common in Egypt, either for fuel or for manufactures. Fenu-greek is a plant cultivated for fodder, though for this use a plant already mentioned, and called barsim, is preferred. This plant, called "helbé," is cried about for sale in November, in

in the ſtreets of the towns; and it is purchaſed and eaten with incredible avidity, without any kind of ſeaſoning. It is pretended, that it is an excellent ſtomachic, a ſpecific againſt worms and the dyſentery, and, in ſhort, a preſervation againſt a great number of diſorders. Lentils form a conſiderable article of food to the inhabitants of Upper Egypt, who rarely enjoy the luxury of rice. The Egyptian onions are remarkably mild, more ſo than the Spaniſh, but not ſo large. They are of the pureſt white, and the lamina are of a ſofter texture and looſer contexture than that of any other ſpecies. They deteriorate by tranſplantation; ſo that much muſt depend on the ſoil and climate. They remain a favourite article of food with all claſſes; and it is uſual to put a layer or two of them, and of meat, on a ſpit or ſkewer, and thus roaſt them over a charcoal fire. We need not wonder at the deſire of the Iſraelites for the onions of Egypt. Leeks are alſo cultivated and eaten in this country, and almoſt all the ſpecies of European vegetables abound in the gardens of Roſetta. Millet and Turkey corn, the vine, the henné or Egyptian privet, the water-melon, &c. &c. are cultivated in Egypt; and the country furniſhes a variety of medicinal plants, as carthamus, ſenna, coloquintida, &c.

Of the animals of Egypt the moſt uſeful is the ox; and though the number of oxen now ſubſiſting in Egypt is inconſiderable, theſe animals were anciently held in high eſtimation. The worſhip of them was univerſal, and ſacred oxen were kept in ſeveral cities. The celebrity of Apis is well known. (See Apis.) Common oxen, when they chanced to die, were interred with funeral rites, and it was forbidden to put to death thoſe that had already worked. At preſent, though the race is tolerably handſome, it is much degenerated through long neglect: their horns are generally ſmall, and they are of a fawn colour, more or leſs deep. The oxen of Egypt are employed in tillage and in giving motion to a variety of hydraulic machines; and as they are harneſſed ſo as to draw from the pitch of the ſhoulders, their withers are higher than thoſe of our countries; and, indeed, they have naturally ſome reſemblance to the biſon (*bos ferus*) or bunched ox. It has been ſaid that the cows of Egypt bring forth two calves at a time; this is an inſtance of fecundity which ſometimes happens, but is not reckoned very common. Their calves are reared to maturity, as veal, which is forbidden by the law of the Mahometans, and the Copts alſo abſtain from the uſe of it, is not eaten in Egypt. The buffalo is an acquiſition of the modern Egyptians, with which their anceſtors were unacquainted, and it was brought from Perſia into their country. The ſpecies is more numerous than that of the ox, and is equally domeſtic. It is eaſily diſtinguiſhable by the conſtantly uniform colour of the hair, and ſtill more by a remnant of ferocity and intractability of diſpoſition, and a wild lowering aſpect, the characteriſtics of all half-tamed animals. The females are reared for the ſake of the milk, and the males to be ſlaughtered and eaten. The fleſh is ſomewhat red, hard, and dry; and has alſo a muſky ſmell, which is rather unpleaſant. This country has alſo horſes, aſſes, mules, and camels. The horſes of Egypt, next in rank to thoſe of the Arabians, are remarkable for their beauty and valuable qualities; and this commendation has been juſtified by the teſtimonies of both ancients and moderns. According to the Jewiſh hiſtory, it was chiefly in Egypt that Solomon purchaſed, at a very high price, the prodigious multitude of horſes which he kept in his numerous ſtables (2 Chron. ix. 25. 1 Kings, iv. 26; x. 28, 29.) See alſo Shaw's Travels, p. 239. In Egypt, and alſo in Arabia, and almoſt every other part of the Eaſt, it is a general cuſtom to abſtain from caſtrating horſes; and the cavalry of Egypt is formed of ſtone-horſes. The aſſes of this country have no leſs a claim to diſtinction than the horſes; and theſe, as well as thoſe of Arabia, are eſteemed for their vigour and beauty the fineſt in the world. They are ſometimes ſold for a higher price than even the horſes. They are more hardy than horſes, leſs difficult as to the quality and quantity of their food, and are, therefore, preferred in traverſing the deſerts. The handſomeſt aſſes ſeen at Cairo are brought from Upper Egypt, and Nubia. On aſcending the Nile, the influence of climate is perceptible in theſe animals, which are moſt beautiful in the Said, but are in every reſpect inferior towards the Delta. With the moſt diſtinguiſhed race of horſes and aſſes, Egypt poſſeſſes alſo the fineſt mules; ſome of which at Cairo exceed in value the price of the moſt beautiful horſes. In deſert places they have tygers, antelopes, foxes, jackals, hares, ſheep, goats, and deer. Egypt has alſo a ſpecies of ape, ſtronger and more ſavage than others, called by the Greeks cunocephalus, from the reſemblance which its head bears to that of a dog. There are few towns in the world that contain ſo many dogs as thoſe of Egypt; and the worſhip of the dog was formerly ſpread over the whole of this country. The dogs of Egypt are a race of large grey hounds; and it is a ſingular circumſtance reſpecting them, that they never quit the quarter where they are born, but form diſtinct tribes, which have limits that they never exceed; and if one dog ſhould go into another quarter, he would ſoon be attacked by the whole of the ſtrange tribe. The Bedouins are ſo much attached to their dogs, that a perſon who killed them would expoſe his own life to danger. In Ancient Egypt cats were held in great veneration, ſo that the killing of a cat, even involuntarily, incurred capital puniſhment; and cats that happened to die were carried to the ſacred temples, and after having been embalmed were buried at Bubaſtis, a city in Lower Egypt. There are ſtill cats in all the houſes in Egypt, and they are treated with much tenderneſs and attention. The ichneumon was one of the ſacred animals of Ancient Egypt. Particular care was taken of it whilſt it lived, and honours were paid to it after its death. Lands were appropriated to the ſupport of this animal; and it was fed like cats with bread ſoaked in milk, or with the fiſh of the Nile cut in pieces; and it was every where forbidden to be killed. At preſent the ichneumon is not domeſticated in Egypt, nor do the inhabitants rear them in their houſes; for though they hunt rats and mice, they deſtroy poultry. By deſtroying the eggs of crocodiles, it prevents their increaſe. However, in more than half of the northern part of Egypt, that is, in that part comprehended between the Mediterranean ſea and the town of Siout, they are very common, although this part has no crocodiles; but they are more ſcarce in Upper Egypt, where crocodiles are more numerous: and, therefore, many fables have been recorded concerning the antipathy of the ichneumon to the crocodile, that are deſtitute of foundation. Upper Egypt, below the cataracts, is much infeſted with crocodiles; and though the ichneumon had received the honour of carrying on a perpetual war againſt theſe animals, a ſpecies of tortoiſe of the Nile, called *Thirſé*, is more ſucceſſfully employed in their deſtruction. As ſoon as the young crocodiles are hatched and reach the river, this tortoiſe attacks and devours them. Rats and mice are very numerous in Egypt, and would render the country uninhabitable, if they were not deſtroyed by other animals, and alſo by the inundation of the Nile. Many cameleons are found in the neighbourhood of Cairo; and lizards and vipers of various ſorts abound in different parts of the country. Swarms of winged inſects ſupply food for ſwallows and wagtails; but the moſt numerous, as well as moſt troubleſome inſects, are flies. Gnats alſo fly in ſwarms

after the rice-harvest, from the inundated fields in which the preceding generation had deposited its eggs; and their sting is no less sharp and painful than that of the musquitoes of South America. The habitations of Egypt are also filled with an enormous quantity of bugs, the bite of which occasions very considerable and painful swellings. Bees form a principal article of culture and commerce in Egypt. As Upper Egypt only retains its verdure for four or five months, and the flowers and harvests are earlier there, the inhabitants of Lower Egypt profit by this difference. They collect the bees of different villages in large boats. Each proprietor trusts to them his hives, which have a particular mark. When the bark is loaded, the men, who have the management of them, gradually ascend the river, and stop at every place where they find flowers and verdure. The bees, at the break of day, quit their cells by thousands, and wander in search of the treasures with which they compose their nectar. They go and come several times laden with their booty. In the evening they return to their habitations. After travelling three months in this manner on the Nile, the bees, having culled the perfumes of the orange-flowers of the Said, the essence of roses of the Faicum, the treasures of the Arabian jessamine, and a variety of flowers, are brought back to the places from which they had been carried. This industry procures for the Egyptians delicious honey, and abundance of bees'-wax. The proprietors, in return, pay the boatmen a recompence proportioned to the number of hives which have been thus carried about from one extremity of Egypt to the other. Wasps are also very common in Upper Egypt; and the hideous insects called scorpions grow to a very large size, and are said to occasion by their bite intense pain, swoonings, convulsions, and sometimes death. It would far exceed our limits to enumerate the various species of birds that are statedly or occasionally found in Egypt; or to recite the different sorts of fish with which the Nile and its other waters abound.

The climate of Egypt is, as we might naturally infer from its latitude, commencing at the Torrid and extending 9° into the Temperate zone, extremely hot. In July and August Fahrenheit's thermometer stands, in the most temperate apartments, at 86° and 88° above the freezing point. In the Said it rises much higher. Of this extreme heat, the height of the sun, which, in summer nearly approaches the zenith, is a primary cause; but when we consider that in other countries, under the same latitude, the heat is less, we may be allowed to seek another secondary cause, no less powerful than the former; and this is, probably, the inconsiderable elevation of the country above. On this account some have distinguished only two seasons in Egypt; the spring and summer, that is, the cool season and the hot. The latter continues from March to November; and from the end of February, the heat, even at nine o'clock in the morning, is hardly supportable by an European. During the whole of this season the air is inflamed, the sky sparkling, and the heat oppressive to all that are unaccustomed to it. The body sweats profusely, and the slightest suppression of it is a serious malady. The departure of the sun tempers, in some degree, these heats. The vapours from the earth soaked by the Nile, and those brought by the west and north-west winds, absorbing the fire dispersed through the atmosphere, produce an agreeable freshness, and even piercing cold, if we may credit the natives and some European merchants; but the Egyptians, almost naked and accustomed to perspire, shiver with the least degree of cold. The thermometer, which, at the lowest, in the month of February, stands at 50° or 52° of Fahrenheit above the freezing point, indicates, that snow and hail are phenomena, which no Egyptian has seen in fifty years. Some writers reckon two summers in Egypt; the first occurring in March, April, and May, during which the excessive heats and parching winds cause various disorders; but in the second summer, in June, July, and August, and in the autumn and winter, the air is much cooler, the weather more constant, and Egypt becomes one of the most delightful countries in the world. The season, however, being uncertain, those who can afford it, and particularly the European merchants, wear furs; and it must be allowed, that the northerly and westerly currents of air, which almost continually prevail, cause a very considerable degree of coolness out of the sun. These northerly winds serve the purpose of wafting a prodigious quantity of clouds into Abyssinia. From the month of April to July these are seen incessantly ascending towards the south; and it might be expected, that rain would ensue; but this parched country is destined to receive its supply of moisture in another form. In the Delta it never rains in summer, and but rarely, and in small quantities, during the whole course of the year. It rains still less as you ascend towards the Said. Accordingly, rain is more frequent at Alexandria and at Rosetta than at Cairo, and at Cairo than at Minieh, and it is almost a prodigy at Djedja. To us it seems to be astonishing that a country should subsist at all without rain; but in Egypt, besides the quantity of water which the earth imbibes at the time of the inundation, the dews which fall in the summer might suffice for vegetation. These dews, as well as the rains, are more copious towards the sea, and decrease in proportion to their distance from it, but they differ from the latter by being more abundant in summer than in winter. At Alexandria, after sun-set, in the month of April, the clothes, exposed to the air, and the terraces, are soaked by them, as if it had rained. Like the rains, these dews are more or less plentiful, according to the prevailing wind. The southerly and the south-easterly produce none; the north wind a great quantity, and the westerly still more. These varieties are accounted for by observing, that the two former proceed from the deserts of Africa and Arabia, which afford not a drop of water: while the northerly and westerly winds, on the contrary, convey over Egypt the vapours from the Mediterranean, which the first crosses, and the other traverses lengthways. Another phenomenon, no less remarkable, is the periodical return of each wind, and its appropriation to certain seasons of the year. In Egypt, when the sun approaches the tropic of Cancer, the winds, which before blew from the east, change to the north, and become constant in that point. In June they always blow from the north and north-west; the winds continue northerly in July, but vary sometimes towards the west, and sometimes towards the east. About the end of July, and during the whole month of August and half of September, they remain constantly in the north, and are moderate; brisker in the day, however, and weaker at night. At this period an universal calm reigns on the Mediterranean. Towards the end of September, when the sun re-passes the line, the winds return to the east, and then more regularly from that point than from any other, except the north. As the sun approaches the other tropic, the winds become more variable and tempestuous; they most usually blow from the north, the north-west, and west, in which points they continue during the months of December, January, and February, which is the winter season in Egypt. The vapours of the Mediterranean, condensed by the coldness of the atmosphere, descend in mist and rains. About the end of February and in March, when the sun returns towards the equator, the winds are more frequently southerly than at any other season. During this last month, and that of

of April, the south-easterly, south, and south-westerly winds prevail and at times the west, north, and east; the latter of which becomes the most prevalent about the end of April; and during May, it divides with the north the empire of the sea. The southerly winds, which we have mentioned, are known in Egypt by the general name of *Kamsin*, or "winds of 50 days," so called because they prevail more frequently in the 50 days preceding and following the equinox. For an account of them, see KAMSIN. These southerly winds, which are distinguished by their heat and aridity, are in December and January as cold in Egypt as those from the north, because the sun, having reached the southern tropic, no longer burns up the northern parts of Africa, and because Abyssinia, which is extremely mountainous, is covered with snow. It might naturally be imagined that Egypt, on account of the heat to which it is subject, and from its wet and marshy condition for three months, must be an unhealthy country; but the case is otherwise. This circumstance, so different from the effect which might be expected, is ascribed by Volney to the natural dryness of the air, to the proximity of Africa and Arabia, which incessantly draw off the humidity, and to the perpetual currents of wind, which meet with no obstacle. This aridity is such, that flesh meat exposed, even in summer, to the north wind, does not putrefy, but dries up, and becomes hard as wood. Besides possessing this drying quality, the air appears to be strongly impregnated with salts, the proofs of which are every where apparent. This property of the air and the earth, added to the heat, gives vegetation an activity almost incredible in our cold climates. Notwithstanding the heat in Egypt, the climate is not, upon the whole, insalubrious. The inhabitants are a robust and healthy race of people. Many of them live to old age. Attentive to their regimen during the hot season, their health is thus preserved. At this time they subsist chiefly on vegetables, pulse, and milk. They make frequent use of the bath, eat little, rarely drink fermented liquors, and mix a great deal of lemon juice in their aliment. By this course of sobriety their vigour is maintained to a very advanced age. The water of the Nile is also said to have a great influence on the health of the inhabitants, and to the use of this water, either as a bath or as a beverage, some have ascribed the fecundity of the Egyptian women. The Nile, however, has been the subject both of panegyric and censure. Sonnini and other travellers concur with the ancients in commendation of its salubrity; and so far from considering it as a source of disorder, those who for a number of years have drank only this water, ascribe to the use of it the good health which they have enjoyed. Such is the generally received opinion in Egypt, where this water is reckoned not only very wholesome, but is also supposed to possess qualities truly miraculous. The method employed in this country for purifying the water of the Nile, when it is loaded with slime, has been described by Prosper Alpinus, and by more modern travellers. Savary says, that it consists in beating about in the water, contained in great jars, some sweet almonds slightly bruised, and in rubbing with this the edges of the vase. At the expiration of a few hours, the impure particles settle at the bottom of the jar, and the water remains clear and limpid. The water thus purified is poured out for use into small vessels, made of dried but unbaked clay, which the Turks call "bardacks," and the Arabs "kollat." These are not varnished, so that on being exposed to the open air the water gradually oozes through their pores; and it is perfectly cooled by the continual evaporation. Notwithstanding the commendations given of the salubrity of Egypt by Herodotus, Strabo, and Diodorus Siculus, and also by many modern travellers, others, and particularly M. Pauw, have asserted that it is the cradle of the plague. Savary, however, and Volney, whose testimony is confirmed by Sonnini and others, have undeceived the public with regard to this circumstance. It is now ascertained, that this dreadful disorder, which is endemial in other countries of the East, is not so in Egypt, and never originates in that country. Whenever it makes its appearance, it has been brought thither, either from Constantinople, from some other part of Turkey, or from the interior of Africa. This latter kind, which is called the "Said plague," because it comes from Upper Egypt, is much dreaded, and is in fact more destructive than any other. It is further affirmed, that no epidemical diseases prevail in this country; and that experience amply attests the purity and salubriousness of its atmosphere. In Egypt, however, though its diseases are neither frequent nor epidemical, putrid and inflammatory disorders attack those, whose constitution is bilious. Herniæ are not common; and they originate from the relaxation occasioned by the use of warm baths, from incautious riding, and from the extraordinary width of a part of the Egyptian dress. Cutaneous diseases are common, and would be more prevalent if they were not counteracted by the use of the bath. The leprosy and the elephantiasis sometimes make their appearance, but they seldom occur, and do not seem to be very contagious. The elephantiasis is peculiar to the northern part of Egypt, and seldom appears at any distance above Cairo. There is, perhaps, no country in the world, where diseases, that corrupt the sources of generation, are more widely spread than Egypt. The ravages of the Syphilis, although checked by the heat of the climate, abundant perspiration, and warm baths, are not the less dreadful; and no remedy being applied to stop its progress, it sometimes produces the most frightful effects. But a malady, truly endemial, is the ophthalmia, or inflammation of the eyes. Eyes, perfectly sound, and which are wholly free from defluctions, are rarely to be seen. This disorder has been ascribed to a variety of causes. Some have attributed it to the reverberation of a burning sun, to the effect of the southerly winds, to the subtile dust, with which the air is filled, or to the vapours which exhale from the stagnant waters. Savary seeks its origin from the custom which the Egyptians have of sleeping in the open air in summer, either on the terraces of their houses, or near their huts. The nitre, he says, generally diffused through the air, and the heavy dews of the night, attack the delicate organ of sight, and deprives them either of one or both eyes. Eight thousand of these unhappy people are kept in the great mosque of Cairo, and there provided with a decent subsistence. The principal causes of this disorder, says Sonnini, are the excessive heat, the air impregnated with nitrous particles, and the acrid and burning dust which the wind scatters in the atmosphere. These, he says, are the principal causes; besides which, there are other secondary causes that render these disorders more frequent than they were in the time of the ancient Egyptians, such as the bad quality of the food on which the present inhabitants subsist, and which communicates to the humours an acrimony that affects the sight; to which may be added the excessive propensity of the Egyptians to pleasures, which are seldom those of love. To this purpose, Avicenna observes, (iii. c. 5.) "Multiplicatio coitus est acribilior res oculo." The air, says Volney, to which the inhabitants of Cairo, the Delta, and also the coast of Syria, are exposed during sleep, acquires some noxious quality from the vicinity of the sea; and this quality, in his opinion, is moisture combined with heat, which becomes a first principle of these disorders. The saline quality of the air, so remarkable in the Delta, contributes still farther to the effect, by the irritation and itching it occasions

casions in the eyes. The usual diet of the Egyptians appears likewise to be a powerful cause. The cheese, sour milk, honey, confection of grapes, green fruits, and raw vegetables, which are the ordinary food of the people, produce in the stomach a disorder, which physicians have observed to affect the sight; and also the raw onions, which they devour in great quantities, have a peculiar heating quality. A disposition to this disorder, transmitted by generation, becomes a fresh cause of malady; and hence the natives are more exposed to it than strangers. He adds, it will appear more probable, that the excessive perspiration of the head is a principal cause, when we consider that the ancient Egyptians, who went bare-headed, are not mentioned by physicians as being so much afflicted with ophthalmies; and that the Arabs of the desert, who cover it very little, especially when young, are equally exempt from them. History informs us, however, that several of the Pharaohs died blind. Blindness in Egypt is, in many instances, occasioned by the small-pox, which, for want of proper treatment, is very fatal in this country. Inoculation is either unknown, or little practised. The spring, which, in Egypt, is the summer of our climates, brings with it malignant fevers, which soon arrive at a crisis. The Egyptians, in general, are of a bilious habit, as appears from their eyes and black eye-brows, their brown complexion, and meagre make. Their habitual malady is the colic; and most of them frequently complain of a fourness in the throat, and an acid nausea; emetics and cream of tartar are, therefore, generally efficacious. The malignant fevers sometimes become epidemic, and are then mistaken for the plague.

The population of Egypt is not easily estimated; because the usual mode of determining the number of inhabitants from the number of houses cannot be applied to this country: a large proportion of the people having no visible dwelling. Ancient Egypt furnished subsistence for about eight millions of inhabitants; but at this day we do not reckon, says Savary, half the number. Mr. Browne, another intelligent traveller, who estimates the population of Cairo at 300,000 persons, suggests, that Egypt may contain, in all, two millions and a half. Volney, stating the number of towns and villages as not exceeding 2300, which was the number in 1783, and the number of inhabitants in each of them, one with another, including Cairo, which contains about 250,000, as not more than a thousand, estimates the whole number of inhabitants in Egypt at two millions three hundred thousand. The cultivable lands, according to d'Anville, contain 2100 square leagues; whence results, for each square league, 1142 inhabitants. This great decrease is principally owing to the nature of its government, which is despotic and oppressive. Egypt, deprived 23 centuries ago of her natural proprietors, has seen her fertile fields successively a prey to the Persians, the Macedonians, the Romans, the Greeks, the Arabs, the Georgians, and, at length, the race of Tartars, distinguished by the name of Ottoman Turks. Several of these various nations have left vestiges of their transient possession; but they have been so blended, that it is not easy to discriminate their respective characters. Volney, however, distinguishes them into four principal races of different origin.

The *first*, and most generally dispersed, is that of the Arabs; who may be distributed into three classes; *viz.* 1. The posterity of those, who, on the conquest of Egypt by Amrou in the year 640, hastened from Hedjaz, and every part of Arabia, to settle in a country justly celebrated for its fertility. Accordingly, the Delta was soon filled with foreigners, to the prejudice of the vanquished Greeks. This first race is preserved in the present class of fellahs, or husbandmen, and artizans, who still retain the characteristic features of their ancestors, but are rather taller, and more strongly formed, from the natural effect of a more plentiful nourishment than that of the deserts. Their skin, tanned by the sun, is almost black, but their countenances are not disagreeable. 2. Another class of Arabs is that of the Africans, or Occidentals, in Arabic "Magarbe," the plural of "Magrebi," western, who have arrived at different periods, and under different chiefs, and united themselves to the former. Like them, they are descended from the Mussulmen conquerors, who expelled the Greeks from Mauritania; like them, they exercise agriculture and trades; but they are more especially numerous in the Said, where they have villages, and even distinct sovereigns of their own. (See MOGRABIANS.) 3. The third class is that of the Bedouins, or inhabitants of the deserts, known to the ancients by the name of "Scenites," that is, dwellers in tents. (See BEDOWEENS.) It is calculated, says Volney, that the different tribes of those in Egypt might form a body of 30,000 horsemen; but these are so dispersed and disunited, that they are only considered as robbers and vagabonds. A *second* race of inhabitants consists of the Copts. (See COPHTI.) A *third* race is composed of Turks, who are the masters of the country, or, at least, possess that title. The name "Turk" was not originally peculiar to the nation to which it is now applied; it denoted, in general, all the hordes dispersed to the east, and even to the north of the Caspian sea, as far as beyond lake Aral, over those extensive countries which have taken from them the name of "Tourk estan." (See TURKS.) These people were known to the ancient Greeks by the names of Parthians, Massagetæ, and even of Scythians, for which we have substituted that of Tartars. They were a nation of shepherds, continually wandering, like the Bedouin Arabs, and, in every age, distinguishing themselves as brave and formidable warriors, whom neither Cyrus nor Alexander could subdue; though the Arabs, about eighty years after Mahomet, invaded their country, and compelled them to embrace their religion, and to pay tribute. Like the Bedouins they were divided into tribes, or camps, called, in Chinese language, "ordou," of which we have made "horde;" and these tribes, allied or at variance, according to their several interests, were perpetually engaged in wars. In 1517, sultan Selim took possession of Syria and Egypt, and from that time the Turks established themselves in that country, but they were not settled much among the villages. Individuals of that nation are chiefly found at Cairo, where they exercise the arts, and occupy the religious and military establishments. Formerly they were advanced to posts under government; but, at a later period, they possess merely the title, without the reality of power; and they are not very numerous. This revolution has been effected by the *fourth*, and last race, that occupy Egypt. The individuals of this race, all born at the foot of mount Caucasus, are distinguished from the other inhabitants by the flaxen colour of their hair, which is entirely different from that of the natives of Egypt. These were found there by the Crusaders in the 13th century, and called by them "Mamelas," or, more correctly, "Mamlouks." After remaining almost annihilated for 230 years, under the government of the Ottomans, they have found means to regain their consequence. For their history, character, &c. see MAMLOUKS. The Jews in Egypt are not very numerous. These, as well as the Christians of Syria and the Greeks, devote themselves to commerce, to the exchange, and the arts. The acuteness and subtlety which distinguish them have rendered them alternately directors of the custom-houses and intendants of

the revenues of Egypt. Many of them are goldſmiths, and work in gold, ſilver, and precious ſtones; and their works in filagree have been admired. Some of them have eſtabliſhed manufactures of light ſtuffs, which they fabricate with Bengal cotton and Syrian ſilk. In order to underſtand the nature of the preſent government of Egypt, we ſhould advert to the firſt introduction of the Mamlouks into the country in the year 1227. Before this period, from the middle of the 6th century, till about the year 1250, the Arabs were in poſſeſſion of Egypt, and it formed a part of the vaſt empire of the Caliphs, who ſent thither viſiers, inveſted with unlimited powers, to govern in their name. Theſe formed a body of ſoldiers of tried courage and extraordinary beauty, who were trained up to military exerciſes. By degrees, the ſoldiers, like the Pretorian bands of Rome, gave laws to their maſter; and ultimately appointed one of their own chiefs inſtead of the ſultan whom they depoſed and maſſacred, inveſting him with the title of ſultan, and retaining for themſelves that of Mamlouks, which ſignifies military ſlaves. About the year 1250, immediately after the defeat of St. Louis, the government of the Arabian princes terminated in Touran Shah, the laſt prince of the family of the Aioubites. Thus, were theſe nominal ſlaves converted into deſpots, who, for many centuries, have continued to give law to Egypt. Claiming the right of authority merely by conqueſt, the Mamlouks had no other rule of conduct and government beſides the violence of a licentious and inſolent ſoldiery. At length, in 1517, Selim, ſultan of the Ottomans, having taken and hanged Toumam-Bey, their laſt chief, put a period to that dynaſty. Selim, inſtead of exterminating the whole body of Mamlouks, according to the principles of Turkiſh policy, projected ſuch a form of government, that the power, being diſtributed among the different members of the ſtate, ſhould preſerve ſuch an equilibrium, as ſhould keep them all dependent upon himſelf. The remnant of the Mamlouks, who had eſcaped his firſt maſſacre, appeared fit for ſerving his purpoſe; and he therefore eſtabliſhed a divan, or council of regency, compoſed of the pacha, or baſhaw, and the chiefs of the ſeven military corps. (See Bashaw and Bey.) The ſultan, likewiſe, eſtabliſhed tributes, one part of which was deſtined to pay 20,000 infantry, and a corps of 12,000 cavalry, reſident in the country; the other, to procure for Mecca and Medina the neceſſary ſupplies of corn, and the third to ſwell the treaſury of Conſtantinople, and to ſupport the luxury of the ſeraglio. In all affairs that concerned religion, they were to maintain ſtrict obedience to the mufti of Conſtantinople, and to inſert the name of the Ottoman emperors in the prayers, and on the coin. This was a kind of mixed government, compoſed of monarchy, repreſented by the pacha, and ariſtocracy, compoſed of the Beys; but the people, who were to defray all charges, were conſidered as mere paſſive agents, and remain in ſubjection to all the rigours of a military deſpotiſm. This form of government has ſubſiſted for more than two centuries; but within the greateſt part of the laſt century, the Porte having relaxed in its vigilance, innovations have taken place; the Mamlouks have increaſed; become maſters of all the riches and ſtrength of the country, and gained ſuch an aſcendancy over the Turks, that the power of the latter is almoſt annihilated. (See Ali-Bey, Bashaw, Bey, and Mamlouks.) The Beys, dreading the diſpleaſure of the Porte, dare not declare their independence; but their ſubmiſſion is more formal and verbal than real. The Mamlouks have taken care to degrade the military corps of the Azabs, or Janizaries, which, on the part of the Turks, were formerly the terror of the pacha; and the whole military force of Egypt really conſiſts in the Mamlouks, who are diſperſed through the country to maintain the authority of their corps, collect the tributes, and improve every opportunity of extortion. Theſe are the men, who at preſent govern and decide the fate of Egypt; men, who have ſtill the meanneſs of ſlaves, though advanced to the rank of monarchs. Sovereignty with them centres in the means of poſſeſſing more women, more toys, horſes, and ſlaves, and ſatisfying all their caprices. It conſiſts in managing the court of Conſtantinople, ſo as to elude the tribute, or the menaces of the ſultan; and in purchaſing a number of ſlaves, multiplying partiſans, counter-mining plots, and deſtroying their ſecret enemies by the dagger, or by poiſon. See Bey.

What is the condition of the people in a country thus governed it is not difficult to determine. Wherever, ſays Volney, the cultivator enjoys not the fruit of his labour, he works only by conſtraint, and agriculture languiſhes; wherever there is no ſecurity in property, there can be no induſtry to procure it, and the arts muſt remain in their infancy; wherever knowledge has no object, men will do nothing to acquire it, and their minds will continue in a ſtate of barbariſm. Such is the condition of Egypt. The greater part of the lands in Egypt is to be conſidered as divided between the government, and the religious bodies who perform the ſervice of the moſques, who have obtained poſſeſſion of what they hold by the munificence of princes and rich men, or by the meaſures taken by individuals for the benefit of their poſterity. Hence, a large proportion of the tenants and cultivators hold either of the government, or the procurators of the moſques. But there is one circumſtance common to both, *viz.* that their lands, becoming unoccupied, are never let but upon terms ruinous to the tenants. Beſides the property and influence of the Beys, the Mamlouks, and the profeſſors of the law, are ſo extenſive, and ſo abſolute, as to engroſs into their own hands a very conſiderable part; the number of the other proprietors is extremely ſmall, and their property liable to a thouſand impoſitions. Every moment ſome contribution is to be paid, or ſome damage repaired; there is no right of ſucceſſion, or inheritance for real property, except for that called "Wakf," which is the property of the moſques; every thing returns to government, from which every thing muſt be re-purchaſed. The peaſants are hired labourers, ſays Volney, to whom no more is left than what is barely ſufficient to ſuſtain life. (But Browne ſays, that theſe terms can be properly applied to very few of them. The occupier of the land, aſſiſted by his family, is the cultivator; and in the operations of huſbandry *ſcarcely* requires any other aid. And the tenant of land commonly holds no more than he and his family can cultivate, and gather the produce of. When, indeed, the Nile riſes, thoſe who are employed to water the fields are commonly hired labourers.) The rice and corn they gather are carried to their maſters, and nothing is reſerved for them but dourra, or Indian millet, of which they make a coarſe and taſteleſs bread, without leaven. This, with water and raw onions, is their only food throughout the year; and they think themſelves happy, if they can ſometimes procure a little honey, cheeſe, ſour milk, and dates. Their whole clothing conſiſts in a ſhirt of coarſe blue linen, and in a black cloak. Their head-dreſs is a ſort of cloth bonnet, over which they roll a long handkerchief of red woollen. Their arms, legs, and breaſts are naked, and ſome of them do not even wear drawers. Their habitations are mud-walled huts, in which they are ſuffocated with heat and ſmoke, and in which, beſides the experience of other inconveniencies, they are perpetually diſtreſſed with the dread of the robberies of the Arabs, and the extortions of

the Mamlouks, family feuds, and all the calamities of a perpetual civil war.

The more considerable sources of revenue in Egypt, as well as of the Porte at this day, and also of the Caliphate while the sovereignty remained with the Arabs, are nearly coeval in their institution with Mahometanism itself. The most ancient tribute due from the subject to the government was the "Zecchât," a tenth of all the permanent productions of the earth. This was imposed by Mahomet himself, and designed for the relief of the necessitous. This impost or tax is still continued, but it is diverted from its original purpose, and applied to necessary expences or needless prodigality. It is not, however, now applicable to land or houses, but to the merchandize imported into the country. The duties on these, when demanded of Mahometans, are taken under the name of "Zecchât." The second impôst is the "charage," which signifies the product of lands; and it denotes, not only any tax on land, but also on the persons of "dhummies," that is, Christians and Jews; though in the latter case it receives the appellation of "Jizie," the capitation tax, or salvage for their persons, which otherwise, according to the letter of the Koran, the true believer is not bound to spare. In modern times the revenue of the Porte, which is derived from various sources, is known under the name of "Miri;" the private one of the emperor is supplied in a different way, and termed "Chasné." The imposts in Egypt, one of the earliest territorial acquisitions of the successors of Mahomet, are not distinguished by any remarkable severity; and if that country has been since impoverished and depopulated, it appears not to result from the original institutions, so much as from the abuses, which happened at an early period of the Egyptian Caliphate. These abuses, which have been long gradually increasing, are now so far multiplied as to be incapable of further extension consistently with the being of the peasantry. The principal local tribute is a tax on land of two pataches each "foddan" all over the country, which was continued by sultan Selim. Taking the cultivable lands in Egypt at two million one hundred thousand acres, this should produce the sum of twelve thousand nine hundred purses, or at the present exchange of 630,000*l.* sterling; but at this time only two thirds of these lands are actually cultivated, which reduces the sum to 420,000*l.* On the other hand, however, the Beys insist on receiving, in many instances, five or six pataches per "foddan," which again raises this single branch of revenue to a million and a quarter, or even more. There are, indeed, some districts in the Upper Egypt, always several years in arrear. The patache may be rated at from 3*s.* to 3*s.* 4*d.* The "foddan" is a given measure, deriving its name from the quantity that a yoke of oxen can plough in a day, roughly taken, equivalent to an acre. The other articles are the customs of Alexandria, Damietta, Suez, and Cosseir, and what is drawn from the commerce of Africa in its passage by Charjé, Assiout, and Cairo. The amount of these is not easily ascertained; but it is very considerable. The "Jizié," already mentioned, is supposed, by Mr. Browne, not to amount to more than 1500 purses. The remaining revenue is made up of casualties: as forfeitures, small imposts, and tolls, passing on the Nile, and other parts of the interior; and above all, the incalculable profit a king from continued plunder of all ranks and denominations. Five, ten, twenty to thirty thousand pataches, are demanded, in one day, of the Christians engaged in commerce, at another of the Mahometans, and at another of the Franks. The wandering Arabs or Bedouins are exempt from any regular tribute, though they are often plundered. All the prostitutes, public baths, places where brandy is sold, &c. &c. are under a particular jurisdiction, and pay something to government. The articles above enumerated form collectively the "Miri," or public revenue; 1200 purses of which should be annually forwarded to Constantinople, but it is retained by the Beys, under pretence of repairing mosques or other public works. The Pacha receives for his whole expences 1000 "mahbûbs," or 3000 piastres per day. (See BASHAW and BEY.) The collectors of the "Miri" are the Copt writers, who exercise their office under the direction of the secretary of the ruling Bey. These writers have registers of each village, and are employed in receiving the payments and accounting for them to the treasury. Rigorous and unjust in their exactions, they often sell the oxen, the buffaloes, and even the mat on which the oppressed wretches lie. It is calculated, that the whole produce of the "Miri," collected as well in money as in corn, barley, beans, rice, &c. may amount to about two millions sterling, when bread sells at somewhat more than a half-penny per pound of 14 ounces. The administration of the customs seems to be, in Egypt, one of the principal offices of government. The person who exercises it is at the same time the comptroller and farmer-general. On him depend all the duties on entry, exports, and the circulation of commodities. He names all the subalterns who collect them; and to this he adds the "paltes," or exclusive privileges of the natron of Terane, the kali of Alexandria, the cassia of the Thebais, the senna of Nubia; and, in a word, he is the despot of commerce, which he regulates at his pleasure. His office is never held for a longer period than a year. The price of his contract, in 1783, was one thousand purses, which, at the rate of 500 piastres per purse, and 50 sols the piastre, makes 12 hundred and 50 000 livres, or above 52 000*l.* The custom-houses were formerly managed, according to ancient custom, by the Jews; but when they were ruined in 1769 by Ali Bey, in consequence of an enormous extortion, they passed into the hands of the Christians of Syria, with whom they still remain. Those Christians who came from Damascus to Cairo almost a century ago, consisted at first of about two or three families, their profit attracted others, and their number has since multiplied to about 500. From the time of their taking possession of the custom-house, after the ruin of the Jews, they have acquired great opulence.

Egypt is excellently situated for commerce and navigation; the trade of the western parts of Asia, Europe, and the North, lying open to it, by the Mediterranean sea; and that of Arabia, Persia, and India, and the southern and western coasts of Africa, by the Red sea: the eastern merchandize being commodiously brought into Egypt on camels, by the isthmus of Suez. It is therefore to be presumed, that the inhabitants would supply themselves with those articles which their country wanted, such as metals, wood, pitch, resin, &c. by bartering their own rich productions and manufactures, such as corn, linen, paper, glass, and other valuable commodities. Sir John Marsham supposes, that the Egyptians did not apply themselves to merchandize till the time of the Ptolemies, but in this opinion he seems to be mistaken; though these princes did very much encourage trade, recovering that of the East to their subjects, by building Berenice, Myos Hormos, and other ports on the Arabian gulf, so that Alexandria became the greatest mart in the world; yet the Egyptians certainly traded very considerably with foreigners long before. The Egyptian Pharaohs were undoubtedly acquainted with the advantages of trade. The numerous canals which they formed served, not only to diffuse fertility by means of the water of the Nile, but to transport with facility the produce.

produce of the country from one end of the empire to another. The fairs they eſtabliſhed in the Delta and the Thebais united the inhabitants of the moſt diſtant provinces. The Egyptians muſt alſo be regarded as one of the moſt ancient nations of navigators. They made voyages on the Red ſea, as it is ſaid, long before the famous expedition of the Argonauts. Danaus, according to Herodotus, carried into Greece, then in a ſtate of barbariſm, the art of navigation and of commerce. His brother Seſoſtris, if we credit ſome hiſtorians (ſee SESOSTRIS,) ſoon after reduced the interior kingdoms of Aſia, and with a fleet of 400 ſail took poſſeſſion of the ports of the Arabic gulf, ſailed through the ſtraits of Babel-Mandel, and penetrated into the Indian ocean. From this era we muſt date the commerce of Egypt with Aſia, which has never been diſcontinued ſince that remote period. Seſoſtris founded ſeveral colonies, one of which fortified itſelf on the coaſt of Phœnicia. If we admit the truth of what ſome writers have reported concerning Seſoſtris, his efforts produced no permanent effect, and they appear to have been ſo contrary to the genius and habits of the Egyptians, that on the death of Seſoſtris they reſumed their ancient maxims, and many ages are ſaid to have elapſed before the commercial connections of Egypt with India became of any great importance. Tyre ſoon prepared to diſpute the glory of navigation with the mother-country, ſending her ſhips as far as the pillars of Hercules, and ſpreading the arts every where with her commerce. The Egyptians on their ſide mounting the Boſphorus, entered the Black ſea, exchanging with their brethren, ſettled in Colchis, the productions of their country with thoſe of the northern nations; whilſt the fleets of the Red ſea went in ſearch of the pearls, the diamonds, the perfumes, and the precious ſtuffs of the eaſtern world. Egypt, as a commercial ſtate, ſoon attained a high degree of power; the colleges of her prieſts, applying to the ſtudy of the heavens, taught navigators that aſtronomy which ſerved to guide them through unknown ſeas; and rich in her own productions, ſhe with her trade propagated the light of the ſciences. Greece, enlightened by the great men who acquired knowledge of various kinds in the ſchools of Memphis and Heliopolis, was divided into ſeveral republics, each of which wiſhed to poſſeſs commerce and a navy. Pſammetichus, to ſay nothing of Oſiris, the Mercury of the Egyptians, to whom the invention of commerce is aſcribed, gained great riches by trade, as we learn from Diodorus, before he became king of all Egypt; and we learn from ſcripture, the moſt ancient and authentic hiſtory extant, that the Midianites and Iſhmaelites traded to Egypt ſo early as the time of Jacob; and, moreover, it is preſumed, that they had anciently the ſovereignty of the Red ſea, by which they engroſſed all the trade of India, and other ports; which were then carried on that way. (See EDOM.) Pſammetichus, ſays Herodotus, being a friend to the Greeks, opened to them the ports of Egypt; and he began his reign in the year 660 B. C. His ſon Nechos, the Pharaoh-Necho of ſcripture, who ſucceeded him 616 B. C., attempted to open a communication between the Nile and the Red ſea; but failing in this attempt he directed his views to another enterprize. Having fitted out a fleet and engaged Phœnician mariners, he ordered them to make a tour of Africa. Accordingly they ſailed out of the Red ſea through the ſtraits of Babel-Mandel, ſteered down the eaſtern ſhores of Africa, and doubling the Cape of Good Hope, coaſted up northward till they came to the pillars of Hercules, or ſtraits of Gibraltar, by which they entered the Mediterranean, and thus returned to Egypt, having performed their voyage in three years. Apries, the Pharaoh-Hophra of ſcripture, aſcended the throne in the year 600 B. C. and defeated in a naval combat the combined fleets of the Tyrians and Cypriots, two of the moſt renowned people in the art of navigation. Amaſis having, as ſome have ſaid, dethroned Apries and uſurped the kingdom, 569 B. C., made a conqueſt of Cyprus and became maſter of the Mediterranean: and in order to give activity to commerce, permitted the Greeks to build Naucrates at the entrance of the Canopic branch, and at the ſame time reſtricted their veſſels from landing merchandize in any harbour but that of this town. The fairs eſtabliſhed there, and the ſucceſſive arrival of ſhips, rendered it very commercial. At this time the proſperity of the kingdom was at its height. The arts had arrived at a great degree of perfection. Aſtronomy predicted eclipſes with accuracy. The ſculptor engraved fine ſtones, and faſhioned at his pleaſure the hardeſt marbles. Mechaniſm elevated in the air maſſes of aſtoniſhing ſize. Chemiſtry ſtained glaſs, gave brilliancy to precious ſtones, and dyed ſtuffs with indelible colours. Agriculture had enriched the country with the productions of India. From Egypt they paſſed to the Greeks; from thence to the Romans; and by the Romans they were tranſmitted to the Gauls. Commerce enriched the country, and called forth into exerciſe a variety of talents; ſo that whilſt treaſures were collected in great abundance from adjacent and diſtant nations, the arts and ſciences were cultivated with ſingular ardour. The gold duſt rolled down by the torrents of Ethiopia, the pearls of Ormuz, the perfumes of Arabia, the ſtuffs of Bengal arrived at Memphis, and it became the moſt commercial city upon earth. In this flouriſhing condition Egypt was attacked by Cambyſes with innumerable armies. Amaſis had given cauſe of diſcontent to the militia of the kingdom, by giving preference to the Grecian troops, and 150,000 men abandoned their country. This deſertion threw the kingdom into the hands of the Perſian monarch, who ravaged it with fire and ſword, 525 B. C. After ſacrificing thouſands of ſoldiers in the mad expedition which he undertook againſt the temple of Jupiter Ammon, and the Ethiopians, he left a detachment of his army in Egypt, and returned into Perſia. Although commerce ſuffered at this time, it ſoon recovered its vigour, and followed its eſtabliſhed courſe. Darius, the ſon of Hyſtaſpes, was ſenſible of its utility, and favoured it through the whole extent of his empire. About the year 332 B. C. Alexander of Macedon turned his arms againſt Egypt. This nation having ſupported with impatience the Perſian yoke, ſubmitted willingly to the great conqueror, and the country was ſubdued without a battle. In order to ſecure Egypt, he founded in it a large city, encompaſſed by three harbours, fit to receive the fleets of Greece and the merchandize of all nations. On his premature death his generals divided his ſpoils, and Ptolemy, ſon of Lagus, called *Soter*, having received Egypt for his ſhare, 323 B. C. endeavoured to carry into execution the great projects of his maſter, and to promote the commercial proſperity of his new government. The improvement of Alexandria engaged his particular attention; and as her ports were ſituated to the weſt, the north, and ſouth, ſhe received the merchandize of the whole univerſe, and became, as Strabo calls her, the greateſt market in the world. (See ALEXANDRIA.) Ptolemy Philadelphus, who ſucceeded his father 284 B. C. purſued the courſe which he had marked out, and rendered Egypt fruitful and happy. This prince, either better acquainted with the level of the ſea, or more fortunate than Nechos and Darius, who had unſucceſsfully proſecuted the ſame object, continued the canal which was to join the Nile to the Red ſea, and had the glory of compleating it. He began at the Peluſian branch and extended it as far as Arſinoé, now called Aggerout.

Aggerout. He founded the city Berenice, &c. (See BERENICE and PTOLEMY.) For the protection of the Egyptian merchants, the Ptolemies kept up a formidable navy in the Red sea and the Mediterranean. Ptolemy Energetes (246 B. C.) imitated the example of his predecessors, and founded his power on trade, which he encouraged to the utmost of his power; and during his reign the wealth of the Egyptians was at its height. The abundance of gold, and of every kind of goods, produced at Alexandria great luxury, and corrupted the court of the kings. But notwithstanding the immense treasures that were consumed by various indulgences and expences, the country long continued rich and flourishing. Ptolemy Physcon (169 B. C.) dispatched Eudoxus on an embassy to several of the potentates of India; and he brought back reports, which gave a new spur to the avidity of the merchants. They made fresh expeditions to the East, and penetrated by the Ganges even to Bengal. After the king's death, his widow, Cleopatra, ordered Eudoxus to visit the nations at the extremity of Africa, and having embarked on the Red sea, he touched on the coast of Soffala. Under Ptolemy Lathyrus (116 B. C.) Eudoxus sailed out of the straits of Babel-Mandel, doubled the point of Africa, and returned to the pillars of Hercules. This was the second time of performing this adventurous voyage. Under Ptolemy IX. the merchants of Alexandria continued to navigate the Black sea, the Persian gulf, and even to the extremities of India. When Egypt passed under the dominion of the Romans, the conquest was, with regard to Rome, what Peru has been for Spain, and Bengal for England. It diffused gold and silver there in such abundance, that lands, merchandize, and every article, doubled their prices. However, it hastened the downfal of that empire. Deprived of their monarchs, and subjected to the Romans, the Egyptians became their factors. In proportion as the Romans extended the limits of their empire, they adopted the vices as well as the ordinary usages of the conquered people. Egypt contributed much to influence their manners, because it was the most ample source of wealth. The beautiful linen and cotton manufactured at Alexandria, her magnificent tapestry, her crystals of various colours, were conveyed to Rome. The grain of the Thebais, and her abundant productions, fed the capital of Italy; so that, from this period, she no longer stood in need of manufactures, and she ceased to encourage the labours of the husbandman. After Constantine had transported the seat of the empire from Rome, Egypt long supported the tottering throne of the emperors of Byzantium. When Egypt became a province of the empire of the Caliphs, she gradually lost her commerce and the arts. The commerce of the Mediterranean was neglected, through dread of intercourse with Christian princes, and the Egyptians confined themselves to that of the Red sea, and the interior of the country. Agriculture, however, still flourished, and some of the Arab princes encouraged the sciences. At length the Venetians found means to open for themselves the ports of this country, and to keep consuls there; and they carried on the trade with India under the protection of the Egyptians. From this intercourse they derived great advantages, and became the first navigators of Europe, which they furnished with all the productions of Asia and Africa. The Genoese partook with them for some time of these advantages; but the marine of the Venetians, having rapidly increased, reigned triumphant in the Mediterranean. When the Ottomans took Egypt from the Arabs, they were excited and aided by the Venetians to equip a fleet on the Red sea, and to put a stop to the conquests of the Portuguese, who had formed settlements in India. Albuquerque, who then governed them, fought the Ottoman fleet, penetrated into the Arabian gulf, and determined to destroy Egypt, by turning the waters of the Nile into the Red sea. But this destructive project of ambition, for the execution of which he had formed a treaty with the emperor of Abyssinia, was defeated by Albuquerque's death. Whilst the maritime powers of the world are endeavouring to found the prosperity of their states on the basis of commerce, in aid of internal cultivation and manufactures, Egypt, without arts, without a marine, and groaning under the tyranny of 24 Beys, is unable to derive any advantage from her situation, or to enter into competition with the Europeans. Her ignorant mariners no longer navigate to India; scarcely do they dare to make the circuit of the Red sea. Their most distant expeditions are annual voyages to Mocha. Their saiks, ill equipped, and incapable of defence, load there the coffee of Yemen, the perfumes of Arabia, the pearls of the Baharein isles, the muslins and the linens of Bengal, which are brought there by the Banians. Even this limited commerce is advantageous to them. The coffee alone is an annual object of eleven millions of livres. They export the principal part to Constantinople, to Greece, to Marseilles, and to the coast of Syria, and consume the remainder in the country. Egypt might again recover her splendour, as she contains within herself the source of genuine riches. Her abundance of grain, with which she feeds Arabia, Syria, and a part of the Archipelago; her rice which she sends throughout the Mediterranean; the flower of the charthamus, with which the inhabitants of Provence yearly load several vessels; her sal-ammoniac, which is conveyed throughout Europe; the kali produced there in abundance; her beautiful flax, so much valued in Italy, and her blue linen are important and profitable articles of trade. The Abyssinians bring her gold dust, elephants' teeth, and other precious substances, which they barter for her produce. The articles exported thither by France are by no means sufficient to pay the various commodities she receives in exchange. The copper vessels and the furs landed by the Turks in the port of Alexandria do not balance the corn, the rice, the lentils, the coffee, the perfumes they load there, which are chiefly paid for in specie. In a word, excepting at Mocha, and at Mecca, where the Egyptians leave every year a great quantity of sequins, all those who carry on a trade with them bring them gold and silver. These precious metals are still in such abundance in the country, that Ali Bey, on flying into Spain, carried with him about a million sterling, and Ismael Bey, who a few years after escaped in the same way, loaded 50 camels with sequins, pataches, pearls, and precious stones. Egypt is still capable of great improvement, and of deriving great advantages from commerce, if the character of her government and consequent condition of her inhabitants were meliorated. What cloth might be manufactured with the beautiful wool of her sheep! What linen with her delicate flax! What muslins with the two sorts of cotton, one annual, one perennial, which grow there! What stuffs, with the silks, which might be easily introduced in a country, where the silk-worms must thrive! What an affluence of benefits might be procured by clearing the canals, repairing the dykes, and restoring to agriculture the third part of her lands now buried under the sands! With what success might not her mines of emeralds be explored, almost equalling in hardness that of the diamond! The granite, the porphyry, and the alabaster, which are found in several of her mountains, would form a valuable branch of commerce. The manufacturer might employ to great advantage her indigo, her carthamus, and other materials for dyeing, that are spread over her deserts. Egypt has possessed

fessed these advantages for many ages. She has lost them by a despotic government. A wise administration would restore to her all the treasures which nature has lavished upon her, and which have rendered her in former ages eminently distinguished among the nations of the earth. The commerce with Egypt is, even now, when uninterrupted by contending nations, far from being inconsiderable. According to Niebuhr's account, about 800 bales of cloth from Languedoc and Provence, and the same quantity from England, Flanders, Germany, and Venice, arrive in Egypt every year. They also require in Egypt, every year, at least 80 barrels of cochineal, and in times of war between France and England, about 200 barrels pass through Egypt into India. From Europe are annually exported into Egypt 400 bales of pepper, each bale containing near 300 pounds. Europe furnishes Egypt with several kinds of drugs, both for medicinal and culinary use. The Europeans send thither annually 60 barrels of pewter, and as many of wine, and a certain quantity of chests containing needles, scissars, knives, small looking-glasses, &c. &c. From Europe, and particularly from Venice, according to the statement of Vansleb, are exported, among other things, a great quantity of small glass ware, as beads, &c., writing-paper, different species of cutlery and looking glasses; from Zante, wine; from Leghorn, cloth; from Genoa, China-ware, and pieces of eight in silver; from Messina, Syracuse wine, velvet, and other silk-stuffs. Egypt has no direct commerce with Holland and England; but it is carried on by Venice and Leghorn. From Marseilles are conveyed money, nuts, almonds, chesnuts, &c., and also cloth and paper. Since the time of Vansleb, the commerce of Egypt has much increased; and it draws every species of merchandize from the different states of Europe. The English, besides cloths, send thither works of polished steel, and all sorts of iron-wares, fire-arms, and gunpowder. The articles of trade which arrive in Europe by the way of Alexandria and Damietta are, flax, spun cotton, printed cottons, muslins, India camblets, dimities, all linens and cottons of different qualities. The exportation of all kinds of grain, roots, and seeds, with which the country abounds, is prohibited; notwithstanding which prohibition, great cargoes of rice and linseed are shipped for Europe. These two ports also afford coffee, assafœtida, senna, cassia fistularis, sugar, sal ammoniac, the black vomica nut, tamarinds, gums, incense, myrrh, aloes, spikenard, cinnamon, carthamus tinctorius, dates, ostrich-feathers, balm of Mecca, coloquintida, buffaloes', bulls', and cows' hides, and precious stones.

How different has been the government of Egypt in modern times from that which laid the foundation of its celebrity at an earlier period of its existence! The Egyptians are said to have been the first who found out the rules of government, and the art of making life easy, and a people happy. Their laws and institutions were not only highly reverenced by those who lived under their immediate influence, but by other nations, and particularly the Greeks, whose first sages and legislators travelled into this country to acquire a knowledge of them, and who borrowed from them the best part of those which they afterwards established at home. Nevertheless, as much as the Egyptians seemed to excel other nations in the wisdom of their laws and constitution, they yet surpassed them more in superstition. Idolatry was so ancient among them, that the Grecians confessed they borrowed not only their religious ceremonies, but the names of almost all their gods, from Egypt. For the Egyptians are said to have been the first people who erected altars, images, and temples, and the first inventors of festivals, ceremonies, and transactions with the gods by the mediation of others; and also to have first given names to the twelve gods. They had a great many deities of different ranks and orders. Those who were chiefly honoured in Egypt were Osiris and Isis, by which they most probably meant the sun and the moon, whose influences governed, and preserved the world. These two luminaries being reckoned by them the great causes of nutrition and generation, and, as it were, the sources from which the other parts of nature, which they also looked upon as gods, and to which they gave distinct names, were derived. These were Jupiter or spirit, Vulcan or fire, Ceres or the earth, Oceanus (meaning the Nile) or moisture, and Minerva, called Neith, or air. Besides these celestial or immortal gods, there were also terrestrial or mortal deities, who had merited the honours paid them by the benefits which they conferred on mankind. Several of them had been kings of Egypt; some of these bore the same names with the celestial gods, and others had proper names of their own. Such were the Sun, Cronus or Saturn, Rhea, Jupiter, called by the Egyptians Ammon, Juno, Vulcan, Vesta, Hermes or Mercury, Orus, Venus, Pan, Anubis, Nephthys, Harpocrates, and others. Serapis is said to have been introduced by one of the Ptolemies at Alexandria; but others suppose him to have been the same with Osiris, who was also called Bacchus. Osiris was supposed to be a god of a good and beneficent nature; but his brother Typhon was the reverse, and held in detestation for the evils brought by him on his family and nation. Although the bodies of these mortal deities remained in their sepulchres on earth, yet the Egyptians believed their souls shone in the stars of heaven, as that of Isis in the Dog-star, that of Orus in Orion, and that of Typhon in the Bear. Notwithstanding the polytheism of the Egyptians, they are said in reality to have acknowledged one supreme God, the maker and ruler of the world, whom they sometimes denoted by the name of Osiris or Serapis, sometimes by that of Isis, and at other times by Neith, who had a temple at Sais. The inhabitants of Thebais are reported to have worshipped only the immortal and unbegotten god *Cneph*, (which see,) for which reason they were exempt from all contributions towards the maintenance of the sacred animals which were worshipped in Lower Egypt. From this god Cneph, they supposed a secondary god proceeded, representing the world, called Phtha, a word which is used by the Copts to signify the divine being. Idolatry of the grossest kind seems, in process of time, to have prevailed throughout Egypt; and they bestowed divine honours on several animals, and even on vegetables, as leeks and onions: and these honours were appropriate to particular places; insomuch that the chief cities of Egypt were named by the Grecians after the gods or animals that were worshipped in them. This diversity of worship was attended with very ill consequences in some cases, especially if their deities happened to be enemies to one another, and thus the inhabitants of one place rendered worship to animals, which were held in abhorrence in other places. Hence proceeded discord, and even war; such as happened in particular between the inhabitants of Heracleopolis, who worshipped the ichneumon, and those of Arsinoe, who worshipped the crocodile; and also between the cities of Oxyrynchus and Cynopolis, the former of which sacrificed and eat dogs, which were the deities of the latter. For a more particular account of the Egyptian deities, see Osiris, Isis, Serapis, Jupiter, and Ammon, Anubis, Harpocrates, Orus, Canopus, Apis, &c. &c. &c. The objects of the Egyptian worship were such animals as the cat, dog, ibis, the wolf, the crocodile, and several others of a similar kind; and they were treated with a respect of a singular nature whilst they lived, and if they were wilfully killed,

killed, the guilty perſon was puniſhed with death: and when they died, they were lamented with the deepeſt concern and ſorrow, and buried with funeral honours. Some have traced the origin of this ſtrange and prepoſterous kind of worſhip to the uſe they made of the images of theſe animals on their ſtandards for the arrangement of their troops; others ſuppoſe that theſe images were fed in the moſt early times to diſtinguiſh the firſt civil ſocieties, which united for mutual defence againſt the violence of their fellow-creatures: others again aſcribe the worſhip of theſe animals to the benefits that were derived from them; as the ox in tilling the land, the ſheep in ſupplying milk and wool, the dog in protecting the houſe, the ibis and hawk in deſtroying ſerpents and noxious inſects, the crocodile in defending the country againſt the incurſions of the Arabian robbers, the ichneumon in preventing the multiplication of crocodiles, and the cat for its ſervice againſt the aſp and other venomous reptiles, &c. &c. Others pretend, that the worſhip paid by the Egyptians to animals did not terminate in the animals themſelves, but in the gods, whoſe ſymbols they were, and to whom they had ſome peculiar relation. Such was the ſtrict attachment of the populace to the groſſeſt kinds of polytheiſm and ſuperſtition, that Herodotus repreſents them as the moſt religious of men. As the objects of their worſhip were not only gods, heroes, and eminent men, but various kinds of animals and plants; Juvenal has juſtly ridiculed their ſuperſtition in the following paſſage, (Sat. xv. v. 1, &c.);

" Quis neſcit, Voluſi Bithynice, qualia demens
Ægyptus portenta colat? Crocodilon adorat
Pars hæc; illa pavet ſaturam ſerpentibus Ibin," &c.

Thus rendered,

" Who knows not, that there's nothing vile or odd,
Which brain-ſick Egypt turns not to a god?
Some of her fools the crocodile adore,
The ibis cramm'd with ſnakes, as many more.
A long-tailed ape, the ſuppliants moſt admire
Where a half Memnon tunes his magic lyre:
Where Thebes, once for her hundred gates renown'd,
An awful heap of ruins ſtrews the ground;
Whole towns in one place, river-fiſh revere,
To ſea-fiſh ſome as piouſly adhere:
In ſome a dog's high deity is ſeen;
But none mind Dian, tho' of dogs the queen:
Nay vegetables here take rank divine;
On leeks and onions 'tis profane to dine.
Oh holy nations! where the gardens bear
A crop of gods through all the live-long year!

The Egyptians were the firſt who aſſigned each month and day to a particular deity, and obſerved the time of each perſon's nativity, by which they judged of their future fortune. If they were not the firſt people who eſtabliſhed oracles, and introduced the cuſtom of conſulting them, the moſt ancient and celebrated oracles among the heathens, particularly thoſe of Jupiter in Libya, and at Dodona, owed their original to Egypt. Amidſt the numerous oracles which exiſted in Egypt, thoſe which they chiefly reverenced were the oracle of Latona in the city of Butus, and in later times that of Serapis in Alexandria. The ſacred animals, as well as the deities, Hercules, Apollo, Minerva, Diana, Mars or Jupiter, had their reſpective oracles, as the apis, the goat, the lion, and the crocodile. The ancient Egyptians alſo offered human ſacrifices at the tomb of Oſiris, at Heliopolis, and to Juno or Lucina, at a city in Upper Thebais. This barbarous cuſtom, however, was aboliſhed by Amaſis, who ordered that ſo many images of wax ſhould be offered inſtead of them. Of their temples we ſhall give an account in the deſcription of the cities in which they were conſtructed; and for their monuments of art, we refer to CATACOMBS, LABYRINTH, OBELISK, PYRAMIDS, &c.

The theology, and alſo the philoſophy, of the Egyptians, were of two kinds; the one exoteric, addreſſed to the vulgar, the other eſoteric, confined to a ſelect number of prieſts, and to thoſe who poſſeſſed, or were to poſſeſs, the regal power. The myſterious nature of their concealed doctrine was ſymbolically expreſſed by images of ſphinxes placed at the entrance of their temples. The former ſort of religion is univerſally known to have conſiſted in the groſſeſt and moſt irrational ſuperſtition. Concerning the eſoteric, or philoſophical doctrine of the Egyptians, it ſeems evident, that they conceived matter to be the firſt principle of things, and that before the regular forms of nature aroſe, an eternal chaos had exiſted, which contained, in a ſtate of darkneſs and confuſion, all the materials of future beings. This chaos, which was alſo called night, was worſhipped, in the moſt ancient times, as one of the ſuperior divinities. This material principle, called Chaos or Night, was probably worſhipped by the Egyptians under the name of "Athor," which, in the Coptic language, ſignifies Night. This divinity the Grecian mythologiſts confounded with Venus. The ſymbol of this divinity, which in their uſual manner the Egyptians placed in her temple, was a cow. Beſides the material principle, it ſeems capable of ſatisfactory proof, that the Egyptians admitted an active principle, or intelligent power, eternally united with the chaotic maſs, by whoſe energy the elements were ſeparated, and bodies were formed, and who continually preſides over the univerſe, and is the efficient cauſe of all effects. By the united teſtimony of many writers, who give accounts of the Egyptian gods, "Phtha," or Vulcan, and "Cneph," or Agathodæmon, it is rendered probable, that theſe were only different names expreſſing different attributes of the ſupreme divinity. The name "Phtha," in the Coptic language, denotes one by whom events are ordained; and the appellation "Cneph" denotes a good genius; and he was repreſented under the ſymbol of a ſerpent. Upon a temple dedicated to Neitha, at Sais, the chief town in Lower Egypt, was this inſcription, "I am whatever is, or has been, or will be, and no mortal has hitherto drawn aſide my veil; my offſpring is in the ſun." If it be granted, that Neitha and Phtha were only different names of the ſame divinity, this inſcription will confirm the opinion, that the Egyptians acknowledged the exiſtence of an active intelligence, the cauſe of all things, whoſe nature is incomprehenſible. The doctrine of an ethereal intelligence pervading and animating the material world, appears, among the Egyptians, to have been from the earlieſt time accompanied with a belief in inferior divinities. Conceiving emanations from the divinity to be reſident in various parts of nature, when they ſaw life, motion, and enjoyment communicated to the inhabitants of the earth from the ſun, not, as they ſuppoſed, from other heavenly bodies, they aſcribed theſe effects to the influence of certain divinities derived from the firſt deity, which they ſuppoſed to inhabit theſe bodies. From the ſame ſource it may be eaſily conceived, that among the Egyptians, as well as in other nations, would ariſe the worſhip of deified men. When they ſaw their illuſtrious heroes or legiſlators protecting their country by their proweſs, or improving human life by uſeful inventions and inſtitutions, they concluded that a large portion of that divinity, which animates all things reſided in them, and that, after their death, good dæmons that animated them paſſed into the ſociety of the divinities.

It is univerſally agreed that the Egyptians believed the human ſoul to be immortal. Herodotus aſſerts, though perhaps

haps without ſufficient ground, that they were the firſt people who taught this doctrine, and Diodorus Siculus relates, that the Egyptians, inſtead of lamenting the death of good men, rejoiced in their felicity, conceiving that, in the inviſible world, they would live for ever among the pious. But it has been a ſubject of diſpute, into what place, according to the Egyptian doctrine, the ſouls of men paſſed after death. Plutarch ſpeaks of the Amenthes of the Egyptians, correſponding to the Hades of the Greeks, a ſubterraneous region, to which the ſouls of dead men were conveyed. With this agrees the account given by Diodorus Siculus of the funeral cuſtoms of the ancients. Herodotus, on the contrary, gives it as the opinion of the Egyptians, that when the body decays, the ſoul paſſes into ſome other animal, which is then born; and that after it has made the circuit of beaſts, birds, and fiſhes, through a period of 3000 years, it again becomes an inhabitant of an human body. Diogenes Laertius alſo relates, after Hecatæus, that, according to the tenets of the Eygptians, the ſoul, after death, continues to live, and paſſes into other bodies. Theſe different notions might be held by different colleges of prieſts, ſome of whom might maintain the doctrine of tranſmigration, while others held, that the ſouls of good men, after wandering for a time among the ſtars, were permitted to return to the ſociety of the gods; or the ſeeming inconſiſtency of theſe opinions may be reconciled by adopting the doctrine, that God is the ſoul of the world, from which all things come, and to which they will return. But as different minds have contracted different degrees of impurity by their union with the body, it is neceſſary that they ſhould paſs through different degrees of purgation, to be accompliſhed by means of ſucceſſive tranſmigrations. According to this ſyſtem, bad men would undergo the metempſychoſis for a longer, good men for a ſhorter period: and the Amenthes or Hades may be conceived to have been the region, in which departed ſouls, immediately after death, received their reſpective deſignations. The Egyptians, whilſt they held that the world was produced from chaos by the energy of an intelligent principle, conceived that there is in nature a continual tendency towards diſſolution.

Of preceptive doctrine the Egyptians had two kinds, one ſacred, the other vulgar; the former, which reſpected the ceremonies of religion, and the duties of the prieſts, was written in the ſacred books of Hermes, but too carefully concealed to paſs down to poſterity. The latter conſiſted of maxims and rules of prudence, virtue, or policy. But it appears by ample evidence, that ſuperſtition blended itſelf with their notions of morals and corrupted them. Indeed, it is in vain to look for accurate principles of ethics among an ignorant and ſuperſtitious people.

The Egyptians paid particular attention to the education of their children, accuſtoming them betimes to a frugal diet, and inſtructing them in two ſorts of letters, thoſe called ſacred, and thoſe in which their common learning was written. The Egyptian youth were taught betimes to behave with great reſpect to their elders. In different parts of Egypt they inculcated abſtinence from ſeveral ſorts of animals, according to the different deities they worſhipped; and they all agreed in their averſion to ſwine's fleſh, which was accounted impure. Their animal food conſiſted of birds and fiſhes, thoſe excepted which were deemed ſacred, and of bread made of vegetables, and particularly the lotus and the lower ſtems of the papyrus. Their common drink was the water of the Nile; and their better ſort of drink or wine, as Herodotus calls it, was made of barley, ſo that we are probably indebted to this nation for the invention of beer. The Egyptians ſtill make a fermented liquor of maize, millet, barley, or rice, pleaſant to the taſte, but in the hot ſeaſon it will not keep above a day. This is drank in conſiderable quantities in Cairo and in the Said. The native Chriſtians diſtil for themſelves, from dates, a liquor called by the general name "Araki;" it is alſo made from currants, or the ſmall grapes, imported from Cerigo. The ancient Egyptians uſed frequent ablutions and purifications; they ſcrupulouſly avoided eating with ſtrangers as unclean; and the cuſtom of circumciſion, which remains to this day, and which was extended to women as well as men, was obſerved by them from time immemorial, and eſteemed by them ſo neceſſary, that Pythagoras, in order to obtain the liberty of converſing with the Egyptian prieſts and entering into their temples, was obliged to ſubmit to this operation. In many of their manners and cuſtoms they ſeemed to act in contradiction to the reſt of mankind; for with them it was the cuſtom for the women to be employed in trade and buſineſs abroad, while the men ſtaid at home to ſpin and mind domeſtic affairs; and this practice, perhaps, gave occaſion to the extraordinary law, by which the ſons were not obliged to provide for their parents, but the daughters were. They kneaded dough with their feet, and tempered mortar with their hands: and though in other countries, the places deſtined for cattle were ſeparated from thoſe of the men, in Egypt men and beaſts dwelt together. Gratitude was a virtue which the Egyptians held in high eſtimation; hence they were led to honour their princes, whom they conſidered to be poſſeſſed of power and will to do good to mankind, as gods, and hence alſo proceeded the great reſpect manifeſted by them to the remains of deceaſed anceſtors. The mourning for the dead, and funeral rites in Egypt, were anciently performed with peculiar ſolemnity. When any eminent perſon died, all the women of the family, having their heads and faces befmeared with dirt, their breaſt bare, and their waiſts girt, left the body at home, and marching in this garb, attended by all their relations of the ſame ſex, through the ſtreets of the city, lamented the deceaſed, and beat themſelves in the moſt cruel manner. The men formed another company and mourned in the ſame manner. This ceremony they continued till the corpſe was interred, abſtaining from the bath, from wine, and delicate meats, and from the uſe of their beſt attire. The body was afterwards embalmed (See EMBALMING), delivered to the relations, and put into a wooden coffin, which was placed upright againſt the wall of the edifice appropriated to this purpoſe. At the time prefixed for the interment, the judges and friends were invited, and ſat in a certain place beyond the lake (ſuppoſed to be that of Mœris) which the body was to paſs. The veſſel, whoſe pilot was called Charon, being hauled up to the ſhore, before the body was ſuffered to embark, every one was at liberty to accuſe the deceaſed. If any accuſer made good his charge that the deceaſed had led a bad life, the body was denied the cuſtomary burial, but if the accuſer charged the deceaſed unjuſtly, he incurred a ſevere puniſhment. If no accuſer appeared, or the accuſation could not be ſupported, the relations recited the praiſe of the deceaſed, and the attendants joined their acclamations to this funeral oration. The body was then depoſited in the family ſepulchre. Thoſe, who for their crimes or for debt were forbidden to be interred, were depoſited privately in their own houſes. This inſtitution of the Egyptians relating to their treatment of dead bodies, was well adapted to the encouragement of virtue and the diſcouragement of vice; and from this practice the Greeks evidently deduced all their fables concerning the infernal judges, and the recompence or puniſhment of men after death. The ſepulchres of the dead were adapted to the

the rank and character of the deceased. See CATACOMBS and PYRAMIDS.

It appears, by very ancient testimonies, that the Egyptians were distinguished by their wisdom and learning, and that they were the inventors of many arts and sciences. Geometry is generally allowed to have been first found out in Egypt. Arithmetic and algebra, and also astronomy, were also diligently cultivated in this country. The science of medicine seems to have owed its origin to the Egyptians; and their physicians had a public provision made for them by the law. Herodotus relates, that, in his time, there were distinct physicians for different diseases; which they classed according to their seat in the human body. From Diodorus Siculus we learn, that, instead of prescribing medicines, according to the judgment and experience of the practitioner, every physician was obliged to follow a written code; and if, in adhering to this, he was unsuccessful, he was free from blame; but if he ventured to depart from the prescribed forms, though the patient recovered, the physician was to lose his life. In administering medicines, they called in the aid of magical incantations, and pretended that supernatural virtues were thus communicated to certain plants. Upon the whole, medical practice was entirely empirical, and artfully connected with superstition, to secure the purposes of priestcraft. Anatomy was likewise cultivated at an early period in Egypt. The invention of music, as far as it comprehends the first elements of melody, is ascribed to the Egyptians. For astrology and magic the Egyptians were particularly famous; the art was very ancient among them; and we find many references to it in the sacred writings. We need not here take notice of their skill in architecture, mechanics, painting, and sculpture. The art of alchemy is said to have been known to the ancient Egyptians; and from the imagined founder of the Egyptian philosophy, it has been called the Hermetic art. (See the several articles above-mentioned). As to the manner in which the Egyptians preserved their knowledge, and transmitted it to posterity, we may here observe, that their priests were the depositaries of all their learning. They had the charge of their philosophy, and other sciences, as well as of their religion and sacred rites; and they were the persons to whom those who desired to be instructed were to apply. For this purpose they had colleges, or academies, in several parts of the kingdom. One of these, at Heliopolis, is mentioned by Strabo, who visited the apartments, where Eudoxus and Plato had studied for several years. The Egyptian learning was partly inscribed on columns, and partly committed to writing in their sacred books. Of their columns, the most famous were those of Hermes, mentioned by several credible authors, from which the Greek philosophers and Egyptian historians deduced much information, and to which Pythagoras and Plato are said to have been partly indebted for their philosophy. Sanchoniatho and Manetho made use of these monuments, which stood in certain subterraneous apartments near Thebes. But it should be considered, that the Egyptians, like others among the ancients, had two sorts of learning, the vulgar, open to all, and the secret, which was veiled and disguised, written in a character not commonly understood, and guarded by the priests. Hence it happened, that Pythagoras is said to have found great difficulty in gaining access to the sources of Egyptian knowledge and learning. The chief method which the Egyptians adopted for concealing their doctrine, was that of wrapping it up in hieroglyphics, symbols, enigmas, and fables. In their inscriptions and writings, they made use of three different sorts of characters. The first and most ancient sort was that of *hieroglyphics*; which see. They also used literal characters, of which they had two kinds, *viz.* the sacred letters, in which their public registers, and all matters of an higher nature, were written; and the other the vulgar, used by every one in their common business. How far the Egyptians were concerned in the invention of letters is a question to which our attention will be directed under the articles LETTERS and WRITING.

The Egyptian language is, without doubt, one of the most ancient in the world, and, as some have imagined, an original, or mother-tongue. See LANGUAGE, and the article COPHTS.

We shall close this article with a concise sketch of the history of Egypt. This country consisted originally of a narrow tract on the borders of the river Nile. The region, afterwards called Lower Egypt, and the Delta, was, in those early ages, a gulf of the sea. The date of the population of Egypt is uncertain. Some learned men have conjectured that, not long after the division of the earth among the sons of Noah, Ham with his family retired to this fertile tract; and that his son Mizraim peopled the country with his own issue, which inhabited several parts of it, under the names of Mizraim, Pathrusim, Casluhim, and Caphtorim. Some have added, that after the death of Mizraim, Egypt was divided into several small principalities, which were governed by their respective sovereigns. It is not probable, however, that Mizraim should establish a monarchy in Egypt. but it is more likely, that the world was at first planted by tribes, or colonies, composed of different families blended together without distinction; and that every tribe should remain separate and independent, in its settlement, till it was constrained to yield to some powerful invader, and that thus the monarchical form of government was established. The sources of information concerning the ancient state of Egypt are those with which we are furnished by Syncellus, Manetho, and Eratosthenes. But these are so fabulous, defective, and inconsistent, that it is needless for us to recite them. The reader may find them stated and examined, or rather exposed in the 1st volume of the Ancient Universal History. The result, however, from an examination of these sources is, that in Egypt there were 30 dynasties, consisting of 36,525 years, and that, after a period of somewhat more than 34,200 years, during which their gods and demi-gods reigned, the cynic circle succeeded. The duration of this dynasty is fixed to 443 years, after which their kings began to reign; the first of whom is Menes. In Blair's tables, the kingdom of Egypt is said to commence under Mizraim, the son of Ham, in the year 2188 B. C., and to have lasted for 1663 years, to the conquest of Cambyses, in the year 525 B. C. Sir Isaac Newton places Menes after Sesostris, supposed by him to be Osiris, and in opposition to other chronologers who wrote before him, he thus transposes the series of the kings of Egypt mentioned by Herodotus. According to his account, Menes was the same with Amenophis and Memnon, and was about 300 years older than Psammetichus, with whom the Egyptian chronology begins to be unravelled, and to acquire a certain degree of clearness and consistency. Sir Isaac holds it irrational to suppose, that there was any king of Egypt till after the expulsion of the shepherds.

Menes, supposed to be the first mortal who reigned over Egypt, is said to have found the whole country, except Thebais, a morass, so that no land appeared between the lake Mœris and the Mediterranean. He diverted the course of the Nile, which before washed the foot of the sandy mountain, towards Libya, and built the city of Memphis within the ancient bed of the river. On the north side he made a lake, and on the west another, both without the walls,

walls, and both fed by the Nile, which flowed along the eaſt ſide of the town; and in the city itſelf he built the famous temple of Vulcan. He is ſaid to have been the firſt who inſtructed the Egyptians in religious matters, that introduced magnificence and luxury, and that inſtituted the pomp of feaſts. After an unaſcertained ſucceſſion of kings, the peace and felicity of the country were diſturbed by the approach of a large body of adventurers, diſtinguiſhed in hiſtory by the appellations of Auritæ, Hyceſos, and Shepherds. Sir John Marſham places this event 157 years before the exodus of the children of Iſrael. Sir Iſaac Newton places their expulſion in the year 1070 B. C. Their irruption happened, according to archbiſhop Uſher, in the year 2048 B. C., and their expulſion in 1825 B. C.; the reign of Salatis, their firſt king, and his five ſucceſſors, as marked by Manetho, amounting to 259 years. Ancient and modern writers have entertained different opinions concerning theſe enterpriſing people. Manetho, quoted by Joſephus, ſuppoſes that they came from Arabia, and held the whole of Lower Egypt in ſubjection for 259 years, at the end of which period they were obliged, by a king of Upper Egypt, named Amoſis, and Thethmoſis, to quit the country, and retire elſewhere. When the Shepherds withdrew from Egypt with their families, their number amounted to 240.000; and, taking the way of the deſert, they entered Syria; but, fearing the Aſſyrians, who were then very powerful, they built for themſelves, in the land now known by the name of Judea, a city capable of holding ſo great a multitude, and called it Jeruſalem: ſuch is the account of Manetho. Others, as Tatian, Juſtin Martyr, Clemens of Alexandria, ſuppoſe, that the expulſion of the Shepherds and the exodus of the children of Iſrael were the ſame event. The ingenious and learned Bryant maintains that theſe Shepherds were Cuthites, who had been expelled from Babylon by the ſons of Shem, at the ſecond diſperſion; and that, abandoning a region, which they could no longer poſſeſs in tranquillity, they precipitated themſelves into Egypt, drove the diſunited tribes of Ham from the moſt fertile part of their territories at the upper end of the Delta, and ſettled there. This invaſion happened ſoon after the Aſſyrians had become formidable by the conqueſts of Ninus; for we are told that the Auritæ fortified the eaſtern borders of their new ſettlements towards Arabia and Chaldæa. About this time, as ancient hiſtorians aſſert, the Delta had acquired the conſiſtency of a moraſs. Drained by the Shepherds, it ſoon became a temperate and beautiful, as it naturally was a fertile region. For the ſpace of 2½ centuries, that bold and enterpriſing race kept poſſeſſion of Middle and Lower Egypt. In the courſe of this period, as we are told, they diſcovered many uſeful arts and inventions, and ſent out colonies, from time to time, in queſt of new ſettlements. Two hundred and ſixty years after their arrival in Egypt, the poſterity of the original natives, not finding ſufficient accommodation in Upper Egypt, to which they had been confined, or envying the ſucceſs of their fortunate invaders, commenced hoſtilities againſt them. After a long, doubtful, and bloody conteſt, the Auritæ were compelled to retire. They ſeparated into ſeveral bodies, and migrated into Phœnicia, Syria, Greece, and other regions, carrying with them their inventions and improvements. (See Auritæ and Shepherds.) This memorable revolution happened not long before the deſcent of Jacob, 1706 B. C. The land of Goſhen, that had been evacuated by the expulſion of the ſhepherds, was allotted as a ſettlement to him and his family. His poſterity poſſeſſed this province for a period of 215 years; and in the year 1491 B.C. they were permitted to depart. Soon after their departure the Egyptian monarch purſued them with a powerful army, determined either to bring them back to ſervitude or to deſtroy them, unarmed and defenceleſs, in the wilderneſs. Providence, however, conducted and preſerved them: and overthrew Pharaoh with his whole hoſt in the Red ſea. Soon after this event, which happened, as ſome ſay, in the reign of Amenophis, this king was ſucceeded (1485 B. C.) by his ſon, as ſome have thought, Seſoſtris, the Seſac or Shiſhak of ſcripture, according to ſir John Marſham, who ſays that the more ancient kings of Egypt are ſtyled Pharaoh. Whiſton has laboured to ſhew, that Seſoſtris is the Typhon of the mythologiſts, and the ſame Pharaoh who periſhed in the Red ſea. Sir Iſaac Newton, as we have already ſaid, maintains, that Seſoſtris is the Oſiris of the Egyptians, the Bacchus of the Greeks, and the Seſac or Shiſhak of the ſcriptures. However this be, his reign, which laſted 68 years according to Blair's tables, formed the moſt extraordinary part of the Egyptian hiſtory. He is repreſented as having been very powerful, both by ſea and land, wiſe, juſt, generous, valiant, and magnificent, but ambitious. (See Sesostris.) After the death of Sethon, about 675 years B. C., Egypt was divided into 12 kingdoms, and as many of the Egyptian lords were appointed rulers or ſovereigns, who entered into the ſtricteſt aſſociation for the public welfare. The ſea-coaſts fell to the lot of one of them, called Pſammetichus, who, encouraging commerce with the Greeks and Phœnicians, not only accumulated great wealth, but acquired the favour and friendſhip of ſeveral foreign kings and nations. The other ſovereigns became jealous and envious, and declared war againſt him. Finding himſelf unequal to the conflict, he hired an army of mercenaries, conſiſting chiefly of Ionians, Carians, and Arabians, and repelling force by force, he at length ſubdued the other kings, and put an end to the duodecemvirate, after it had ſubſiſted 15 years. In the year 660 B. C. he became maſter of the whole kingdom of Egypt, and reigned with as much wiſdom, magnanimity, and ſplendour, as any of his predeceſſors had ever diſplayed. After a long and proſperous reign, he was ſucceeded (616 B. C.) by his ſon Pharaoh-Necho, who was defeated by Nebuchadnezzar king of Babylon. Soon after this defeat, Nebuchadnezzar returned to Egypt with a powerful army, laid waſte the kingdom, dethroned Apries, Necho's ſucceſſor, (587 B. C.) inveſted Amaſis with the ſupreme power (569 B. C.), and carried an incredible quantity of captives and ſpoils to Babylon. Amaſis, conſulting his own ſafety, entered into an alliance with the Grecian ſtates, and with Cræſus, king of Lydia. About this time the Perſian empire had been much elevated by the victories and triumphs of Cyrus. Twenty-three years after the conqueſt of Lydia, Cambyſes, the ſon of Cyrus, reduced Egypt, and made it tributary to Perſia, 525 years B C. In the ſecond year of Artaxerxes Longimanus (463 B. C.) Egypt revolted from the Perſians, under Inarus, who procured for them the aſſiſtance of the Athenians; but they were again compelled to ſubmiſſion. In the 10th year of Darius Nothus (414 B. C.) another revolt took place; and Egypt had for a ſhort interval its own kings, the laſt of whom was Nectanebus, when it was compelled to ſubmit to the Perſians in the 9th year of Artaxerxes Ochus, 350 years B. C. In a few years Alexander the Great, having ſubdued Perſia (331 B.C.) marched towards Egypt, and the whole kingdom ſubmitted without reſiſtance to his victorious army. After his death Ptolemy, one of his generals, took poſſeſſion of it, 323 years B. C.; and his poſterity maintained themſelves upon the throne for about 280 years. Upon the defeat of Antony, and the death of Cleopatra, Egypt ſhared the fate of other kingdoms, and was reduced by Auguſtus into a Roman province, in the 2d year of his reign, 30 B.C. Auguſtus divided the government among ſeveral perſons of equeſtrian order;

order; not venturing to confide in ſenators, who were already too powerful. No circumſtances pertaining to Egypt of ſufficient moment to be here recited, occurred during the reigns of the firſt emperors: but in that of Gallienus, (about A. D. 254) Emilian, who had been prefect for ſome years, aſſumed the imperial purple, and gratified the people by delivering them from the yoke of Gallienus, who was hated and deſpiſed. The people and the ſoldiers concurred in acknowledging his ſovereign authority, and he governed the country for ſome time with prudence and vigour. At length, however, he was taken by Theodotus, and ſent to Gallienus, who ordered him to be ſtrangled in priſon. Under Claudius (A. D. 269) Zenobia, who called herſelf a deſcendant of the kings of Egypt, and decorated her pedigree with the names of the Ptolemies and Cleopatras, from whom ſhe pretended to derive her origin, took poſſeſſion of Egypt; but whilſt Aurelian made war upon this ambitious ſovereign in the Eaſt, his lieutenant Probus re-conquered Egypt and annexed it to the Roman empire. In the year 640 Egypt was ſubdued by Amrou, the famous general of Omar, caliph of the Saracens. (See ALEXANDRIA.) Under the adminiſtration of Amrou Egypt proſpered; and his genius renewed the maritime communication, which had been attempted or atchieved by the Pharaohs, the Ptolemies, and the Cæſars; and a canal, at leaſt 80 miles in length, was opened from the Nile to the Red ſea. This inland navigation, which would have joined the Mediterranean and the Indian ocean, was ſoon diſcontinued as uſeleſs and dangerous. Amrou's letter to Omar exhibits in glowing colours the riches and populouſneſs of this country. The Saracens retained poſſeſſion of this country, until Saladin, A.D. 1174, eſtabliſhed the empire of the Turks in Africa. In the year 1250, the Turkiſh government gave way to that of the Mamlouks. (See MAMLOUKS.) This dynaſty terminated in 1517, when Selim, ſultan of the Ottomans, annexed the kingdom of Egypt to the Turkiſh dominions. It ſtill remains in ſubjection to the Sultans, and is governed by Pachas or Baſhaws, and Beys, who, as we have already ſeen, have reduced it to extreme miſery. (See BASHAW and BEY.) Of the attempts that have been lately made both by the Engliſh and French, to take poſſeſſion of this country, it is unneceſſary to take notice, as they have terminated by alternate victories and defeats between the contending parties, and in the withdrawment of the forces of England and France from this ſcene of conteſt. Anc. Un. Hiſt. vol. i. Savary's Travels in Egypt, vol. ii. Volney's Travels in Egypt and Syria, vol. i. Sonnini's Travels in Egypt. Browne's Travels in Egypt. Brucker's Hiſt. Philoſ. by Enfield, vol. i.

EGYPTIAN GNOSTICS. See GNOSTICS.

EGYPTIAN *Pebble*. See JASPER.

EGYPTIAN *Year*. See YEAR.

EGYPTIANS, popularly *Gypſies*, in our ſtatutes, impoſtors and jugglers, forming a kind of commonwealth among themſelves, who diſguiſe themſelves in uncouth habits, ſmearing their faces and bodies, and framing to themſelves a canting language, wander up and down, and, under pretence of telling fortunes, curing diſeaſes, &c. abuſe the common people, trick them of their money, and ſteal all that they can come at.

The origin of this tribe of vagabonds is ſomewhat obſcure; at leaſt, the reaſon of the denomination is ſo. It is certain, the ancient Egyptians had the character of great cheats, and were famous for the ſubtlety of their impoſtures, whence the name might afterwards paſs proverbially into other languages, as it is pretty certain it did into the Greek and Latin; or elſe, the ancient Egyptians being much verſed in aſtronomy, which in thoſe days was little elſe but aſtrology, the name was on that ſcore aſſumed by theſe tellers of good fortune.

Be this as it will, there is ſcarcely any country of Europe but has its Egyptians, though not all of them under that denomination: the Latins call them *Ægyptii*: the Italians, *Cingani* and *Cingari*; the Germans, *Zigeuner*; the French, *Bohemiens*; others, *Saracens*; and others, *Tartars*, &c.

Munſter, Geogr. lib. iii. cap. 5. relates, that they made their firſt appearance in Germany, in 1417, exceedingly tawney and ſun-burnt, and in pitiful array, though they affected quality and travelled with a train of hunting-dogs after them, like nobles. The above date ſhould probably have been 1517, as Munſter himſelf owns, he never ſaw any till 1524. He adds, that they had paſſports from king Sigiſmund of Bohemia, and other princes. Ten years afterwards, they came into France, and thence paſſed into England. Pope Pius II., who died A. D. 1464, mentions them in his hiſtory as thieves and vagabonds, thus wandering with their families over Europe, under the name of Zigari; and whom he ſuppoſes to have migrated from the country of the Zigi, which nearly anſwers to the modern Circaſſia. Several hiſtorians inform us, that when ſultan Selim conquered Egypt, in the year 1517, ſeveral of the natives refuſed to ſubmit to the Turkiſh yoke; but being at length ſubdued and baniſhed, they agreed to diſperſe in ſmall parties over the world, where their ſuppoſed ſkill in the black art gave them an univerſal reception, in that age of ſuperſtition and credulity. In a few years the number of their proſelytes multiplied, and they became formidable in moſt of the ſtates of Europe. Paſquier, in his Recherch. liv. iv. chap. 19. relates a leſs probable origin of the Gypſies, thus: on the 17th of April 1427, there came to Paris twelve penitents, or perſons, as they ſaid, adjudged to penance, *viz.* one duke, one count, and ten cavaliers, or perſons on horſeback: they took on themſelves the character of "Chriſtians of the Lower Egypt," expelled by the Saracens; who, having made application to the pope, and confeſſed their ſins, received for penance, that they ſhould travel through the world for ſeven years, without ever lying on a bed. Their train conſiſted of 120 perſons, men, women, and children, which were all that were left of 1200, who came together out of Egypt. They had lodgings aſſigned them in the chapel, and people went in crowds to ſee them. Their ears were perforated, and ſilver buckles hung to them; their hair was exceedingly black, and frizzled; their women were ugly, thieviſh, and pretenders to telling of fortunes. The biſhop ſoon afterwards obliged them to retire, and excommunicated ſuch as had ſhewn them their hands.

Ralph. Volaterranus, making mention of them, affirms, that they firſt proceeded or ſtrolled from among the Uxii, a people of Perſis or Perſia. Mr. Grellman, in a German "Diſſertation on the Gypſies," of which an Engliſh tranſlation by Matthew Raper, eſq. was publiſhed in 1787, has given a circumſtantial and connected account of theſe wandering tribes and their manner of living in different parts of Europe. Having collected the opinions of ſeveral writers on the origin of the Gypſies, and, as he conceived, refuted the arguments alleged in ſupport of them, he aſſerts, that they came from Hindooſtan: this hypotheſis he grounds chiefly on the ſimilarity of the Gipſy language to the Hindooſtanic; and upon a compariſon it muſt be acknowledged that many words are the ſame, whilſt many are different. Many of theſe words, as ſir William Jones has obſerved (Aſiatic Reſ. v. iii. p. 7.) are pure Sancrit, ſcarcely changed in a ſingle letter. Mr. Grellman, moreover, ſuppoſes, that the Gypſies are of the loweſt claſs of Indians, *viz.* "Parias," or, as they are called in Hindooſtan, "Suders."

He

He compares the manners of this clafs with thofe of the Gypfies, and enumerates many circumftances in which they agree; but fome of his comparifons are frivolous, and prove nothing. In anfwer to the queftion, How and when did the Gypfies migrate from Hindooftan, he replies, that there is no caufe to be affigned for their retreat from thence by any means fo plaufible as the war of Timur Beg in India. The date of their arrival, he fays, marks it very plainly. It was in the year 1408 and 1409 that this conqueror ravaged India; and his progrefs was fo alarming and deftructive, that thefe, among other terrified inhabitants, faved themfelves by flight. Accordingly this author endeavours to trace their route from Hindooftan to Europe; but he acknowledges that nothing can be faid on this fubject beyond mere furmife. Sir W. Jones (ubi fupra) fuggefts, that, in fome piratical expedition, they might have landed on the coaft of Arabia, or Africa, whence they might have rambled to Egypt, and, at length, have migrated, or been driven into Europe. A race of banditti, refembling them in their habits and features, is found among the Troglodytes, in the rocks near Thebes.

Mr. Grellman eftimates the number of thefe wanderers in Europe to be between 7 and 800 000. As to the favourite food of thefe people our author fays, that they are fo far from being difgufted with the carrion of a fheep, hog, cow, or other beaft, horfe-flefh only excepted, that their fill of fuch a meal is with them the height of epicurifm. He has then defcribed their drefs, their family-economy, their occupations and trades, their marriages and education, their difeafes and burials, their political regulations and religion. In thefe particulars we cannot follow him. With regard to their character he fays, that they are lively, and uncommonly loquacious, extremely fickle and inconftant in their purfuits, and faithlefs to every body even of their own caft, deftitute of gratitude, and frequently recompenfing benefits with the moft infidious malice: flavifh when intimidated, and cruel when unapprehenfive of danger, revengeful and violent in their refentments; fo addicted to drinking as to part with any neceffary for fpirits; and exceedingly vain and fond of fine clothes. Such are the levity and infenfibility of a Gipfy's temper, that in the fpace of an hour he forgets that he has been juft releafed from the whipping poft.

But there are other traits of character much more atrocious than any we have already mentioned. The depravity of their manners, with regard to the intercourfe of the fexes, is extreme. The mother, fays our author, endeavours, by the moft fcandalous arts, to train up her daughter for an offering to fenfuality, and the daughter is fcarcely grown up to maturity, before fhe becomes a feducer of others. Lazinefs is fo predominant among them, that if they were to fubfift merely by their own labour, they would hardly have bread for two days in the week. This indolence increafes their propenfity to ftealing and cheating. It is not matter of furprife, if this picture be fairly drawn, that almoft every European ftate has exerted its utmoft power to get rid of thefe noxious intruders. Mr. Grellman enumerates feveral edicts that have been paffed for the banifhment of the Gypfies out of Spain, France, Italy, England, Denmark, Sweden, the Netherlands, Holland, and Germany. He difapproves of thefe laws, and recommends other methods for making them ufeful fubjects in the feveral kingdoms, where they are now dangerous and mifchievous vagabonds. One of the means which he propofes is not likely to anfwer any valuable purpofe. The civilization of a favage muft be effected by gentle treatment, and not by corporeal punifhment, which he recommends.

By an ordonnance of the ftates of Orleans, in the year 1560, it was enjoined all thefe impoftors, under the name of *Bohemians* and *Egyptians*, to quit the kingdom, on penalty of the gallies. Upon this they difperfed into leffer companies, and fpread themfelves over Europe. They were expelled from Spain in 1591. The firft time we hear of them in England was in the year 1530, when they were defcribed by the ftatute 22 Hen. VIII. cap 10. as "an outlandifh people, calling themfelves Egyptians, ufing no craft nor feat of merchandize, who have come into this realm, and gone from fhire to fhire and place to place in great company, and ufed great, fubtile, and crafty means to deceive the people; bearing them in hand, that they by palmiftry could tell men's and women's fortunes; and fomany times by craft and fubtlety have deceived the people of their money, and alfo have committed many heinous felonies and robberies." Wherefore they are directed to avoid the realm, and not to return under pain of imprifonment, and forfeiture of their goods and chattels; and upon their trials for any felony which they may have committed, they fhall not be entitled to a jury "de Medietate linguæ." And afterwards, it is enacted by ftatutes 1 and 2 Ph. and M. c. 4, and 5 Eliz. c. 20, that if any fuch perfon fhall be imported into this kingdom, the importer fhall forfeit 40 *l.* And if the Egyptians themfelves remain one month in this kingdom, or if any perfon, being fourteen years old, (whether natural born fubject or ftranger,) which hath been feen or found in the fellowfhip of fuch Egyptians, or which hath difguifed him or herfelf like them, fhall remain in the fame one month, at one or feveral times; it is felony without benefit of clergy: and fir Matthew Hale informs us, that at one Suffolk affizes no lefs than 13 Gypfies were executed upon thefe ftatutes, a few years before the Reftoration. But to the honour of our national humanity, there are no inftances more modern than this of carrying thefe laws into practice. Now, indeed, by ftat. 23 Geo. III. c. 51. the faid act of 5 Eliz. c. 20. is repealed: and the ftatute 17 Geo. II. c. 5. regards them only under the denomination of rogues and vagabonds. See VAGRANTS.

EHENHEIM, or UPPER EHENHEIM, relatively to the village of the fame name, called *Lower Ehenheim*, in *Geography*, is a fmall town of France, in the department of the Lower Rhine, on the river Ergel, or Ergers; 15 miles S.W. of Strafbourg. It was anciently a free imperial city.

EHINGEN, a fmall town of Germany, in the kingdom of Wirtemberg, fituated on the Danube; 12 miles S.W. of Ulm, remarkable for a very ancient nunnery.—Alfo, a fmall town of Germany of the fame kingdom, fituated on the Necker; 6 miles W. of Tubingen.

EHLE, a river of Germany, in the circle of Upper Saxony, which runs into the Elbe, near Magdeburg.

EHRENBERG, a fmall town of Germany, in the kingdom of Bavaria, fituated in the Tyrol, on the frontiers of Suabia, in the lordfhip of the fame name. It is remarkable for an ancient caftle, which formerly was confidered as very ftrong. It is 30 miles S.E. of Kempten.—Alfo, a fmall town of Germany, in the former principality of Fulda, with a chapel dedicated to the Virgin Mary on the top of a very high hill, which its termination *berg*, the German for mountain, denotes.

EHRENBREITSTEIN, (*the broad rock of honour,*) an important fortrefs of Germany, near the Rhine, on a high mountain oppofite Coblentz, at the place where the river Mofelle falls into the Rhine. The rock is fo fteep, and the fortifications are fo ftrong, that it can be reduced only by famine. It furrendered to the French in 1798, after a blockade of eighteen months. The electoral palace of the archbifhops and electors of Trêves, whofe territory was ceded to France by the peace of Luneville, is at the foot of the rock, and furrounded with works of defence. Ehrenbreitftein is now in the territory of the grand duke of Naf-

ſau Weilburg, one of the princes of the Confederation of the Rhine.

EHRENBURG, a town of Germany, in the kingdom of Weſtphalia, and county of Hoya; 18 miles W.S.W. of Hoya.

EHRENFRIEDERSDORF, anciently IRBERSDORF, a ſmall town of the kingdom of Saxony, in the circle of the Ertzgebirge, on a ſmall rivulet, which, after having received ſeveral other brooks, takes the name of Wilſch, and falls into the Zſchopau near Grieſbach. It is chiefly inhabited by miners occupied in the adjacent mines; its population amounts to 1300 individuals, and its chief manufacture is that of thread, lace, and yarn.

EHRENSTEIN, a town and caſtle of Germany, in the circle of Upper Saxony, and principality of Schwartzburg Rudolſtadt; 10 miles N.W. of Saalfeld.

EHRETIA, in *Botany*, ſo named by Browne, in honour of George Dionyſius Ehret, a German, much celebrated for his beautiful botanical drawings, which now fetch a high price among collectors. Mr. Ehret was the friend of Miller, as well as a correſpondent of Linnæus. He drew from dried ſpecimens the excellent plates of Browne's Natural Hiſtory of Jamaica, and after reſiding long in England, where he had many pupils, even among the nobility, who highly reſpected him, he died about 40 years ago, and was interred near his friend Miller, in the burial ground of the King's-road, Chelſea. He was born in 1708. Browne's Jam. 168. t. 16. f. 1. Linn. Gen. 102. Schreb. 139. Willd. Sp. Pl. v. 1. 1077. Mart. Mill. Dict. v. 2. Juſſ. 128. Claſs and order, *Pentandria Monogynia*. Nat. Ord. *Aſperifoliæ*, Linn. *Borraginea*, Juſſ.

Gen. Ch. *Cal.* Perianth of one leaf, bell-ſhaped, ſmall, permanent, divided half-way down into five obtuſe ſegments. *Cor.* of one petal; tube twice as long as the calyx; limb in five, nearly ovate, recurved, obtuſe ſegments. *Stam.* Filaments five, inſerted into the baſe of the tube, awl-ſhaped, ſpreading, the length of the corolla; anthers roundiſh, incumbent. *Piſt.* Germen ſuperior, roundiſh; ſtyle thread-ſhaped, ſwelling upwards, the length of the ſtamens; ſtigma obtuſe, cloven. *Peric.* Berry, according to Juſſieu, of four cells, but ſeparable into two hemiſpheres, each of two cells. *Seeds* one in each cell, convex on one ſide, angular on the other.

Obſ. E. *Beurreria* has the fruit ſeparable into four parts, each of which has two cells and two ſeeds. *Juſſ.* Hence Linnæus's paradoxical account, that each *ſeed* is of two cells in that ſpecies.

Eſſ. Ch. Corolla of one petal, inferior. Berry of four or eight cells. Seeds ſolitary. Stigma cloven.

This genus in Willdenow conſiſts of ſeven ſpecies. E. *tinifolia* is the original one. "Leaves oblong-ovate, entire, ſmooth. Flowers panicled."—Figured in Browne as above-ſaid, and in Trew's Plantæ Selectæ, t. 25, where it is repreſented as hexandrous, with ſix ſegments to the corolla, which the editor erroneouſly terms ſo many petals. This tree grows in Jamaica "in the lower lands," and is from 16 to 20 feet high. The *flowers* are white, not remarkable for beauty. *Berries* yellowiſh, about the ſize of currants. Browne ſays they ſerve to feed poultry, and are ſometimes eaten by the poorer ſort of people. The plant having not much to recommend it to general notice, is only occaſionally cultivated in the Engliſh ſtoves. Miller introduced it in 1734.

E. *Beurreria* is ſtill more unfrequent in our collections. "Leaves ovate, entire, ſmooth. Flowers ſomewhat corymboſe Calyx ſmooth."—Native of Jamaica, figured in Browne t. 15. f. 2, who deſcribes it as growing in the Savannahs, to the height of 14 or 15 feet only. The *flowers* are white, fewer, but much larger, than in the former. *Berries* ſaffron-coloured, with eight ſeeds.

E. *buxifolia*, Roxburgh Coromand. v. 1. t. 57, is an Eaſt Indian ſpecies, unknown to Linnæus, and as yet a ſtranger in England. "Leaves cluſtered, obovate, beſprinkled with callous points, obſcurely three-toothed at the ſummit. Stalks many-flowered." A rigid ſhrub, remarkable for the white calloſities on its *leaves*. From three to ſix white ſmall *flowers* grow on each flower-ſtalk. *Berry* red, the ſize of a pea.

Juſſieu ſuſpects this genus may be the ſame with the *Menais* of Linnæus; but the latter has been ſeen by Loefling and Aymen only, and we know not how the queſtion is to be clearly determined.

If it ſhould prove ſo, the name of *Ehretia* has a prior claim, in point of time, to *Menais*, not to mention the greater inconveniences of changing it. If, however, the calyx of *Menais* be correctly deſcribed, as "of three loſely ſpreading leaves," this genus muſt be diſtinct, and the linear and ſeſſile anthers moreover abundantly mark it as ſuch.

EHRFELDEN, in *Geography*, a town of Germany, in the circle of the Upper Rhine, and principality of Heſſe Darmſtadt; 8 miles W. of Darmſtadt.

EHRHARTA, in *Botany*, named by Thunberg and the younger Linnæus after their friend Frederick Ehrhart, a Swiſs botaniſt of great diligence and acuteneſs, who ſtudied at Upſal, and ſettled as an apothecary at Hanover, where he died ſome years ſince. He publiſhed ſeveral collections of dried plants, with authentic names, for the uſe of the medical practitioner as well as botaniſt, and a miſcellaneous work, entitled *Beiträge*, in 7 vols. 8vo. in German, full of excellent botanical remarks, with ſome peculiarities of opinion and ſtyle. He beſtowed great and commendable attention upon many common garden trees and flowers, which other botaniſts had confounded or neglected, as well as on cryptogamic plants. Being employed to ſuperintend the printing of the *Supplementum Plantarum*, he introduced ſome of his own genera of moſſes, with new, affected, and unauthorized terms, which gave ſo much diſpleaſure to Linnæus, that the ſheet was cancelled. Thunb. Stockholm Tranſ. for 1779, 216, t. 8. Linn. fil. Nov. Gram. Gen. 32. fig. Suppl. 28. Smith Pl. Ic. faſc. 1. t. 9. Schreb. 236. Willd. Sp. Pl. v. 2. 246. Juſſ. 32. Mart. Mill. Dict. v. 2. Swartz Tr. of Linn. Soc. v. 6. 40. t. 3, 4. (Trochera; Rozier Journ. for 1779, 225.) Claſs and order, *Hexandria Digynia*. Nat. Ord. *Gramina*, near *Oryza*.

Gen. Ch. *Cal.* Glume of two valves, ſingle-flowered; valves uſually ſhorter than the corolla, ovate, acute, concave, channelled, beardleſs, a little ſpreading, unequal; the outer generally ſmaller, ovato-lanceolate, embracing the inner by its baſe; inner rather larger, ovate, broad, acute. *Cor.* double, longer than the calyx, ſcarcely gaping. Outer of two-folded, compreſſed, unequal valves, embracing each other, often furniſhed with one or two tufts of hairs at the baſe; the inner valve narroweſt, with a notch at each ſide of its baſe; outer valve in an early ſtate almoſt concealing the other, and connected with it by a ſort of joint at the very bottom. Inner corolla compreſſed, two edged, of two valves, which are folded, membranous, keeled, unequal; the outer valve broadeſt, embracing the oppoſite glume of the outer corolla with its baſe, at the notched ſides of that glume; inner valve tapering, ſomewhat incurved. At the baſe of the interior corolla, adjoining to the inner valve of the outer corolla, is a ſeſſile, roundiſh, uneven tubercle; perhaps the rudiment of another floret. Nectary of two minute membranes, thickened at their baſe, very thin at the ſummit, enfolding the organs of impregnation. *Stam.* Filaments ſix, very ſhort, inſerted round the germen; anthers linear, erect,

notched at the base, cloven at the summit, of two cells, each of which bursts obliquely at the top. *Pist.* Germen superior, ovate, minute, smooth; styles two, very short, erect, contiguous; stigmas long, approaching each other, at length divaricated, each consisting of two opposite, feathery rows. *Peric* none, except the permanent valves of the corolla. *Seed* solitary, smooth.

The above description is taken from Dr. Swartz's paper, the only correct history of this curious and elegant genus, in which the contrarieties and errors of preceding authors are explained and corrected. Dr. Swartz remarks, that in those species where the tubercle, or rudiment of a floret, is wanting, a petal-like scale is found in its stead, on both sides, where the inner valve is notched.

Ess. Ch. Calyx a glume of two valves, single-flowered. Corolla double, each of two valves; the outer corolla notched at the base.

The celebrated Thunberg first founded this genus upon a single species in 1779; about the same time the abbé Rozier published a description of another species by Richard, under the name of *Trochera*. The name of Thunberg however was adopted by Linnæus in the *Supplementum* who described his original *E. capensis*, by the name of *E. Mnemateia*, a name probably suggested by Ehrhart himself, who was partial to words of Greek derivation. Dr. Smith first distinguished these two species, and added three others to the genus, in his *Plantarum Icones*. Finally, Professor Swartz has investigated the whole, and ascertained four more species, making nine in all. Professor Willdenow was not acquainted with this excellent treatise when he described the genus in his *Sp. Plantarum;* and this popular work being therefore deficient, as well as the subject very curious, we shall briefly elucidate all the species. They all grow, as far as is at present known, near the Cape of Good Hope only. In habit they most resemble *Melica*, but the flowers have a singular and elegant aspect, especially such as have the outer corolla transversely wrinkled. Some bear terminal awns on that part, others none.

* *Beardless.*

1. E. *mnematea*, Sw. in Tr. of L. Soc. v. 6 44. f. 1. Linn. Suppl. 209. Thunb. Prod. 66 (E. capensis; Thunb. Stockh. Trans. for 1779, 216. t. 8. E. cartilaginea; Sm. Pl. Ic. fasc. 2. sub t. 33. Willd. Sp. Pl. v. 2. 246. E. nutans; Lamarck Encycl. v. 2. 346.) "Outer corolla rugose, obtuse, beardless. Panicle simple, lax. Stem simple. Margin of the leaves cartilaginous and crisped."—The *leaves* have a cartilaginous edge, very elegantly notched and crisped. *Flowers* tinged with purple, on capillary drooping stalks.

2. E. *panicea*, Sw. 47. f. 2. Sm. Pl. Ic. fasc. 1. t. 9. Willd. Sp. Pl. v. 2. 247. (E. erecta; Lamarck 347) "Outer corolla smooth, somewhat rugged, obtuse. Panicle slightly branched, drooping. Stem subdivided."—Cultivated in the stoves at Kew and Cambridge, flowering in June and July. It has the habit and small green flowers of a *Panicum* or *Poa*, but the slightest inspection shews its true genus.

3. E. *ramosa*, Sw. 49. f. 3. (Melica ramosa; Thunb. Prod. 21. Willd. Sp. Pl. v. 1. 383.) "Outer corolla rough, abrupt. Panicle close. Stem much branched, rather shrubby."—Dr. Swartz informs us this is also the *Ehrharta digyna* of Thunberg, the only botanist who seems to have found it; and that the flowers somewhat resemble *Festuca decumbens* of Linnæus. The *calyx* is nearly as long as the *corolla*. The *stem* jointed, branched, and almost woody.

4. E. *melicoides*, Sw. 51. f. 4. (Melica capensis; Thunb. Prod. 21. Willd. Sp. Pl. v. 1. 383) "Outer corolla very smooth and obtuse. Panicle widely spreading."—Much resembling a *Melica*. Glumes of the *corolla* peculiarly bare and rounded, and *panicle* very much branched. Sw.

5. E. *calycina*, Sw. 53. f. 5. Sm. Pl. Ic. fasc. 2. t. 33. Willd. Sp. Pl. v. 2. 247. (Aira capensis; Linn. Suppl. 108) "Outer corolla somewhat hairy, obtuse with a short point. Panicle close, nearly simple. Stem branched."—Sparrman was the discoverer of this species, whose pointed hairy *glumes* distinguish it from the last, as well as its close *panicle*.

** *Awned.*

6. E. *geniculata*, Sw. 55. f. 6. (Melica geniculata; Thunb. Prod. 21. Willd. Sp. Pl. v. 1. 382.) "Outer corolla hairy; one valve awned. Panicle close. Stem decumbent, bent at the joints."—Habit of the last, but its crisped *leaves*, and pointed awned *corolla* distinguish it.

7. E. *longiflora*, Sw. 56. f. 7. Sm. Pl. Ic. fasc. 2. t. 32. Willd. Sp. Pl. v. 2. 246. (E. aristata; Thunb. Prod. 66.) "Outer corolla rugged, hispid, both valves awned. Panicle rather lax, branched."—A large species, with the habit of an *Avena*. Dr. Swartz found six stamens, Dr. Smith but three, in the flowers they severally examined. The length of the awns varies.

8. E. *gigantea*, Sw. 58. f. 8. (Melica gigantea; Thunb. Prod. 21. Willd. Sp. Pl. v. 1. 382. Aira villosa; Linn. Suppl. 109.) "Outer corolla hairy, both valves awned. Panicle close, somewhat whorled. Stem remotely jointed. Leaves involute."—One of the largest species, being six feet high. The *flowers* also are larger and more hairy than in any other. *Calyx* very membranous, half as long as the corolla.

9. E. *bulbosa*, Sw. 60. f. 9. Sm. Pl. Ic. fasc. 2. sub t. 33. (Trochera striata; Richard in Rozier's Journal, v. 13. 225. t. 3.) "Outer corolla with obovate, emarginate, rugged, short-awned glumes. Panicle lax."—The *root* is more bulbose in this than in some others. It was described by Richard from a plant in some of the French gardens, and he attributes "but three stamens to the flowers." We have found four, with appearance of abortive filaments, so that the number probably varies. This most resembles the first species, with which indeed Lamarck confounded it.

EHRIAH Gross, in *Geography*, a town of Germany, in the circle of Upper Saxony, and county of Schwartzburg; 4 miles W. of Greussen.

EHRNAU, a town of Germany, in the duchy of Stiria; six miles N. of Knittelfeld.

EHRNHAUSEN, a town of Germany, in the duchy of Stiria, at the conflux of the Salm and the Muehr; 10 miles N. of Mahrburg.

EHRNSPRUNN, a town of Germany, in the archduchy of Austria; 8 miles S. of Laab.

EIA, a river of Russia, which runs into the sea of Azoph, at Eiskoi.

Eia, or *Ey*, in our *Old Writers*, are used for an island. Hence the names of places ending in *ey*, denote them to be islands. Thus, Ramsey, the isle of Rams; Sheppey, the isle of Sheep, &c.

Eia is also sometimes used for water; and hence the names of places near waters or lakes, terminate in *ey*.

EJACULATION, in *Medicine*, the act of emitting seed, from the Latin, *ejaculare*, to cast outwards. See Emission.

EJACULATOR Seminis, in *Anatomy*, a muscle of the urethra, called also accelerator urinæ; which see.

EJACULATORY Ducts, a term which has been applied to the openings of the vasa deferentia in the urethra. See Generation, *Organs of*.

EIBESWALD,

EIBESWALD, in *Geography*, a town of Germany, in the duchy of Stiria; 16 miles S. of Voitsberg.

EICETÆ, called also *Heicetæ* and *Hicetæ*, heretics of the seventh century, who made profession of the monastic life.

From that passage in Exodus, where Moses and the children of Israel are said to have sung a song in praise of the Lord, after they had passed the Red sea, wherein their enemies had perished, the Eicetæ concluded, that they must sing and dance, to praise God aright; and as Mary the prophetess, sister of Moses and Aaron, took a drum in her hand, on the same occasion, and all the women did the like, to testify their joy, by playing, beating, and dancing, the Eicetæ, the better to imitate their conduct herein, endeavoured to draw women to them to make profession of the monastic life, and assist in their mirth.

EICHENBUHL, in *Geography*, a town of Germany, in the circle of the Lower Rhine, and electorate of Mentz; 3 miles S E. of Miltenberg.

EICHHOLZ, a town of Germany, in the circle of Upper Saxony, and principality of Anhalt Zerbst; 3 miles S.W. of Zerbst.

EICHMED, a town of Prussia, in the province of Natangen; six miles S S E. of Rastenburg.

EICHNER, M. in *Biography*, an eminent performer on the bassoon, and an excellent composer, not only for his own instrument, but for the harpsichord and piano-forte. He was in this country about five and twenty years ago, and introduced a style between that of Schobert and the present; with less fire than Schobert, and more taste and expression. He was accused by the critics of his own country of being too modern. He was in a bad state of health during his residence in England, and played but little in public; yet from that little it was easy to discover a style, taste, and expression, of the most refined and polished kind. His pieces for keyed-instruments, printed by Bremner, were elegant, correct, and extremely pleasing. He died at Berlin the beginning of 1778.

EICHSFELD, in *Geography*, frequently but improperly called the *Eisfeld*, is a country of Germany, situated in the Electoral Rhenish circle, bounded by Hanover, Hesse, and Thuringia, about 35 miles in its greatest length from south to north, and 24 miles in breadth from east to west, having altogether a territorial extent of 185 square miles. It is divided into Lower and Upper Eichsfeld, the Lower being the northern, and the Upper the southern part. The latter is very mountainous, and gives birth to several rivers, as the Leine; the Lutter, which first runs into the Wiesel, and then conjointly with this into the Werre; the Unstrut; the Wipper, and the Rume.

The Eichsfeld contains four cities, three boroughs, and one hundred and fifty villages. Duderstadt, in the Lower Eichsfeld, was considered as the capital. Its population, at the peace of Luneville, was about 120,000 individuals.

Anciently the Eichsfeld belonged to Thuringia. The Upper Eichsfeld was ceded by Henry, count of Gleichen, in the year 1294 to Gerhard II. elector of Mayence; the remaining parts of this country were successively added to the electorate in 1334, 1563, and 1692. But at the peace of Luneville, the archbishop of Mayence was secularized, and the Eichsfeld given as an indemnity to Prussia for the Prussian provinces on the west side of the Rhine. This cession was confirmed by the convention of the 26th of December 1802, between Austria, Russia, and France. But Prussia lost the Eichsfeld again at the peace of Tilsit in 1807, and by Napoleon's decree of the 18th of August of the same year, the Eichsfeld was constituted a part of the new kingdom of Westphalia.

EICHSTAEDT, Eichstett, or *Aichstadt*, an ancient town of Germany, in the circle of Franconia, formerly the chief city and episcopal residence of the bithopric of the same name, is situated in a fertile valley on the river Altmühl, 45 miles S. of Nuremberg, in a tract of country called the Nordgau. The place on which the town of Eichstett stands belonged anciently to the counts of Hirschberg, one of whom ceded it to St. Boniface, and the latter to his sister's son Willibald, who founded a convent, near which houses were gradually built, and this assemblage of buildings obtained the name of Eichstett from the number of large oaks with which it was surrounded. In 745 Boniface consecrated Willibald bishop of Eichstett.

The bishopric of Eichstett, which was nearly 54 miles long and about 21 in breadth, contained 10 towns and one borough: but it was secularized at the peace of Luneville, and first given to the king of Bavaria, who still retains a small portion of it. The principal part, together with the town of Eichstett, was afterwards transferred as part of his indemnities to the grand duke of Tuscany, who was created elector of Salzburg, and whose possessions in Germany are now known by the name of the grand duchy of Salzburg. They are considered as under the protection of Austria.

EIDA, in *Modern History*, a Mahometan spring festival, celebrated annually by the Nawab of Lucknow, in Hindoostan, on the 1st of March, after the new moon becomes visible, and kept, as it is said, in commemoration of Abraham's sacrifice. A camel is here substituted for a ram. The princes of Hindoostan march in procession, at this ceremony, with all their courtiers, and a large military escort. On such occasions, the oriental taste for shew and gaudy magnificence is displayed with extraordinary attention. The howdahs, palankeens, and harnessing of the elephants, are so contrived, as to exhibit a blaze of gold, in which the numerous ornaments cannot be well distinguished. After the pomp and ostentation of the procession, during which alms are distributed, when the first part of it arrives on the ground, the ceremony consists in a solemn invocation of the Deity for plenty and prosperity during the ensuing season. It is observed, however, that the transitions from outward acts of devotion to the grossest crimes is short and frequent. This festival seems to resemble the feast of Tabernacles among the Jews, which, as we learn from the complaint of the prophet, was observed by that people with as little moral effect, or purity of intention, as this is by the Mussulmans. Both Jews and Mussulmans have, in too many instances, equally regarded superstitious observances, as a substitute for every moral virtue, and a compensation to the Deity for the violation of his laws.

EIDE, in *Geography*, a town of Norway; 36 miles E.S.E. of Berghen.

EIDER, a river, which, in a great part of its course, divides the duchy of Slesvick from that of Holstein, and runs into the German ocean; 12 miles W.S.W. of Lunden.

Eider-*Duck*, in *Ornithology*. See Duck.

EIDWALD, in *Geography*, a town of Bohemia, in the circle of Leitmeritz; 16 miles W.N.W. of Leitmeritz.

EJECIT Infra Terminum. See Quare *Ejecit*.

EJECTION, the act of throwing out, or discharging any thing at some of the emunctories, as by stool, vomiting, or the like.

EJECTIONE Custodiæ, *Ejectment de Garde*, in *Law*, a writ which lies against him that casts out the guardian from any land during the minority of the heir. See Guardian.

Ejectione *firmæ*, a writ that lies for the lessee for years, who

who is ejected before the expiration of his term, either by the lessor, or a stranger.

Also ejectment may be brought by a lessor against the lessee, for rent in arrears, or holding over his term, &c. Reg. Orig. 227. This writ of *ejectione firmæ*, or action of trespass in *ejectment*, lieth where lands or tenements are let for a term of years, and afterwards the lessor, reversioner, remainder-man, or any stranger, doth eject, or oust the lessee of his term. (1 Inst. 45.) In this case, he shall have his writ of *ejection*, to call the defendant to answer for entering on the lands so demised to the plaintiff for a term that is not yet expired, and ejecting him. And by this writ the plaintiff shall recover back his term, or the remainder of it, with damages. Ejectment is now become an action in the place of many real actions, as writs of right, formedons, &c. which are very difficult, as well as tedious and chargeable; and this is the common action for trying of titles, and recovering of lands, &c. illegally kept from the right owner. However, all titles cannot be tried by this action. This method seems to have been settled as early as the reign of Edward IV. (7 Edw. IV. 6.); though it hath been said (F.N.B. 220.) to have first begun under Henry VII., because it was then first applied to its present principal use, that of trying the title to the land. In order to apprehend the contrivance, by which this end is effected, it should be recollected, that the remedy by ejectment is, in its original, an action brought by one, who hath a lease for years, to repair the injury done him by dispossession. For the purpose of converting it into a method of trying titles to the freehold, it is first necessary that the claimant do take possession of the lands, to empower him to constitute a lessee for years, that may be capable of receiving this injury of dispossession. For it would be an offence, called in our law "Maintenance," to convey a title to another, when the grantor is not in possession of the land. When, therefore, a person, who hath right of entry into lands, determines to acquire that possession, which is wrongfully withheld by the present tenant, he makes (as by law he may) a formal entry on the premises; and being so in possession of the soil, he there, upon the land, seals and delivers a lease for years to some third person or lessee; and, having thus given him entry, leaves him in possession of the premises. This lessee is to stay upon the land, till the prior tenant, or he who had the previous possession, enters thereon afresh and ousts him; or till some other person (either by accident, or by agreement, before-hand) comes upon the land, and turns him out or ejects him. For this injury the lessee is entitled to his action of ejectment against the tenant, or this "casual ejector," which-ever it was that ousted him, to recover back his term and damages. But where this action is brought against such a casual ejector, before-mentioned, and not against the very tenant in possession, the court will not suffer the tenant to lose his possession, without any opportunity to defend it. Accordingly, it is a standing rule, that no plaintiff shall proceed in ejectment to recover lands against a casual ejector, without notice given to the tenant in possession (if there be any), and making him a defendant, if he pleases. In order to maintain the action, the plaintiff must, in case of any defence, make out four points before the court; *viz. title, lease, entry*, and *ouster*. He must, first, shew a good *title* in his lessor, which brings the matter of right entirely before the court; then, that the lessor, being seised or possessed by virtue of such a title, did not make him the *lease* for the present term; thirdly, that he, the lessee, or plaintiff, did *enter*, or take possession, in consequence of such lease; and, lastly, that the defendant *ousted*, or ejected him. Whereupon he shall have judgment to recover his term and damages; and shall, in consequence, have a *writ of possession*, which the sheriff is to execute, by delivering him the undisturbed and peaceable possession of his term.

This is the regular method of bringing an action of ejectment; and this method must still be continued in due form and strictness, except only as to the notice to the tenant, whenever the possession is vacant, or there is no actual occupant of the premises; and also in some other cases. But, as much trouble and formality were found to attend the actual making of the *lease, entry*, and *ouster*, a new and more easy method of trying titles by ejectment, when there is any actual tenant, or occupier of the premises in dispute, was invented above a century ago by the lord chief justice Rolle, who then sat in the court of *upper* bench, so called during the exile of king Charles II.

This new method entirely depends upon a string of legal fictions: no actual lease is made, no actual entry by the plaintiff, no actual ouster by the defendant; but all are merely ideal, for the sole purpose of trying the title. To this end, in the proceedings, a lease for a term of years is stated to have been made by him who claims title, to the plaintiff, who brings the action, as by John Rogers to Richard Smith, which plaintiff ought to be some real person, and not merely an ideal fictitious one, as is frequently, though unwarrantably, practised (6 Mod. 309.): it is also stated, that Smith, the lessee, entered; and that the defendant, Willam Styles, called the "casual ejector," ousted him; for which ouster he brings this action. As soon as this action is brought, and the complaint fully stated in the declaration, Styles, the casual ejector, or defendant, sends a written notice to the tenant in possession of the lands, *e.g.* George Saunders, informing him of the action brought by Richard Smith, and transmitting him a copy of the declaration; assuring him that he, Styles, the defendant, has no title at all to the premises, and shall make no defence; and therefore advising the tenant to appear in court, and defend his own title; otherwise, he, the casual ejector, will suffer judgment to be had against him; and thereby the actual tenant, Saunders, will inevitably be turned out of possession. On receipt of this friendly caution, if the tenant in possession does not, within a limited time, apply to the court to be admitted a defendant in the stead of Styles, he is supposed to have no right at all; and, upon judgment being had against Styles, the casual ejector; Saunders, the real tenant, will be turned out of possession by the sheriff.

But, if the tenant in possession applies to be made a defendant, it is allowed him upon this condition; that he enter into a rule of court to confess, at the trial of the cause, three of the four requisites for the maintenance of the plaintiff's action, *viz.* the *lease* of Rogers the lessor, the *entry* of Smith the plaintiff, and his *ouster* by Saunders himself, now made the defendant instead of Styles; which requisites being wholly fictitious, should the defendant put the plaintiff to prove them, he must of course be non-suited for want of evidence; but by such stipulated confession of *lease, entry*, and *ouster*, the trial will now stand upon the merits of the *title* only. When this is done, the declaration is altered by inserting the name of George Saunders instead of William Styles, and the cause goes down to trial under the name of Smith, the plaintiff, on the demise of Rogers the lessor, against Saunders, the now defendant. And herein the lessor of the plaintiff is bound to make out a clear title: otherwise his fictitious lessee cannot obtain judgment to have possession of the land for the term supposed to be granted. But if the lessor makes out his title in a satisfactory manner, then judgment and a writ of possession shall go for Richard Smith, the nominal plaintiff, who by this trial has proved

proved the right of John Rogers his ſuppoſed leſſor. Yet to prevent fraudulent recoveries of the poſſeſſion, by colluſion with the tenant of the land, all tenants are obliged by ſtatute 11 Geo. II. c. 19. on pain of forfeiting three years' rent, to give notice to their landlords, when ſerved with any declaration in ejectment: and any landlord may, by leave of the court, be made a co-defendant to the action, in caſe the tenant himſelf appears to it; or if he makes default, though judgment muſt be then ſigned againſt the caſual ejector, yet execution ſhall be ſtayed in caſe the landlord applies to be made a defendant, and enters into the common rule;—a right, which indeed the landlord had, long before the proviſion of this ſtatute; in like manner as (previous to the ſtatute of Weſtm. 2. c. 3.) if in a real action the tenant of the freehold made default, the remainder-man or reverſioner had a right to come in and defend the poſſeſſion; leſt, if judgment were had againſt the tenant, the eſtate of thoſe behind ſhould be turned to a naked right. (Bracton, l. 5. c. 10. § 14.) But if the new defendants, whether landlord or tenant, or both, after entering into the common rule, fail to appear at the trial, and to confeſs leaſe, entry, and ouſter, the plaintiff Smith muſt be non-ſuited, for want of proving theſe requiſites; but judgment will in the end be entered againſt the caſual ejector Styles; for the condition, on which Saunders, or his landlord, was admitted a defendant, is broken, and therefore the plaintiff is put again in the ſame ſituation as if he never had appeared at all; the conſequence of which would have been, that judgment would have been entered for the plaintiff, and the ſheriff, by virtue of a writ for that purpoſe, would have turned out Saunders, and delivered poſſeſſion to Smith. The ſame proceſs, therefore, as would have been had, provided no conditional rule had been ever made, muſt now be purſued as ſoon as the condition is broken.

The damages recovered in theſe actions, though formerly their only intent, are now uſually (the title being conſidered as the principal queſtion) very ſmall and inadequate; amounting commonly to one ſhilling or ſome other trivial ſum. In order, therefore, to complete the remedy, when the poſſeſſion has been long detained from him that had the right to it, an action of treſpaſs alſo lies, after a recovery in ejectment, to recover the meſne profits which the tenant in poſſeſſion has wrongfully received. This action may be brought in the name of either the nominal plaintiff in the ejectment, or his leſſor, againſt the tenant in poſſeſſion; whether he be made party to the ejectment, or ſuffers judgment to go by default. (4 Burr. 668.) In this caſe the judgment in ejectment is concluſive evidence againſt the defendant, for all profits which have accrued ſince the date of the demiſe ſtated in the former declaration of the plaintiff; but if the plaintiff ſues for any antecedent profits, the defendant may make a new defence.

This is the modern way, now univerſally adopted, of obliquely bringing in queſtion the title to lands and tenements. It is founded on the ſame principle as the ancient writs of aſſiſe, being calculated to try the mere *poſſeſſory* title to an eſtate, and hath ſucceeded to thoſe real actions, as being infinitely more convenient for attaining the ends of juſtice; becauſe the form of the proceeding being entirely fictitious, it is wholly in the power of the court to direct the application of that fiction, ſo as to prevent fraud and chicane, and eviſcerate the very truth of the title. The writ of ejectment, and its nominal parties, as was reſolved by all the judges (Mich. 32 Geo. II. 4 Burr. 668. Stra. 54.) are "judicially to be conſidered as the fictitious form of an action, really brought by the leſſor of the plaintiff againſt the tenant in poſſeſſion: invented, under the controul and power of the court, for the advancement of juſtice in many reſpects; and to force the parties to go to trial on the merits, without being entangled in the nicety of pleadings on either ſide."

But a writ of ejectment is not an adequate means to try the title of all eſtates; for on thoſe things, whereon an entry cannot in fact be made, no entry ſhall be ſuppoſed by any fiction of the parties. Therefore an ejectment will not lie of an advowſon, a rent, a common, or other incorporeal hereditaments. (Brownl. 129. Cro. Car. 492): except for tithes in the hands of lay appropriators, by the expreſs purview of ſtat. 32 Hen. VIII c. 7., which doctrine hath ſince been extended by analogy to tithes in the hands of the clergy (Cro. Car. 301. 2 Lord Raym. 789.): nor will it lie in ſuch caſes, where the entry of him that hath right is taken away by deſcent, diſcontinuance, twenty years' diſpoſſeſſion, or otherwiſe.

The action of ejectment is, however, rendered a very eaſy and expeditious remedy to landlords, whoſe tenants are in arrears, by ſtatute 4 Geo. II. c. 28, which enacts, that every landlord, who hath by his leaſe a right of re-entry in caſe of non-payment of rent, when half a year's rent is due, and no ſufficient diſtreſs is to be had, may ſerve a declaration in ejectment on his tenant, or fix the ſame upon ſome notorious part of the premiſes, which ſhall be valid, without any formal re-entry or previous demand of rent; and a recovery in ſuch ejectment ſhall be final and concluſive, both in law and equity, unleſs the rent, and all coſts, be paid or tendered within ſix calendar months afterwards. Blackſt. Comm. B. iii. c. 11. For the practice relating to ejectments, ſee Jacob's Dict. by Tomlins, art. *Ejectment*. See alſo Bull. Ni. Pri. and Gilbert's *Ejectments* by Runnington.

EIGHT-FOIL, or *Double Quarter foil*, in *Heraldry*, a modern difference, denoting the ninth ſon of the firſt houſe.

EIGHT, *Piece of*. See PIECE *of Eight*.

EIGHTH *Pair of Nerves*, in *Anatomy*, the ſame with the par vagum. See NERVES.

EIGHTH, in *Muſic*, is, next to the uniſon, the moſt perfect concord, and the boundary of the preſent muſical ſyſtem; it includes 12 ſemitones, which produce 24 keys, 12 major and 12 minor: it contains all the intervals, concords and diſcords; as all beyond the octave are but replicates, or recurrences of the ſame ſounds: the flat 9th being but the octave of the flat 2d, and the major 9th of the major 2d; the 10th of the 3d, &c. It is an eſſential note of the triad or common chord, and is ſo near uniſon in its effects, that when a male and female, or a man and an adoleſcent ſing the ſame melody together, it ſeems, to perſons ignorant of muſic, as if they ſung in the ſame pitch of voice. In inſtrumental muſic, as well as in the accompaniment to vocal, the tenor often plays *Col. Baſſo*; that is, an octave above the baſe; and the 2d violin playing an octave below the firſt, has ſometimes a beautiful effect. See OCTAVE.

EIGNE, from the French *eiſne*, in *Law Books*, is uſed for eldeſt, or firſt-born. Thus we ſay, baſtard eigne, and mulier puiſne, for the elder baſtard, and the younger lawfully born.

EIGNOTZ, in *Modern Hiſtory*, the name of a party which ſprung up in Geneva about the year 1530, denoting a confederacy in defence of liberty, ſo called in oppoſition to another, reproachfully denominated *Mamelukes*, or ſlaves. When the proteſtant opinions began to ſpread among the citizens, A. D. 1532, theſe opinions inſpired ſuch as embraced them with a bold enterprizing ſpirit, which always accompanied, or was naturally produced by them in their firſt operations. As both the duke of Savoy and the biſhop were, from intereſt, from prejudice, and from political conſiderations, violent enemies of the reformation, all the new converts

converts joined with warmth the party of the Eignotz; and zeal for religion, blended with the love of liberty, added ſtrength to that generous paſſion. The rage and animoſity of two factions, ſhut up within the ſame walls, occaſioned frequent inſurrections, which terminated moſtly to the advantage of the friends of liberty; and therefore they daily gained ground.

EIKON BASILIKE, a poſthumous publication bearing this anonymous title, is generally ſuppoſed to have been the compoſition of king Charles I. and to have been written by his own hand. It was entitled *Eikon Baſilike*, that is, *the royal image*, "or portraiture of his ſacred majeſty in his ſolitude and ſufferings," becauſe intended to repreſent the religious diſpoſition of that unfortunate monarch, and depict the unmerited treatment he experienced at the hands of his ſubjects. It was firſt printed in the year 1649, and paſſed through 50 editions in different languages within 12 months. By the friends of royalty it has been conſidered as the king's pious meditations and confeſſions, during the long period of his trying perils, and unavailing ſtruggles againſt the uſurped power of his parliament: and by the eſpouſers of republican principles, as an apology in which he vindicates his own character, endeavours to ſupport the juſtice of his cauſe, and to ſhew the unprecedented and unjuſtifiable conduct of his opponents. The book compriſes twenty-ſeven ſections; the firſt containing the king's thoughts on calling his laſt parliament, and the laſt, meditations on death. This work produced an animated and ſevere reply from a moſt able writer, entitled *Eikonoklaſtes*; for which title the author in his preface gives the following reaſon: "In one thing I muſt commend his openneſs, who gave the title to this book, Εικων Βασιλικη, that is to ſay, the king's image; and by the ſhrine he dreſſes out for him, certainly would have the people come and worſhip him. For which reaſon this anſwer alſo is entitled Εικονοκλαστης, the famous furname of many Greek emperors, who in their zeal to the command of God, after long tradition of idolatry in the church, took courage and brake all ſuperſtitious images to pieces." Whatever ſentiments the reader of the work and its anſwer may entertain, there can exiſt but one opinion, as to which performance ſhould be aſſigned the palm of victory. Indeed, whatever cauſe ſuch a writer as the author of Paradiſe Loſt were induced to defend, leaving the merits of the queſtion totally out of conſideration, he would not fail, by logical ſubtlety and eloquent elucidation, to make it appear incontrovertibly the beſt. After the work made its appearance, the queſtion was ſtrongly agitated, whether the Eikon Baſilike was the production of the deceaſed monarch, and the honour or diſgrace attached to the writing of it was affixed to different perſons among the abettors of the royal cauſe:—Lord Clarendon, author of the "Hiſtory of the Rebellion;" biſhop Burnet, who in his youth accompanied prince Charles in his exile; biſhop Juxon, the king's chaplain, who poſſeſſed his confidence, was his ſecret adviſer, and attended the monarch in his laſt moments, &c. &c.

The grounds and evidences of the ſpuriouſneſs of the book are theſe: 1. That lord Clarendon, in his Hiſtory of the Grand Rebellion, makes no mention of it. 2. Biſhop Burnet ſays, the duke of York, afterwards king James II., told him in the year 1673, that the book called Eikon Baſilike was not of his father's writing, but that Dr. Gauden writ it: that after the reſtoration, the doctor brought the duke of Somerſet to the king and to the duke of York, who both affirmed that they knew it to be his (the doctor's) writing, and that it was carried down by the earl of Southampton, and ſhewed the king during the treaty of Newport, who read and approved it. 3. The earl of Angleſey gave it under his hand, that king Charles II. and the duke of York declared to him, in the year 1675, that they were very ſure the ſaid book was not written by the king their father, but by Dr. Gauden, biſhop of Exeter. 4. Dr. Gauden himſelf, after the reſtoration, pleaded the merit of this performance in a letter to lord chancellor Hyde, who returned for anſwer, that the particular he mentioned (*i. e.* of his being the author of that book,) was communicated to him as a ſecret: I am ſorry, ſays his lordſhip, that it was told me, for when it ceaſes to be a ſecret it will pleaſe nobody but Mr. Milton. 5. Dr. Walker, a clergyman of the church of England, after invoking the great God, the ſearcher of hearts, to witneſs to the truth of what he declares, ſays, in his treatiſe entitled "A True Account of the Author of Eikon Baſilike," I know and believe the book was written by Dr. Gauden, except chap. 16th and 24th by Dr. Duppa. "Dr. Gauden, ſays he, acquainted me with his deſign, and ſhewed me the heads of ſeveral chapters, and ſome of the diſcourſes. Some time after the king's death I aſked him, whether his majeſty had ever ſeen the book? He replied, I know it certainly no more than you; but I uſed my beſt endeavours that he might, for I delivered a copy of it to the marquis of Hertford, when he went to the treaty of the Iſle of Wight." Dr. Gauden delivered the MS. to this Walker, and Walker carried it to the preſs; it was copied by Mr. Gifford, and both the doctor's ſon and his wife affirm, that they believe it was written in the houſe where they lived. Notwithſtanding all this evidence, Mr. archdeacon Eachard ſays, the book is inconteſtably the king's; and biſhop Kennet adds, that thoſe who pretend Eikon Baſilike was a ſham put upon the world, are a ſet of men that delight to judge and execute the royal martyr over again by murdering his name. Dr. Hollingworth, Dugdale, Wagſtaffe, and others, have endeavoured to invalidate the above-mentioned authorities, by ſhewing that Dr. Gauden was not capable of writing ſuch a book; but the evidence already produced is as ſtrong and convincing as any thing of this nature can poſſibly be. Neal's Hiſt. of the Puritans, vol. ii. p. 369, &c. 4to.

When the Eikonoklaſtes was publiſhed the writer was not known, or it would doubtleſs have been mentioned. The author of that treatiſe was in doubt, and ſtill "ſtat nominis umbra." Whoever was the writer, there can no doubt remain as to the ſcope and tendency of the facts produced, and the arguments uſed in the Eikon Baſilike. It appears to have been written, not merely as an apology for the paſt, but a vindication of the then preſent meaſures, and to further the cauſe of royalty. In this view it has been conſidered by the favourers of a republican form of government. To counteract the effects likely to be produced by it on the minds of the public, Milton was aſſigned the taſk of drawing up a confutation. In the light above ſtated he ſaw it; for "it appears manifeſtly the cunning driſt of a factious and defeated party, to make the ſame advantage of his (the king's) book, which they did before of his regal name and authority; and intend it not ſo much the defence of his former actions, as the promoting of their own *future deſigns*; and that by publiſhing, diſperſing, commending, and almoſt adoring it, ſeem to place therein the chief ſtrength and nerves of their cauſe. For how much their intent, who publiſhed theſe over-late apologies, and meditations of the dead king, drives to the ſame end of ſtirring up the people, to bring him that honour, that affection, and, by conſequence, that revenge to his dead corpſe, which he himſelf living could never gain to his perſon; it appears both by the concerted portraiture before his book, drawn out to the full meaſure of a maſking ſcene; and ſet theſe to catch fools and ſilly gazers; and by thoſe Latin words after the end, "Vola dabunt quæ bella negarunt:"

negarunt;" intimating, "that what he could not compaſs by war, he ſhould atchieve by his meditations." See preface to Milton's Eikonoklaſtes, edition by Baron.

EILAMIDES, from ειλεω, *I involve*, a word uſed by Hippocrates, to expreſs the meninges, or membranes of the brain, and dura mater and pia mater.

EILENBURG, in *Geography*, in old times called Ileburck, Ileburg, Ilinburg, Iingenburg, Ilburg, is a very ancient town of the kingdom of Saxony, in the circle of Leipzic, on the high road leading to Breſlau, 15 miles from Leipzic, pleaſantly ſituated in an iſland formed by the river Mulde, over which there is a wooden bridge. Brewing conſtituted its chief induſtry before and ſome time after the thirty years' war, during which it ſuffered ſeverely. It is now chiefly remarkable for its hops, which are reckoned the beſt in Saxony. Eilenburg has about 3500 inhabitants. There is cloſe to the town an ancient caſtle, in which Margaret, the widow of the elector of Saxony, Frederick II. ſurnamed the Mild, reſided 22 years, from 1464 to 1486.

EIMBECK, or Einbeck, anciently *Embike*, a town of Germany, in the principality of Grubenhagen, which conſtituted part of the electorate of Hanover, and now, by Napoleon's decree of the 18th of Auguſt, 1807, forms part of the new kingdom of Weſtphalia, is ſituated on the river Ilme, which, at a ſmall diſtance from the town, falls into the river Leine, 15 miles N. of Goettingen, and 30 S. W. of Hildeſheim. It contains about 5000 inhabitants, and is remarkable for its manufactures of woollen cloth, flannel, ſerge, crape, dimity, and other cotton ſtuffs. Eimbeck is ſurrounded with mountains, part of the Hartz or Hercynian foreſt, which yield ſilver, copper, iron, and lead.

EIMĒO, or Imao, one of the Society Iſlands, in the ſouth Pacific ocean; about four leagues W. from the N.W. part of Otaheite. It has two harbours, *viz.* Taloo and Parowroah; the former is ſituated upon the north ſide of the iſland, in the diſtrict of Oboonohoo or Poonohoo, S. lat. 17° 30′. E. long. 210° 0′. It runs in S. or S. by E. between the hills above two miles. This is not inferior, ſays Capt. Cook, for ſecurity and goodneſs of its bottom, to any harbour belonging to the iſlands in this ocean; and it has this advantage over moſt of them, that a ſhip can ſail in and out with the reigning trade-wind, ſo that the acceſs and receſs are equally eaſy. There are ſeveral rivulets that fall into it. Wood and water are to be procured here with great facility. The harbour of Parowroah, on the ſame ſide of the iſland, is much larger within, than that of Taloo, but the entrance is much narrower, and lies to leeward of the harbour. The inhabitants of this iſland were anxious to trade in bread-fruit, cocoa-nuts, and hogs, which they exchanged for hatchets, nails, and beads. Eimēo ſupplies abundance of fire-wood. There is little difference between the produce of this iſland and that of Otaheite; but there is a ſtriking difference in their women. Thoſe of Eimēo are of low ſtature and dark hue, and their features are generally forbidding. The general appearance of this iſland is very different from that of Otaheite. The latter riſes in one ſteep hilly body, has little low land, except ſome deep vallies, and a flat border that ſurrounds it, towards the ſea. Eimēo, on the contrary, has hills running in every direction, which are ſteep and rugged, incloſing large valleys, and covered almoſt to their tops with trees. Near the harbour where Capt. Cook lay, in October 1777, were two large ſtones, or rather rocks, concerning which the natives have ſome ſuperſtitious notions. They conſider them as "Eatooas" or divinities, ſaying that they are brother and ſiſter, and that they came, by ſome ſupernatural means, from Ulietea. Cook's Third Voyage, vol. ii.

EINABI, a town of Aſiatic Turkey, in the province of Natolia; 36 miles N. of Degnizlu.

EINBLINDER, in *Ichthyology*, the name of a ſort of lamprey, without eyes, called by the writers on theſe ſubjects the *lampetra cæca*, or blind lamprey. See Petromyzon *branchialis*.

EINECIA, in our *Old Writers*, is uſed for primogeniture. It is ſometimes writ *eſnecia* and *eſnecy*. See Esnecy.

EINICH, in *Geography*, a town of Aſiatic Turkey, in the province of Natolia; 44 miles S.W. of Artaki.

EINSIEDLEN, or Einsiedel, a ſmall town of Switzerland, in the canton of Surtz, remarkable for the ancient and rich abbey of the ſame name.

This abbey, which is alſo called "St. Meinrad's Cell in the Dark Foreſt," in Latin Eremus Deiparæ Matris; Eremus Divæ Virginis; Monaſterium Eremitarum; Eremitarium Cœnobium in Helvetiis; in ancient records Monaſterium in Silva, Meginradi Cella; in French, Notre Dame des Hermites; in Italian, La Madonna di Waldo, is ſituated in a thick gloomy foreſt, to which St. Meinrad or Meginrad is ſaid to have retired. In 838, the firſt abbeſs of the Frauenmünſter at Zurich, cauſed a chapel and cell to be built for him, but after the murder of the hermit in 863, they fell to ruin. About the year 906 St. Benno laid the foundation of the abbey, which is the ſecond of the Benedictine order in Switzerland. In 1704 the convent was rebuilt, and is now a large ſplendid edifice. It has an extenſive library, and rooms for the reception of ſtrangers. The church of our Lady was rebuilt in 1719. In a chapel is an image of the Virgin, which particularly uſed to attract a great number of pilgrims, and which has been productive of conſiderable wealth to the abbey. The manors of Erlibach and Mannedorf, in the canton of Zurich, the lordſhips of Sonnenberg, Gachrang, and Freudenfels, in the canton of Thurgau, the pariſh of Oberkirch, and ſeveral villages in Germany, belonged to Einſiedlen.

EINVILLE, a ſmall town of France, in the department of the Meurthe, in the diſtrict of Lunéville, 3 miles N. of that place, remarkable for a palace which king Staniſlaus of Poland built here during his retreat at Nancy.

EINZELLEE, one of the Perſian havens of the Caſpian, which, though it be only a wretched village, is the moſt frequented for the Perſian commerce. Formerly veſſels ventured through the channel into a bay; but this bay being choaked up, they are now obliged to lie at anchor in the road. Einzellee is ſituated on the ſouth-weſtern coaſt, a few miles N. of Reſhd, capital of the province of Ghilan: it conſiſts of Old and New Einzellee; the former inhabited by the Perſians and Armenians, under the juriſdiction of the ſophy; the latter by the Ruſſian merchants, and thoſe Armenians who are ſubject to Ruſſia. A garriſon of 30 ſoldiers is ſtationed under the command of the conſul. It contains a Ruſſian and Armenian church, and about 300 houſes, moſtly formed with mud. The refuſe only of the Perſian and European commodities is expoſed to ſale at Einzellee: the great mart being at *Reſhd*, which ſee.

EION, in *Ancient Geography*, a town of Thrace, near the mouth of the river Strymon; four miles from Amphipolis and its port.

EIRE. See Eyre.

EIRESIONE, Ειρεσιωνη, from ειρος, *wool*, in *Antiquity*, an olive branch, bound about with wool, and crowned with all ſorts of firſt fruits, which was carried in proceſſion in the Athenian feſtival, called *Pyanepſia*. Pott. Archæol. Græc. lib. ii. cap. 20. tom. i. p. 428.

EIRON, in *Geography*, a river of South Wales, in Cardiganſhire,

diganſhire, which, deſcending through a narrow vale between ſteep impending hills, falls into the ſea, a little below a picturesque bridge at Abereiron, in the road from Cardigan to Aberyſtwith.

EISENACH, in Latin *Iſenacum*, a town of Germany, in the duchy of Saxe Weimar, formerly the chief city of the principality of Saxe Eiſenach, which devolved to the dukes of Weimar in 1741, is ſituated in an agreeable fertile valley on the ſmall river Neſſe, 45 miles S. W. of Erfurt, and has an ancient palace, which has been converted into ſtables. Eiſenach contains between 8 and 9000 inhabitants; it has ſeveral manufactures of woollen cloth, ſerge, and woollen and cotton ſtuffs, which are conſiderably benefited by an excellent fuller's earth, that abounds in the neighbourhood. The grammar ſchool, which was founded by the duke John-William in 1707, has a very extenſive and valuable library. The town has been much improved of late, the ſtreets are regular, well paved, and well lighted. The vicinity of Eiſenach is alſo remarkable for hops and madder. At a diſtance of two miles is an ancient caſtle, called the Wartburg, in which Luther was confined in the year 1521; and at nearly the ſame diſtance is the ſummer-palace of Wilhelm's Thal (William's Dale) with a large park, founded in 1729, by the duke John-William.

EISENBACH, a ſmall town of Hungary, near Schemnitz, remarkable for a warm bath, and ſurrounded by limeſtone rocks.

EISENBERG, a ſmall town of Germany, in the duchy of Saxe Gotha, principality of Altenburg, 6 miles from Zeitz, with an ancient ducal palace, and a good grammar ſchool. It contains 3500 inhabitants, and has a briſk timber and deal trade, beſides ſeveral manufactures of chairs, waggons, woollen ſtuffs, and leather.—Alſo, a ſmall town of Germany, with an old ruined caſtle, in the principality of Waldeck.

EISENHARTZ, a town of Germany, in the duchy of Stiria, enriched by iron mines, diſcovered in 702; 10 miles N. of Leoben.

EISENSTADT, a ſmall town of Hungary, three miles to the left of the road from Vienna to Oedinburgh, with a palace, which is the reſidence of prince Eſterhazy, who has large eſtates in its neighbourhood.

EISETERIA, Εισιτηρια, from εισειμι, *I enter*, in *Antiquity*, the day on which the magiſtrates at Athens entered upon their office; upon which it was cuſtomary for them to offer a ſolemn ſacrifice, praying for the preſervation and proſperity of the commonwealth, in the temple of Jupiter Βουλαιος, and Minerva Βουλαια, *i. e.* the Counſellors. Pott. Archæol. Græc. lib. ii. cap. 20. tom. 1. p. 385.

EISFELD, anciently *Aſſfeld*, *Eſefeld*, *Eſſefeld*, or *Pfefeld*, in *Geography*, a ſmall town of Germany, in the duchy of Saxe Cobourg, on the river Werra, 9 miles from Cobourg, with a good grammar ſchool and an old ducal palace, uſually the reſidence of the ducheſs dowager, if any.

EISKOI, a town of Ruſſia, in the government of Caucaſus, ſituated at the mouth of the river Eia, on the eaſt coaſt of the ſea of Azoph; 50 miles S.W. of Azoph.

EISLEBEN, or Eiszleben, in Latin *Iſleba*, an ancient and conſiderable town of the kingdom of Saxony, chief city of the county of Mansfeld, ſituated on a hill near a brook, called the Klippenbach, 15 miles E. of Halle, 20 of Merſeburg, and 30 of Leipzic, containing 993 houſes, and a population of 5000 individuals. It is divided into the Old and New Town. The former, which was known as a flouriſhing city in 1024, has an ancient caſtle, three pariſh churches, and an excellent grammar ſchool, attended by ſeven profeſſors. Brewing was the principal occupation of the inhabitants in former times. They brewed a ſtrong beer called *krappel*, which uſed to be exported to a great part of Germany; they are now chiefly employed in agriculture, and in the making of ſaltpetre and potaſh. There are alſo ſome mines of importance in the neighbourhood. The New Town has only one pariſh church.

But Eiſleben derives its principal celebrity from being the birth-place of Martin Luther. The houſe in which he was born has been rebuilt, after the great conflagration of 1594, and is ſtill viſited by travellers. The furniture of the room in which this eminent reformer firſt ſaw the light, is reported to have been ſaved from the fire, and is ſhewn as a curioſity, to which the ſuperſtition of the vulgar attaches the ſanctity of a relick, and the power of healing certain diſeaſes. Since the year 1772 a part of the houſe has been converted into a charity ſchool, than which nothing could have been more appropriate, to honour the memory of him who reſtored the freedom of conſcience, and enforced the extenſion of a more enlightened inſtruction in the ſacred records of revealed religion to all and every member of the community.

EISTEDDFOD, in *Antiquities*, was an annual ſeſſion of the Britiſh bards. The learned Mr. Owen, in his Sketch of Bardiſm, prefixed to his tranſlation of the Heroic Elegies, by Llywarc Hen, obſerves, that the bards generally held annual aſſemblies, called *Gorſeddau*; at which the traditions of the bardic ſyſtem were rehearſed, and all matters reſpecting their religion and policy tranſacted. But, ſubſequent to the introduction of Chriſtianity, genuine bardiſm declined. A ſchiſm took place in the bardic body, not, as he ſuppoſes, from the two ſyſtems claſhing with each other; but through the introduction of ſuperſtitions from the practice of the Romiſh church. A prince, by the name of Belus, propoſed numerous deviations from the tenets of the original inſtitution, with which moſt of the order complied. Among many of the privileges of which they were deprived on that occaſion, *eligibility to the prieſthood* appears to have been one. But from the tenor of hiſtory, it is moſt probable, that the nonjuring bards were ſuch as were tenacious of their Ethnic opinions; and that the Beirdd-Beli, Over-Veirdd, or Pſeudo-bards, on the other hand, were ſuch as complied with the inſtitutes of Chriſtianity. This ſchiſm took place in the 5th century. After which, the diſſenting party continued to hold gorſeddau, and propagate their tenets, till the death of the laſt Llywelyn; when, by the cruelty of the Engliſh monarch, bardiſm was nearly annihilated. From the time of the ſchiſm, the character of the bardic orders, generally acknowledged as ſuch, was materially changed; and their occupations became widely different. They appear, however, to have been divided into three claſſes, or orders, as poets, miniſtrels, and ſingers; and, in imitation of their ancient aſſemblies, or gorſeddau, they held annual meetings, which, from the ſpirit of party, they termed Eiſteddfodau. The learned author of the Welſh Dictionary, however, conſiders them as a ſpurious race, and although they were an incorporated ſociety, governed by peculiar laws, yet they were not bards. The eiſteddfod, or congreſs, was held under the ſanction of the Welſh princes; and as North Wales was the laſt part of the country which preſerved its independency, and with that its peculiar laws; the moſt authentic veſtiges are there to be traced of the ancient uſages of Cambria. At this meeting the princes and chieftains, as well as bards, attended. It was uſually held at one of the royal reſidences, Aberfraw, Mathraval, or Caerwys; which circumſtance has induced ſome to ſuppoſe it a triennial, rather than an annual meeting. For the calling of theſe aſſemblies, a ſpecial commiſſion was iſſued by the Welſh princes, while they continued maſters of the country, and afterwards by royal authority under the Engliſh monarchs,

narchs. At these British olympics were collected in a focus the scattered rays of musical and poetic genius. British bards pour d forth their most animated strains, and minstrels tuned their fascinating harps to melody. This was considered not only as an opportunity of displaying skill, but as a college of harmony, where genius was registered, and merit rewarded with honours and emoluments. Candidates for bardic professions were admitted, others were assigned precedence, and the bard most distinguished for his talents on the occasion was solemnly chaired, and had awarded to him, as the highest mark of respect, the badge of merit, the *silver harp*. Without an examination at this public meeting, and receiving a diploma in consequence of being approved, none was qualified to exercise the profession, either of bard, or minstrel. The last eisteddfod convened by royal authority was held in the reign of Elizabeth. The commission for the purpose was granted to sir Richard Bulkley, and other persons of distinction, October 20th, in the year 1567. In pursuance of that, an eisteddfod was held at the town of Caerwys, in Flintshire, the requisite notice having been previously given to the principality. The assembly was numerous, and many persons of eminent genius displayed extraordinary talents, both in music and poetry. Fifty-five bardic degrees were conferred; seventeen in vocal, and thirty-eight in instrumental music. From that period, the eisteddfod was discontinued, bards and minstrels sunk into insignificance; and bardism may now be said to have expired. The cruelty of Edward was the preparatory step to the downfal of the institution, and the subjecting of the Welsh to the jurisprudence of England, in the reign of Henry VIII, has been operating to accomplish it. A public spirited society in London, associated under the name of the Gwyneddigion, determined to revive a practice calculated to elicit genius; and, by rivalship, to produce poetical and musical excellence. The ancient notice of a year and a day was given previous to the meeting, and the enthusiasm of the country was increased by the aid of locality. Caerwys was appointed as the place of meeting, and the old town-hall was fitted up on the occasion, for the reception of the company. It was numerously and respectably attended, and many excellent performers on the harp, as well as poetical composers, and others of great vocal powers, displayed abilities; which evinced, that however the genius of harmony had been neglected, or the bardic spirit suppressed, it was not extinguished among the inhabitants of North Wales. The number of bards in attendance was twenty, of minstrels twelve, and of dateeiniaid, or singers, eighteen. Having elected a proper person to fill the *cader*, or chair, the first day was occupied in hearing the poetical compositions recited; and on the second, the vocal and instrumental candidates displayed their respective abilities. The distinguishing honours of bardd braint, or principal bard; pencerdd dant, or chief performer on the harp; and pencerdd dasod, or chief of vocal powers,

"Who gave to song resistless powers to charm,"

were then conferred: and the meeting, which had been highly gratifying to the lovers of genuine music and poetry, then adjourned, *sine die*. Evans's Tour in North Wales.

EITHON, or Ython, in *Geography*, a river of Scotland, which runs into the German sea; 26 miles N. of Aberdeen.

EITIAT, a town of Africa, in the empire of Morocco, and province of Tedla, defended with walls, and containing about 3000 inhabitants.

EKA, a town of Sweden, in the province of Smoland; 11 miles N. of Wexio.

EKANGA, a river of Russia, which runs into the Frozen sea; 140 miles E. of Kola.

EKARMA, one of the smaller Kurile islands, in the North Pacific ocean. N. lat. 49° 32'. E. long. 154° 29'.

EKASTROV, a town of Russia, in the government of Archangel; 80 miles S. of Kola.

EKATERINGBURG. See Catharinenburg.

EKATERINOGRAD, a town of Russia, in the government of Caucasus, on the Malva; 260 miles S.E. of Azoph. N lat 44° 15'. E. long. 43° 38'.

EKATERINOSLAV. See Catharinenslaf.

EKATERINOSLAVSKOI, a province of Russia, in the government of Ekaterinoslav, comprehending what was formerly called Budziac Tartary, and the Ukraine, now part of the government of Ekaterinoslav. See Catharinenslaf.

EKATERINSKAIA, a bay of the North sea, in Russian Lapland, near Kola. N. lat. 68° 50'. E. long. 32° 24'.

EKEBERGIA, in *Botany*, named by Sparrman after sir Charles Gustavus Ekeberg, knight of the order of Wasa, captain of a Swedish Indiaman, who took him to China for the purpose of making inquiries in natural history, and who first brought the tea plant alive to Europe. (See Amœn. Acad. v. 7. 498.) Sparmann finding this tree, of a new genus, during their visit to the Cape of Good Hope, justly dedicated it to his friend and patron, and has described it, with a figure, in the Stockholm Transactions for 1779, 282. t. 9. Thunb. Nov. Gen. 43. Murray in Linn. Syst. Veg. ed. 14. 399. Schreb. 284. Willd. Sp. Pl. v. 2. 549. Juss. 265. Mart. Mill. Dict. v. 2. Class and order, *Decandria Monogynia*. Nat. Ord. *Trikilatæ*, Linn. *Meliæ*, Juss.

Gen. Ch. *Cal.* Perianth of one leaf, bell-shaped, downy, in four or five deep, ovate, obtuse segments. *Cor.* Petals four or five, oblong, obtuse, rather larger than the segments of the calyx, being about a line long, externally downy. Nectary a ring encompassing the base of the germen. *Stam.* Filaments ten, inserted into the nectary, broad and short, downy, somewhat cohering together; anthers erect, oblong, acute, much longer than the filaments. *Pist.* Germen superior, round; style cylindrical, very short; stigma large, capitate, umbilicated. *Peric.* Berry globose, mealy. *Seeds* from two to five, oblong, angular.

Ess. Ch. Calyx in four or five segments. Petals four or five. Nectary a ring round the germen, bearing the stamens. Berry superior, with from two to five seeds.

Obs. Jussieu doubts, with great reason, that the corolla can really be of four petals, while the stamens are ten, and accordingly we find on dissection that the flowers are, sometimes at least, five-cleft, the stamens being twice as numerous as the petals. From the hairiness and minuteness of the parts, it is difficult to ascertain precisely the mode of connection between the filaments and the nectary, or to define the limits of each, but analogy seems to have rightly guided Jussieu to improve the descriptions of Thunberg and Sparrman.

E. *capensis*, the only known species, is reported by Thunberg to grow in the woods of Hauteniquas and Essenboch at the Cape. The Dutch colonists call it Essen or Esschenboom, and Hauteniquas Essen, from its resemblance to the European ash. It forms a tall tree, with greyish bark, and a hard wood used for many utensils. *Branches* alternate, knotty, rugged, scarred, downy when young. *Leaves* clustered about the tops of each branch, alternate, much resembling those of the ash in general appearance, being pinnate and smooth, but the leaflets are entire. The panicles of whitish small *flowers* come forth in November and the

following months, and are axillary, much ſhorter than the leaves. Sparrman deſcribes the fruit as about half an inch in diameter, mealy and rather bitter, with five ſeeds reſembling thoſe of an orange. Thunberg obſerves that they vary from two to five, probably from partial abortion, and not from any original diverſity of number in the germs.

EKENAS, in *Geography*, a ſea-port town of Sweden, in the province of Nyland, on the north coaſt of the gulf of Finland, with an indifferent harbour; 50 miles S.E. of Abo.

EKERDEN, a town of Aſiatic Turkey, in the province of Natolia; 16 miles E. of Iſbarteh.

EKESIO, a town of Sweden, in the province of Smoland; 60 miles N.W. of Calmar.

EKHONT, Gerbrant Vanden, or rather Eckhont, in *Biography*, a painter born at Amſterdam in 1621. He is better known by the excellence of the manner in which he imitated the peculiarities of his maſter Rembrandt, than for original genius in thought, or execution. He is eſteemed as one of the moſt perfect diſciples of that great man; but he never obtained that juſt perception of truth and taſteful arrangement of the materials compoſing his pictures, which was Rembrandt's grand characteriſtic; although many of his pictures are highly eſteemed for their force and colour. He painted portraits principally; but oftentimes he attempted hiſtorical compoſitions, in which he was not ſo ſucceſsful. He died in 1674, aged 53.

Eckhont, Anthony Vanden, a fruit and flower painter, born at Bruſſels in 1656. His works are much eſteemed for the peculiarities of their compoſition, more than for the truth of their execution. He travelled to Liſbon, where he was married to a young lady of quality and great fortune: this ſucceſs and affluence excited the envy of ſome abandoned ruffians, who ſhot him in his carriage, in 1695, and remained undiſcovered.

EKIE, in *Geography*, a town of Aſia, in Tibet; 55 miles S. of Toſſon-Hotun.

EKKI-TEKKI, a town of Africa, in the country of Commendo.

EKRAD, a town of Egypt; 10 miles S.E. of Monfalout.

EKRON, in *Ancient Geography*. See Accaron.

EKSAS, in *Geography*, a town of Egypt; 21 miles S. of Cairo.

EKSENIDE, a town of Aſiatic Turkey, in Natolia; 84 miles S. of Degnizlu. N. lat. 36° 27′. E. long. 28° 59′.

ELABORATION, the act of finiſhing or perfecting any thing with labour and time.

The term is chiefly uſed in *Medicine*, where the chyle, blood, and ſemen, are ſaid to be *well elaborated*, when they are well conditioned, have undergone all the ſecretions, mixtions, impregnations, and circulations, neceſſary to bring them to perfection.

If the chyle went directly from its receptaculum to the breaſts, it would not be ſufficiently elaborated to afford good milk. See Milk.

ELABORATORY. See Laboratory.

ELABUGA, in *Geography*, a town of Ruſſia, in the government of Viatka, on the Bielaia; 156 miles S. of Viatka.

ELACATÆUM, in *Ancient Geography*, a mountain of Greece in Theſſaly.

EL-ADDA, in *Zoology*. See *El* Adda.

ELÆA, in *Ancient Geography*, a maritime town of Aſia Minor, in the Eolide, at the mouth of the river Caicus, oppoſite to the S.E. part of the iſle of Leſbos.—Alſo, a town of Phœnicia, between Tyre and Sidon.—Alſo, a promontory in the eaſtern part of the iſle of Cyprus, S.E. of Serapis. Ptolemy.—Alſo, an iſland of the Propontis, ſo called on account of its olives. Pliny.—Alſo, a mountain of Paleſtine, ſix ſtadia E. of Jeruſalem. Joſephus.—Alſo, a town and ſea-port of Aſia Minor, in Bithynia, near Myſia. Steph. Byz.—Alſo, a port of Ethiopia. Id.

ELÆAGNUS, in *Botany*, ἐλαιάγνος of Theophraſtus, from ἐλαία, *the olive*, and ἁγνός, *the chaſte tree*. Linn. Gen. 62. Schreb. 85. Willd. Sp. Pl. v. 1. 688 Mart. Mill. Dict. v. 2. Juſſ. 75. Tourn. t. 489. Claſs and order, *Tetrandria Monogynia*. Nat. Ord. *Calycifloræ*, Linn. *Elæagni*, Juſſ.

Gen. Ch. *Cal.* Perianth of one leaf, four-cleft ſuperior, erect, bell-ſhaped, rough on the outſide, coloured within, deciduous. *Cor.* Petals none. Nectary in the bottom of the flower, globoſe, four-cleft at its ſummit, ſurrounding the baſe of the ſtyle. *Stam.* Filaments four, very ſhort, inſerted below, and alternate with, the ſegments of the calyx; anthers oblong, incumbent. *Piſt.* Germen inferior, oblong; ſtyle ſimple, rather ſhorter than the calyx; ſtigma ſimple. *Peric.* Drupa ovate, obtuſe, ſmooth, with a minute point at the top. *Seed.* Nut ſolitary, oblong, obtuſe, of one cell. Some flowers, according to Adanſon, are male.

Eſſ. Ch. Corolla none. Calyx four-cleft, bell-ſhaped, coloured. Drupa inferior.

A genus of ſhrubs, elegant for their white ſcaly ſilvery pubeſcence, which is moſt copious on the under ſide of the leaves, the upper being nearly ſmooth and naked. Flowers axillary, ſolitary, or cluſtered, ſmall, externally ſcaly, yellow or greeniſh within, the calyx partaking of the nature of a corolla. The fruit is uſually reddiſh, pulpy, but uſeleſs. Willdenow enumerates ten ſpecies, ſix of which are natives of Japan.

E. *anguſtifolia*, Linn. Sp. Pl. 176. Sm. Prod. Fl. Græc. v. 1. 105. Pallaſ. Roſſ. v. 1. 10. t. 4. Duhamel Arb. v. 1. 213. t. 89. (ἐλαία αἰθιοπικὴ Diſſc. book 1. chap. 137.) "Leaves lanceolate." Native of the eaſtern and ſouthern parts of Europe; it is very hardy in our gardens, but ſeldom bears fruit. The flowers have a ſtrong ſcent, eſpecially at night, and are yellow. Tournefort and Pallas deſcribe the fruit as ſweetiſh. The ancients thought this tree barren of fruit. The leaves they celebrate as aſtringent. Its natural ſoil, according to Pallas, is moiſt and ſandy.

E. *orientalis* and *ſpinoſa* are very nearly akin to the above; the thorns appear to be a variable character of the latter ſpecies, as in *Amygdalus*, *Pyrus*, &c.—E. *latifolia*, "leaves ovate," is a native of Ceylon, of which we know little, and ſtill leſs of the ſix Japaneſe ſpecies deſcribed by Thunberg and partly by Kæmpfer.

ELÆAS, in *Ancient Geography*, a port of Greece, in Epirus.

ELÆGNON. See Agnus *Caſtus*.

ELÆIS, in *Botany*, ſo named by Jacquin from ἐλαία, the *olive*, in alluſion to its oily fruit. Jacq. Amer. 288. t. 172. Linn. Mant. 21. Schreb. 776. Juſſ. 38. Gærtn. t. 6. Mart. Mill Dict. v. 2. Claſs and order, *Dioecia Hexandria*, Thunb. and Gærtner. (*Monoecia*, Jacq.) Nat. Ord. *Palmæ*.

Gen. Ch. Male, *Cal.* Perianth of ſix concave upright leaves. *Cor.* of one petal, the length of the calyx, with ſix acute upright ſegments. *Stam.* Filaments ſix, awl-ſhaped, the length of the corolla; anthers oblong, acute.

Female, *Cal.* as in the male. *Cor.* of ſix petals. *Piſt.* Germen ſuperior, ovate, of three cells; ſtyle thickiſh, triangular; ſtigmas three, obovate, depreſſed, reflexed. *Peric.* Drupa ovate, ſomewhat angular, internally fibrous and oily, of one cell. *Seed.* Nut ſolitary, ovate, obſcurely triangular, thick and hard, of one cell, without any valves, with three pores at the baſe. Embryo at the baſe of the ſeed.

Eſſ. Ch. Male, Calyx of ſix leaves. Corolla ſix-cleft.

Female,

Female, Calyx of six leaves. Corolla of six petals. Stigmas three, dilated. Drupa fibrous. Nut solitary, stony.

Gærtner has improved Jacquin's description of the fruit, but we apprehend the latter to be most correct as to the female flower.

E. *guineensis*, Linn. Mant. 137. Gærtn. v. 1. 17. (Palma foliorum pediculis spinosis, fructu pruniformi luteo oleoso; Sloane Jam. v. 2. 113. t. 214.) The Oily Palm. Native of Guinea, from whence it is said to have been carried to America. Jacquin found it cultivated, though rarely, in the gardens of Martinico. The tree he described and figured was 30 feet high, and, as he conceived, 10 years old. *Trunk* erect, beset with the remains of old leaf-stalks, and crowned by a tuft of long, pinnated, *leaves*, unarmed, but having hooked spines on the edges of their stalks; leaflets sword-shaped, a foot and half long, entire. *Spadixes* axillary, solitary, large, repeatedly compound, and very dense; their stalks imbricated, compressed, covered, (except their naked triangular points,) with *flowers*, which in the evening especially exhale a strong anise-like smell. *Fruit* about the size of a pidgeon's egg, yellowish variegated with black and red, its pulp abounding with oil, which exudes on the slightest pressure between the fingers. *Nut* very black, marked with whitish, longitudinal, interrupted streaks.

Gærtner describes and figures the fruit of an *E. melanococca* which he esteems a mere variety of the above. It is smaller, more oblong, and internally blacker, but no clear specific mark of distinction appears.

ELÆOCARPUS, compounded of ἐλαία, the *olive*, and καρπὸς, *fruit*, the drupa bearing some resemblance to an olive. Burm. Zeyl. 93. t. 40. Linn. Gen. 268. Schreb. 356. Willd. Sp. Pl. v. 2. 1169. Mart. Mill. Dict. v. 2. Juss. 258. Gærtn. t. 43. (Dicera; Forst. Gen. 40.) Class and order, *Polyandria Monogynia*. Nat. Ord. Akin to *Guttiferæ*, Juss.

Gen. Ch. *Cal.* Perianth of one leaf, inferior, permanent, divided to the base into five linear-lanceolate, concave, acute segments. *Cor.* Petals commonly five, with claws, three-cleft, and usually deeply laciniated, equal, scarcely longer than the calyx, inserted at the base of the nectary; their ultimate segments often capillary. Nectary an orbicular, depressed, fleshy, lobed, villous gland, in the centre of the calyx. *Stam.* Filaments from 20 to 30, capillary, short and slender, erect, inserted into the nectary; anthers shorter than the corolla, erect, linear, rough, taper-pointed, of two cells, opening by two common reflexed valves, usually more or less unequal in length. *Pist.* Germen somewhat globose, hairy, seated on the nectary; style thread-shaped, longer than the stamens; stigma acute. *Peric.* Drupa oblong or globose, smooth and polished. *Seed.* Nut oblong or roundish, furrowed and tuberculated, with an imperfectly three-valved shell, and one cell: kernel bluntly triangular.

Obs. The number of segments of the calyx, as well as the petals, and the segments of the latter, vary from three to five. The number of stamens also is from 8 to about 30, some say 40.

Ess. Ch. Petals three to five, torn. Anthers with two valves at the summit. Calyx in three to five deep segments. Drupa superior, with a furrowed crisped nut.

The species of this genus are so ill defined by authors, that although we are not furnished with sufficient materials to elucidate them all as we could wish, we will not withhold such information as we have. In arranging the known species we find new specific characters requisite, in order to explain the new ones.

1. E. *serrata*. Linn. Sp. Pl. 734. Fl. Zeyl. 92. Burm. Zeyl. 93. t. 40.—Leaves elliptical, obtuse, bluntly serrated, smooth; divarications of their veins glandular, anthers with nearly equal valves, bearded. Native of Ceylon, where it is called Weralu. We have a specimen from thence whose *leaves* are two or three inches long, with veins glandular only at their base. *Petals* three-cleft, and beautifully laciniated. *Calyx* in five downy segments. The *fruit* is said to be oval. Another, either from the same island or some other part of the East Indies, sent by Koenig to David Van Royen, has *leaves* but half as long as the former, with veins much subdivided, and glandular at most of their subdivisions, as well as at the base. The *petals* are fallen, but all the other parts agree. Both these plants have a pair of glands at the base of the leaves, as described in *Fl. Zeyl.* or rather at the summit of their footstalks, and both have long simple axillary clusters of flowers. We cannot refer any synonym of Rumphius or Rheede with satisfaction to either, nor dare we assert, that the two specimens are distinct species.

2. E. *oblonga*. Gærtn. v. 1. 202. t. 43. (Ganitrum oblongum, Catuiampa; Rumph. Amb. v. 3. 163. t. 102.)—Leaves elliptic-oblong, pointed, with shallow serratures; veins downy underneath. Anthers with nearly equal valves, scarcely bearded. Fruit oval. Sent by Dr. Buchanan from the East Indies, by the name of *E. serrata*. It is nevertheless manifestly distinct from the genuine Weralu above described. The *leaves* are five or six inches, or more, in length, sharp-pointed, with numerous shallow, though acute, serratures; smooth above, but the veins, which are numerous and strong, destitute of glands, are downy and rusty at the under side, which gives that softness to the touch mentioned by Rumphius. As to the size, they accord with his description, and it must always be remembered that his figures are diminished. The *footstalks*, which are bi-glandular at their summit, are likewise downy, as well as the flower-stalks. The latter grow from above the scars left by the last-year's leaves, not as in *E. serrata* (the genuine Ceylon plant at least) from the bosoms of the foliage of the present season. Each *cluster* is five or six inches long, simple, much resembling those of *Prunus lusitanica*, or Portugal Laurel. *Calyx* in five downy segments, shorter and rather blunter than in the first species. *Petals* five, each in five moderately deep and equal divisions, cut into various capillary points. *Stamens* 20 or more; anthers with nearly equal valves, only very slightly and occasionally bearded at their points. *Germen* oblong, furrowed, bristly; style hairy; stigma naked. The *nectary* seems to swell into five hairy globose glands. *Fruit* oblong, according to Rumphius and Gærtner. Their synonyms depend on each other, and we have no doubt of their belonging to our plant.

3. E. *elliptica*.—Leaves elliptical, entire, smooth on both sides; veins destitute of glands. Anthers slightly bearded. This is the specimen described by Linnæus Mant. 2. 401, which Willdenow copies. It is a very miserable specimen, apparently from the East Indies, and if the *flowers* have, as he says, but three petals and eight stamens, which we cannot correctly verify, they confirm that specific difference from both the foregoing, which the *leaves* sufficiently evince. The latter are about three inches long, smooth all over, as well as their footstalks, which have no glands at their summit, neither are the veins glandular. *Flowers* small. *Calyx* acute. *Germen* globose, silky, with five large swellings of the nectary under it; style silky near the base only, and longer in proportion than the last, though the flowers are not above half so large.

4. E. *integrifolia*. Lamarck Encycl. v. 2. 604. Willd. Sp. Pl. v. 2. 1170, excluding the synonym.—Leaves obovate, obtuse, entire, smooth; divarications of their veins glandular. Petals silky on both sides. Anthers with equal valves.

valves. Gathered by Commerfon in the ifland of Mauritius, and given by Thouin to the younger Linnæus, among the duplicates of his whole herbarium. The *leaves* are about $2\frac{1}{2}$ inches long, obovate, obtufe at each end, either quite entire, or very rarely and flightly ferrated here and there, fmooth on both fides, fhining above, paler beneath, cluftered about the points of the branches. At the origin and fubdivifions of each vein is a glandular tubercle, open at the top on the under fide of the leaf, and projecting much more on the upper, where each forms a globofe red fwelling. *Footftalks* thick and ftort, fmooth, without glands. *Clufters* axillary, ftout, rather longer than the leaves, with finely downy ftalks. *Flowers* fewer than in *E. oblonga*, and twice as large. *Calyx* four-cleft, broad and bluntifh. *Petals* four, filky on both fides, not very deeply three-cleft, obtufely jagged. *Anthers* with equal beardlefs valves. *Nectary* very large and wrinkled. *Germen* roundifh, hairy, like the lower half of the ftyle. *Fruit* unknown. Lamarck quotes with a doubt, and Willdenow abfolutely, the fynonym of Rumphius, which we refer, without any fcruple, to our *E. oblonga*, and which has no affinity to the fpecies before us.

5. E. *grandiflora*.—Leaves elliptic-lanceolate, undulated, obtufe, without glands. Petals filky. One valve of the anthers elongated, awl fhaped. Communicated to the writer of this article by the late fir G. L. Staunton, bart. who collected it in his voyage to China, but in what country is not mentioned. This is the finefl fpecies we have feen of its genus, the *flowers* being twice as large as thofe laft defcribed, and diftinguifhed from all the foregoing by the long taper points of the anthers, formed by the elongation of one of their valves. The *calyx* has five linear acute downy fegments. *Petals* five, filky on both fides, except the jagged part. The *clufters* confift but of few flowers, with fmooth flender ftalks, and grow among the long, crowded, fmooth, crenate or undulated *leaves*, about the extremities of the branches.

6. E. *reticulata*. Leaves lanceolate, ferrated, reticulated with interbranching veins, which are glandular at their origin. Petals laciniated, fmooth. One valve of the anthers taper-pointed. Gathered near Port Jackfon, New South Wales, by Dr. White. *Leaves* about three inches long, on fmooth fomewhat glandular foot-ftalks, lanceolate, pointed, ftrongly ferrated throughout, fmooth, fhining above, reticulated on both fides with innumerable veins, which have ufually a fmall gland, or pore, at their origin on the back of the leaf. *Clufters* axillary, fhorter than the leaves, of eight or ten white flowers, not half fo large as the laft, with fmooth ftalks. *Calyx* in five or fix fmooth, linear-lanceolate fegments. *Petals* fmooth, three-cleft, fcarcely half-way down, finely jagged. One valve of each *anther* terminates in a flender point, at length recurved, but much fhorter than in E. *grandiflora*. *Germen* ovate, fhort, quite fmooth, as well as the furrowed annular *nectary* beneath it, and the whole *ftyle*. *Fruit* globofe, larger than a pea, blue. *Nut* curiouffy tuberculated and wrinkled. This fpecies would prove a great acquifition to our greenhoufes and confervatories, and poffibly may be in fome collections already; but we have not heard of its flowering, till which it would hardly be juftly appreciated, and might be miftaken for an *Olea*, or fome unoftentatious fhrub of the clafs *Pentandria*.

7. E. *dentata*, Willd. Sp. Pl. v. 2. 1169. (E. ferratus; Linn. Suppl. 269, but not, as Willdenow rightly remarks, Syft. Veg. ed. 13. 410. It may poffibly be what Murray meant as E. monogynus, Syft. Veg. ed. 14. 494. Dicera dentata; Forft. Gen. 40. t. 40. Prod. 41.) Leaves obovato-lanceolate, obfcurely toothed; veins glandular and pouched at their origin. Petals fimply three-lobed-anthers with taper-pointed valves. Gathered by Forfter in New Zealand. From his fpecimen given to the younger Linnæus, though a poor one, it is eafy to perceive its clofe affinity to our E. *reticulata*, with which it agrees altogether in habit, but differs in the following particulars. The *leaves* are inclining to obovate, finely filky beneath, though not perceptibly fo till examined with a high magnifier, crenate, or flightly dentate; the bafe of their lateral veins not merely glandular, but forming a deep triangular pouch, very prominent on the upper fide. We are aware, however, that this part may, in the different fpecies, vary, according to the age of the leaf, or other circumftances, though it appears, in fome fhape or other, to be almoft univerfal in the genus before us. *Clufters* much like thofe of the laft, but the *flowers* are effentially different, having *petals* only fimply three-lobed; the central lobe broader, and longer than the other two, and all of them entire and undivided, not jagged, or torn, as in all the foregoing fpecies. The *anthers* appear to us to have one of their valves awned, as in the laft; but Forfter defcribes them, from this very plant, as having two equal capillary points, or horns. A ftill greater contrariety occurs in his account of the *fruit*, which we have never feen. He defcribes and figures it as a "capfule of two cells, containing numerous feeds." This, if true, would make the plant a moft diftinct genus from *Elæocarpus*, and the petals would ftrengthen its character. But the authority of fir J. Banks and Dr. Solander, marked by Linnæus the younger in his own copy of Forfter's work, declares it an *Elæocarpus*, and therefore Forfter muft have fallen into an unaccountable error. The fame authority makes a new genus of the following fpecies; but, as Forfter and all his followers have called it a *Dicera*, or *Elæocarpus*, we fhall defcribe it under this laft name, in hopes that Mr. Brown, or fome fuch original obferver, will difpofe of it better.

8. E. *Dicera*. Linn. Fil. Suppl. 266. Murray Syft. Veg. ed. 14. 494. Willd. Sp. Pl. v. 2. 1170. (Dicera ferrata; Forft. Gen. 40. Prod. 41.) Leaves oppofite, ovate inclining to heart-fhaped, unequally ferrated. Clufters compound. Petals fimply three-lobed. Styles four. Native of New Zealand. The *leaves* are oppofite, (not alternate, as in all the foregoing), on flender flightly hairy ftalks, ovate, broad, pointed, unequally and fharply ferrated, thin and pliant, apparently deciduous, fmooth on both fides except the rib and veins. Small glandular pores are plentifully fcattered over the under fide, generally adjoining to the veins, but feldom at their divarications. Thefe foon become perforations with a white membranous border. *Clufters* two, from the bafe of the prefent year's fhoot, oppofite, much fhorter than the leaves, compound, but of few flowers, with flightly hairy ftalks, and oblong *bracteas* in the lower part. *Flowers* fmall, greenifh. *Petals* fmooth, and, as far as we can difcern, divided into three obtufe entire lobes. *Anthers* hairy; we cannot perceive any horns, or terminal briftles. *Styles* four, fmooth, recurved, with obtufe ftigmas. *Fruit*, according to Forfter, a berry with four cells, and two feeds in each cell. The ftudy of botany would be truly fatisfactory, and extremely eafy, were every genus as eafily defined as this plant is diftinguifhable from *Elæocarpus*, and even from that fpecies with which Forfter affociated it. We beg leave to remark, that it muft not, when eftablifhed as a genus, be called *Dicera*, with the characters of which, and the name thence derived, it has nothing in common, merely agreeing in its three-lobed petals only with Forfter's real *Dicera*, which is, according to all appearance, an *Elæocarpus*. Even the fpecific name, therefore, which we have been forced to retain, for the prefent, is falfe; nor could

could we adopt that of Forster, *ferrata*, as belonging to the first *Elæocarpus*, however excellent, for this plant, when established as a separate genus.

We have purposely omitted E. *integerrima* of Lourciro, being uncertain of its genus and species. Still less reason do we find to follow Retzius and Vahl in reducing *Vateria indica* of Linnæus, a plant, indeed, we have never seen, to this genus. S.

ELÆOCOCCA, from ἐλαία, *an olive*, and κόκκος, *a berry*, a name given by Commerson to a tree called in French *arbre d'huile*, or oily tree. This, Jussieu tells us, is a species of *Dryandra*, possibly the very same plant as D. *cordata*; which see.

ELÆODENDRUM, from ἐλαία, *an olive*, and δένδρον, *a tree*. Jacq. jun. in Nov. Act. Helvet. v. 1. 36. Jacq. Ic. Rar. v. 1. t. 48. Murray Syst. Veg. ed 14. 241. Schreb 152. Willd. Sp. Pl. v. 1. 1148. Mart. Mill. Dict. v. 2. Ait. Hort. Kew. v. 1. 278. Gærtn. t. 57? (Rubentia; Juss. 378, and 452.) Class and order, *Pentandria Monogynia*. Nat. Ord. *Rhamni*, Juss.

Gen. Ch. *Cal.* Perianth inferior, of five small, deep, roundish, obtuse, concave, widely spreading, permanent, segments. *Cor.* Petals five, roundish, obtuse, concave, widely spreading, twice as long as the calyx. Nectary a gland beneath the germen. *Stam.* Filaments five, awl-shaped, recurved, inserted under the nectary; anthers roundish, erect. *Pist.* Germen roundish, pointed, standing on the nectary; style conical, short; stigma obtuse, cloven. *Peric.* Drupa ovate, obtuse. *Seed.* Nut ovate, of two cells, with a very hard thick shell, and two oblong compressed kernels.

Ess. Ch. Calyx in five deep segments. Petals five. Drupa superior, ovate. Nut of two cells.

1. E. *orientale*. Jacq. as above. "Without thorns. Leaves lanceolate, acute." A shrub, native of the isles of Mauritius and Bourbon, where it is called Bois d'Olive, or Bois Rouge. The *branches* are spreading, and, at length, pendulous. *Leaves* lanceolate; those of the lower branches entire, longest, and narrowest, elegantly marked with a red nerve; the upper ones broader, crenate, with a pale nerve. In the bosoms of these last stand small stalked clusters of greenish sweet-smelling *flowers*. *Fruit* a reddish drupa, usually perfecting but one seed, from which an oil is expressed.

2. E. *Argan*. Retz. Obs. Fasc. 6. 26. Willd. Sp. Pl. v. 1. 1148. (Rhamnus pentaphyllus; Jacq. Obs. v. 2. 17. Murray Syst. Veg. ed. 14. 233. R. ficulus; Linn. Syst. Nat. v. 3. 229. R. ficulus pentaphylius; Bocc. Sic. 43. t. 21. Raii Hist. 1626.) "Branches spinous. Leaves obovate, obtuse." Native of Sicily and Morocco, in which last country it is called Argan, and the expressed oil of the seed is used for food and other purposes. It forms a thorny bush. The *leaves* grow usually about five together, on long stalks. *Flowers* in dense clusters. Linnæus describes five barren filaments between the stamens. *Fruit* ovate, generally perfecting but one seed.

ELÆOMELI, in the writings of the ancient *Physicians*, the name of a substance, thus described by Dioscorides. In Palmyra, a country of Syria, the elæomeli, which is an oil thicker than honey, and of a sweet taste, flows from the trunk of a tree. Two cyathi of this oil, he adds, drank with a hemina of water, evacuate crude and bilious humours by stool. There was much good obtained from the giving of this medicine; but it had this remarkable effect, that those who took it were seized with a torpor, and privation of strength for a time: this was, however, of no ill consequence, but people knew of and expected it, and used always to keep those persons awake who had taken it, and the symptoms soon went off. The same author also adds, that the oil was sometimes prepared from the buds of the tree; and such of this kind was esteemed the best that was old, thick, fatty, and not foul, or turbid. It was judged of a heating nature, and frequently applied externally to the eyes, with good effect in the cure of dimness of sight, and contributed to the cure of leprosies, and palsus of the nerves. Hermolaus Barbarus has a strange conjecture in regard to the substance, which is, that it was the same with the manna mentioned in Scripture, only used in medicine instead of food: but the account which Dioscorides gives of the effects of it is a very sufficient answer to the absurdity of such an opinion. Dioscorides, lib i. cap. 37.

ELÆON, in *Ancient Geography*, a mountain of Palestine, one stadium from Jerusalem. See *Mount* of Olives.—Also, a maritime town of Greece, on the coast of Bœotia.

ELÆOSACCHARUM, in *Pharmacy*, is the term given to a powder composed of sugar rubbed with a little essential oil, or other aromatic matter, so as to give it the fragrant smell and aromatic taste when dissolved in any watery liquid, in which the sugar promotes the solution of the essential oil.

As an example, the *elæosaccharum anisi* is composed of an ounce of white sugar candy, or, in the room of it, of the finest and driest loaf sugar, rubbed into fine powder, with 20 drops of oil of aniseed. About a dram of this, dissolved in barley-water, or any other watery liquid, may be taken for a dose, and it is a convenient and elegant way of exhibiting this essential oil.

The *elæosaccharum citri corticis*, or sugar imbued with the oil of lemon-peel, is commonly in use in confectionary, and is prepared by rubbing a lump of hard loaf sugar upon the rind of a whole lemon, by which the cells in which the flavoury essential oil is contained are broken down, and the sugar absorbs it. In this way a very perfect extemporaneous lemonade may be made by the elæosaccharum of lemon peel, and the concrete acid of lemons mixed with water, when wanted, and the dry materials will keep unimpaired for any length of time.

ELÆOTHESIUM, Ἐλαιοθέσιον, in *Antiquity*. See Aliptterium.

ELÆUS, in *Ancient Geography*, a town of Asia Minor, in Lycia.—Also, a town of the Thracian Chersonesus, on the bank of the Hellespont; now a castle on the strait of the Dardanelles.—Also, a town placed by Strabo and Pliny in the gulf of the Doride.—Also, a town of the Peloponnesus, in the Argolide. Steph. Byz.—Also, a town of Greece, in Epirus, according to Ptolemy; probably the same with that placed by Polybius in Calydonia, a country in the vicinity of Epirus.

ELÆUSSA, an island situated upon the coast of Cilicia, near *Corycos*. It was small according to Strabo, who says, that Archelaus made it his place of residence.—Also, an island of Asia Minor, near Smyrna. Pliny and Livy, the latter of whom calls it *Elæa*.

ELAGABALUS. See Heliogabalus.

ELAHAJAN, in *Geography*, a town of Arabia, in the country of Yemen; 100 miles S. E. of Amanzirifdin.

ELAIS, in *Ancient Geography*, a town of Phœnicia, between Joppa, Gaza, and Tyre.

ELAITIS, a small country of Asia Minor, in the Eolide, adjoining to the territory of Pergamus, and watered by the Caicus.

ELAIUS, a mountain of Arcadia, S.W. of Megalopolis, and N. of Phigalia. In this mountain Ceres had a grotto, in which sacrifices were offered to her, at which a female presided,

presided, who had for her assistant one of the priests, called "Hierothytes." The grotto was situated in the midst of a sacred wood.

ELAM, in *Scripture History*, one of the sons of Shem, and grandson of Noah, who is supposed to have settled in the southern tract beyond the Tigris or Euphrates. This is inferred not only from the authority of Scripture, in which the inhabitants of the said tract are plainly and frequently denoted by the name of Elam; but also from the testimony of heathen writers, who mention a country in this tract called Elymais, and a city of the same name. The name Elam, however, is sometimes taken in a stricter sense, as when it is distinguished from Susiana and the adjoining provinces, and sometimes in a larger sense, so as to include Susiana and other adjacent provinces. Hence Pliny and Ptolemy mention the Elymæi, as a people inhabiting on the Persian gulf; and hence the prophet Daniel speaks of Shushan, the chief city of Susiana, as lying in the province of Elam. (Dan. viii. 2.) The Elamites were a warlike people, living by rapine, and fighting with bows and arrows, (Is. xxii. 6. Jer. xlix. 35.) and they were joined to Susia, as Strabo says, and there was an ingress to them from Persia, and the Susians and Elamites are mentioned apart. (Ezra iv. 3.)

ELAM, in *Ancient Geography*, a city of Edom, on the Elanitic gulf of the Red sea. It was taken by David when he subdued the Edomites; and again, after they had recovered their liberty and independence, by Uzziah or Azariah. (2 Kings, xiv. 23.) But Rezin, king of Syria, drove the Jews out of it. Elam is by the ancients named Elana, Elalh, Elas, Ælan, or Elon: and hence the gulf near the isthmus of Suez is called the Elanitic gulf. Strabo places it 1260 furlongs from Gaza. St. Jerom says, that Elam lies at the extreme of Palestine: and Procopius places it at the eastern extremity of Palestine.

ELAN, in *Geography*, a town of Russia, in the country of the Cossacks, on the Don; 68 miles S.W. of Achadiaskaia.

ELAN *of Buffon*, in *Zoology*. See CERVUS *Alces*. See also TAPIR.

ELANITIC GULF. See ELAM.

ELAPHEBOLIA, Ελαφηβολια, in *Antiquity*, a festival kept in honour of Diana Ελαφηβολος, *i. e.* the Huntress, for which reason, a cake, made in form of a deer, and upon that account called ελαφος, was offered to her. For a farther account of it, see Pott. Archæol. Græc. lib. ii. cap. 20.

ELAPHEBOLION, Ελαφηβολιων, in *Ancient Chronology*, the ninth month of the Athenian year. It consisted of thirty days, and answered to the latter part of our February and beginning of March. See MONTH.

It was thus called from the festival *Elaphebolia* kept in it.

ELAPHIS. See ELAPS.

ELAPHITES, in *Ancient Geography*, islands on the coast of Illyria, so called on account of the deer, with which they abounded. Pliny enumerates three of them, which he places 15 miles from Melita.

ELAPHITIS, an island of the Ionian sea, in the vicinity of Ephesus. Pliny.

ELAPHOCAMELOS, in *Zoology*, a name by which several authors have called the Peruvian camel, usually called *glama*, and employed there as a beast of burden. See CAMELUS.

ELAPHONESUM MARMOR, a name used by the ancients to express a species of marble used in statuary, and called also *Proconnesium marmor;* it was of a blueish white, variegated with slender veins of black. See PROCONNESIUM.

ELAPHONNESUS, in *Ancient Geography*, an island of the Propontide, over-against the town of Cyzicus. Hence was obtained the marble to which it gave name.

ELAPHUS, a mountain of Asia, in the island of Argiussa.—Also a river of the Peloponnesus, in Arcadia, called lake *Elatum* by Pliny.—Also, a rapid stream of Arcadia, N.E. of Megalopolis.

ELAPHUS. See CERVUS.

ELAPHUSA, an island of the Ionian sea, near that of Corcyra. Pliny.

ELAPS, or ELAPHIS, by some called also *elops*, the name of a serpent described by many authors, and met with by Bellonius in the island of Lemnos: it grows to about three feet long, and is on the back of a dark grey, with three longitudinal black lines, running from the head to the tail, and on the belly of a bright yellow, according to Aldrovandus. The people of Lemnos call it *laphiati*.

ELARABAD, or EL HARABAD, in *Geography*, a town of Spain, in the province of Seville; 20 miles N. W. of Seville.

ELASERE, a town of Arabia, in the country of Yemen; 28 miles N. of Chamir.

ELASMIS, in *Natural History*, the name of a genus of fossil bodies, of the talc class, the distinguishing characters of which are, that they are composed of small plates, in form of spangles, each of which is either single, and not farther fissile; or, if complex, fissile only to a certain degree, and that into somewhat thick laminæ.

The word is derived from the Greek ελασμος, a *lamina*, or *plate:* the several component parts of these masses being so many small plates.

The bodies of this genus have been used to be named mica, glimmer, and catsiver, by authors, in the same manner with the bractearia. There are only four known species of this fossil.

ELASTIC, (from the Greek ελαστης, *impulsor*, of ελαυνειν, *to impel, push*, &c.) springy, *viz.* having the power of returning to the form from which it has been forced to deviate, or from which it is withheld. Thus a branch of a tree, the blade of a sword, &c. are said to be elastic, because if they are bent to a certain degree, and then let go, they will of themselves return to their former situation.

ELASTIC *Bodies* are such as will suffer their form to be altered by the application of a force or pressure, and will recover it on the removal of that pressure. In this respect all the bodies which come within our knowledge are comprehended under the following distinctions. If two bodies, when pressed towards each other, suffer an alteration of their forms, and if afterwards, on removing that pressure, they recover their original forms, then they are said to be *elastic;* if, when pressed, their forms are not altered in the least, or if their forms, when once altered by pressure, are never afterwards recovered, then the bodies are said to be *non-elastic*, and the former are called *perfectly hard*, whilst the latter are called *perfectly soft*. So that a hard body is that whose parts do not yield to any pressure or percussion; but retains its original form unaltered; a body *perfectly elastic*, is that whose parts yield to any stroke or pressure, but recover their original form as soon as the pressure is removed; and a body *perfectly soft*, is that whose parts yield to any stroke or pressure, but does not after the removal of the pressure in the least endeavour to recover its original form.

As far as we know, there do not exist in nature bodies that are perfectly hard or perfectly soft; for they all seem to be elastic in a greater or less degree. With respect to perfect elasticity, perhaps air alone may be said to possess it; for a long continued pressure does not seem to affect its elasticity. A quantity of air has been left for several years, much compressed in proper vessels, wherein there was nothing that could have any chemical action upon it; and afterwards on removing that pressure, and replacing it in the same temperature,

perature, under the ſame barometrical altitude, as it had before; that air has been found to recover its original bulk without any perceptible difference. Moſt other aerial fluids, or gaſſes, as far as they have been tried, ſeem to be equally elaſtic; but they have not been ſubmitted to trials equally long.

Glaſs, certain metals, ivory, moſt woods, feathers, and a few others, are the moſt elaſtic bodies, next to the aerial fluids. Soft clay, wax mixed with oil, butter, and ſome other bodies, in a temperate degree of heat, come neareſt to a ſtate of perfect ſoftneſs. It has long been doubted whether water had any elaſticity or not; but Mr. Canton's diſcovery of the compreſſibility of water, determined the queſtion, by ſhewing that by the application of force, water may be compreſſed in a ſmall degree. See the article Compression.

The form of an elaſtic body may be altered by force, three different ways; *viz.* by compreſſion, by diſtenſion, and by bending, which laſt mode, in fact, is only a combination of the other two; for when an oblong ſtraight body is bent, thoſe particles of it which are on the concave ſide are compreſſed, whilſt thoſe of the convex ſide are diſtended. In an elaſtic body the change of form is greater when the preſſure is greater, and *vice verſâ;* but it is not always exactly proportionate to it, excepting in the caſe of air and other aerial fluids, the bulk of which is always inverſely proportional to the compreſſing force.

In the recovery of their form from a ſtate of compreſſion, after the removal of the compreſſing force, elaſtic bodies exert a greater power at firſt than at laſt, ſo that the whole progreſs of reſtoration is a retarded motion. Thus, let a quantity of air be condenſed in a ſtrong metallic veſſel, and then let the ſtop-cock, or any other ſmall orifice, be opened, and it will be found that the air ruſhes out of it with great violence at firſt, but it ſlackens its power gradually, until at laſt it can hardly be perceived to move.

The elaſticity of moſt bodies, eſpecially of long and ſlender forms, may be eaſily ſhewn, but even in very hard and compact bodies their elaſticity may be manifeſted without much difficulty; for inſtance, let a marble ſlab, or a flat and ſmooth iron, be covered with black-lead, or with printing ink, then drop an ivory ball upon it ſucceſſively from different heights, and the degree of compreſſion will be indicated by the magnitude of the ſpot which will be found upon the ivory ball.

The elaſticity of ſolids appears to be more perfect when they are ſubjected to a low degree of compreſſion, than when they are expoſed to a higher degree of it. Or, in other words, an elaſtic ſolid in general will recover its full original form after having been little deflected from it; but not after a violent diſtortion; for in the latter caſe its parts ſuffer another ſort of derangement, from which they are not capable of recovering. Thus, take a watch ſpring, bend it in a moderate degree, and afterwards on removing the band, the ſpring will be found to recover its original direction without any perceivable deviation; but if you bend it to a ſharp angle as far as it will bear without breaking, then it will remain conſiderably bent, or deflected from its original direction. Thus alſo, if a muſical chord be ſtruck gently, it will expreſs a certain ſound which is produced by its vibrations, and theſe vibrations are performed in conſequence of its elaſticity. And if it be thus repeatedly ſtruck, it will expreſs the ſame ſound preciſely; but if it be ſtruck violently, then, on being ſtruck again, it will expreſs a lower ſound, which ſhews that it has ſuffered an elongation, that is, a derangement of its parts.

Elaſtic bodies are either ſolid or fluid, and it is neceſſary to conſider them ſeparately on account of their poſſeſſing ſome remarkable peculiar properties. The elaſtic ſolids are very numerous; for all ſolid bodies are more or leſs elaſtic; but ſome of them are elaſtic in ſo ſmall a degree as almoſt to deſerve the appellation of *ſoft*, whilſt others poſſeſs that property in an eminent degree, on which account they are extremely uſeful in the arts, in civil economy, and, above all, in mechanics; for there is hardly a machine, wherein the elaſticity of one or more ſolids is not eſſentially concerned. The principal bodies of this latter ſort are certain metallic bodies, moſt kinds of wood, glaſs, bones, ivory, dry membranes, and feathers, caout-chouc, and a few others.

The metallic bodies, in the ſtate in which they remain after fuſion, are not very elaſtic, but they may be rendered ſo, more or leſs, by various operations. Steel, whether perfectly hard, or of the ſoftaſt temper, reſiſts flexure with equal force, when the deviations from the natural ſtate are ſmall; but at a certain point of the ſteel, if ſoft, it begins to undergo an alteration of form; at another point it breaks if much hardened: but when the hardneſs is moderate, it is capable of a much greater curvature without either permanent alteration or fracture. In order to give it the above-mentioned degree of hardneſs, a piece of ſteel is firſt of all rendered quite hard and rigid by plunging it, when red or white hot, in cold water, and it is then heated to about the 500th degree of Fahrenheit's thermometer, which gives it what the workmen call *a ſpring temper;* for by heating it more or leſs, ſteel, that has been hardened in the above-mentioned manner, may be rendered more or leſs elaſtic. Platina, gold, ſilver, copper, and ſteel, may be rendered elaſtic to a conſiderable degree, by hammering, or by treatments of the like nature, ſuch as wire-drawing, milling, &c. Amongſt all the other metallic bodies, there are few which will acquire any moderate degree of elaſticity by any known method. Metallic alloys generally are (or they may be rendered, by hammering, milling, &c.) much more elaſtic than any of the ſimple metals which enter into their compoſition. Thus, braſs may be rendered much more elaſtic than either the zinc or the copper, which are its component ſimple metals.

The elaſticity of ſolids is apt to be diminiſhed by heat; and a high temperature ſoftens metallic bodies ſo as to deprive them of all the hardneſs and elaſticity which had been given them by any of the above-mentioned means. But the preſence or abſence of air does not appear to affect the elaſticity of ſolids.

Thus much relates to the bending and unbending of elaſtic ſolids; but with reſpect to diſtenſion and compreſſion, it has been found by experiment, that the meaſure of the extenſion and compreſſion of uniform elaſtic bodies is ſimply proportional to the force which occaſions it, at leaſt when the forces are comparatively ſmall. Thus, if a weight of 100lbs. lengthened a rod of ſteel one hundredth of an inch, a weight of 200 would lengthen it very nearly two hundredths, and a weight of 300lbs. three hundredths. The ſame weights, acting in a contrary direction, would alſo ſhorten it one, two, or three hundredths reſpectively. The former part of this law was diſcovered by Dr. Hooke, and the effects appear to be analogous to thoſe which are more eaſily obſervable in elaſtic fluids.

The elaſticity of the ſame metallic body ſeems to be greater or leſs, according as that metal is more or leſs compact; thus, by hammering or milling, a piece of ſilver is rendered more elaſtic and more compact; for its ſpecific gravity is thereby increaſed; but this is not the caſe with ſteel hardened and tempered, as appears from the following ſtatement. The ſpecific gravity of ſoft ſteel is 7.833; that of ſteel hardened in water is 7.816. Mr. Cavallo mentions the following experiment of Mr. R. Pennington, as a confirmation

tion of the expanſion of ſteel by hardening. Mr. Pennington found, that a piece of ſteel, which when ſoft meaſured in length 2.769 inches, after having been hardened by plunging it, when red hot, in cold water, was found to meaſure 2.7785 inches; and after having been let down to a blue temper, it meaſured 2.768 inches. Cavallo's Philoſophy, vol. ii. p. 77.

The elaſtic fluids have a tendency to expand, when at liberty, with an elaſtic force which is proportional to their denſity, and of contracting when preſſed into a ſpace which is inverſely proportional to the preſſing force. It has been queſtioned, however, whether this rule holds good in all degrees of rarefaction or of condenſation. But no limit has been found to the rarefaction or condenſation of air (See the articles Air and Atmosphere.) Not only common air, but all the gaſſes, or permanently elaſtic fluids, follow the ſame law, as alſo thoſe which are not permanently ſo, ſuch as vapour, or the ſteam of water, and of other ſubſtances, provided they be kept in the ſame temperature. (See the articles Gas and Pneumatics.) The elaſtic power of theſe fluids (contrary to that of ſolids) is increaſed by heat, *viz.* by an elevation of temperature, and is diminiſhed by cold. The bulk of common air becomes augmented of 412 thouſandths, or (according to more recent experiments,) of 375 thouſandths, by the heat of boiling water above that of freezing. The elaſtic power of ſteam is capable of being raiſed to a prodigious degree by the application of heat. Thus, in diſtilleries the vapour of ſpirit of wine has often occaſioned terrible exploſions; the vapours of mercury have burſt an iron box; and thoſe of nitrous acid, muriatic acid, and various others, when confined in veſſels, have burſt forth with great violence. In founderies a ſmall quantity of water accidentally poured over the melted metal, has often occaſioned the total deſtruction of the foundery. It is in conſequence of this property, that the elaſticity of ſteam has been employed with wonderful ſucceſs in ſteam-engines; and that it has been ſuppoſed to be the cauſe of earthquakes, of volcanoes, &c. ſince, by the increaſe of heat, its force may be rendered ſuperior to any obſtacle.

The elaſtic force of ſteam, or the vapour of water, in different temperatures, has been examined by various philoſophers, and their intereſting experiments, which have been conducted different ways, do not materially diſagree in their reſults. The principle upon which theſe experiments are in general conducted is as follows; though the peculiar conſtruction and application of the apparatus may be varied at pleaſure. An inverted glaſs ſiphon is connected with a cloſe veſſel containing ſome water, *viz.* one extremity of the ſiphon is cemented tight into the veſſel, and ſome mercury is poured into the arched part of the ſiphon. Now, in a natural ſtate, *viz.* when the preſſure of the atmoſphere only acts upon the ſiphon, the mercury muſt have the ſame altitude in both legs; but if the vapour of water begins to preſs upon the ſurface of the mercury in that leg which communicates with the above-mentioned veſſel, then the ſurface of the mercury muſt deſcend in the ſaid leg, and muſt riſe in the oppoſite one; therefore the altitude of the ſurface of the mercury in the latter, above the level of the former, indicates, or meaſures, the elaſtic power of the ſteam; and hence that power is expreſſed in perpendicular altitudes of mercury: and when that altitude is about 29.89 inches, then the elaſtic force of ſteam is ſaid to be equivalent to the ordinary preſſure of the atmoſphere, becauſe, at a mean, the preſſure of the atmoſphere balances a perpendicular column of quickſilver 29.89 inches high in a common barometer. The principal reſults of the experiments of the Chev. de Bettancourt (De Prony's Archit. Hydraul. vol. i. p. 557.) are conciſely expreſſed in the following table; the firſt column of which contains the temperature of the water in degrees of Fahrenheit's ſcale; and the ſecond contains the correſpondent altitudes of mercury in inches and decimals, which the ſteam of the water can ſuſtain, ſuppoſing the barometer to ſtand at its mean altitude, *viz.* 29.89.

50°	0.106
100	1.600
150	6.715
160	8.740
170	11.405
180	14.709
190	18.227
200	22.703
212	29.89

Beyond the boiling point, the Chev. de Bettancourt found that every additional 30° of heat nearly double the elaſtic force of ſteam; ſo that at the temperature of 242°, that elaſtic force is equal to twice the preſſure of the atmoſphere; at 272° it is equal to four times the preſſure of the atmoſphere; at 302° it is equal to eight times the preſſure of the atmoſphere, and ſo on.

The following table contains the reſults of Mr. Dalton's valuable and accurate experiments, together with thoſe of other experimenters. The firſt column contains the degrees of heat according to Fahrenheit's ſcale; the ſecond ſhews the correſponding elaſtic powers of ſteam according to Dalton; and the third contains promiſcuous obſervations made by various philoſophers.

Heat.	Elaſticity of ſteam in perpendicular inches of mercury.	
2°	0.008	
12	0.096	
22	0.139	
23	0.144	
24	0.150	
25	0.156	
26	0.162	
27	0.168	
28	0.174	
29	0.180	
30	0.186	
31	0.193	
32	0.200	
33	0.207	
34	0.214	
35	0.221	
36	0.229	
37	0.237	
38	0.245	
39	0.254	
40	0.263	
41	0.273	
42	0.283	
43	0.294	
44	0.305	
45	0.316	
46	0.328	
47	0.339	
48	0.351	
49	0.363	

Heat.	Elasticity of steam in perpendicular inches of mercury.	
50°	0.375	
51	0.388	
52	0.401	
53	0.415	
54	0.429	
55	0.443	Muriate of lime .022 Dalt. as water 18° lower.
56	0.45	Alcohol 1.5; as water 36° higher. Ammonia 7.7; as water 95° higher. Ether 13 3; as water 118° higher.
57	0.474	
58	0.490	
59	0.507	
60	0.524	Alcohol 1 45 D. as water 30° higher. Ammonia 4.3 D.; as water 69° higher.
61	0.542	
62	0.560	Ether 12.75; as water 110° higher. Dalt.
63	0.578	
64	0.597	
65	0.616	Muriate of lime 0.3 Dalt.; as water 19° lower.
66	0.635	
67	0.655	
68	0.676	
69	0.698	
70	0.721	Muriate of lime 0.4 D. as water 18° lower.
71	0.745	
72	0.770	
73	0.796	
74	0.823	
75	0.851	
76	0.880	
77	0.910	
78	0.940	
79	0.971	
80	1.000	
81	1.04	
82	1.07	
83	1.10	
84	1.14	
85	1.17	
86	1.21	
87	1.24	
88	1.28	
89	1.32	
90	1.36	
91	1.40	
92	1.44	
93	1.48	
94	1.53	
95	1.58	Muriate of lime 0.9 Dalt.; as water 18° lower.
96	1.63	
97	1.68	
98	1.74	
99	1.80	
100	1.86	
101	1.92	
102	1.98	Ether 30: as water 110° higher. Dalt.

Heat.	Elasticity of steam in perpendicular inches of mercury.	
103°	2.04	
104	2.11	
105	2.18	
106	2.25	
107	2.32	
108	2.39	
109	2.46	
110	2.53	
111	2.60	
112	2.68	
113	2.76	
114	2.84	
115	2.92	
116	3.00	
117	3.08	
118	3.16	
119	3.25	
120	3.33	Alc. as water 6° higher. Robison.
121	3.42	
122	3.50	
123	3.59	
124	3.69	
125	3.79	
126	3.89	
127	4.00	
128	4.11	
129	4.22	
130	4.34	
131	4.47	
132	4.60	
133	4.73	
134	4.86	Alc. as water 29°. Achard.
135	5.00	
136	5.14	
137	5.29	
138	5.44	
139	5.59	
140	5.74	Alc. as water 30° higher. Robison. Ammonia 30, as water 72° higher. Dalton.
141	5.90	
142	6.05	
143	6.21	
144	6.37	
145	6.53	
146	6.70	
147	6.87	Alcohol, as water 35°.5 higher. Ach. Ether 64.75 D. as water 105° higher.
148	7.05	
149	7.23	
150	7.42	
151	7.61	
152	7.81	
153	8.01	
154	8.20	
155	8.40	
156	8.60	
157	8.81	
158	9.02	
159	9.24	
160	9.46	

Heat.	Elasticity of steam in perpendicular inches of mercury.	
161°	9.68	
162	9.91	
163	10.15	
164	10.41	
165	10.68	
166	10.96	
167	11.25	Alc. as water 33° higher. Achard.
168	11.54	
169	11.83	
170	12.13	
171	12.43	Alc. as water 36° higher. Achard.
172	12.73	
173	13.02	
174	13.32	
175	13.62	Alc. 30. Dalt. as water 37° higher.
176	13.92	
177	14.22	
178	14.52	
179	14.83	
180	15.15	Alc. as water 37° higher. Robison.
181	15.50	
182	15.86	
183	16.23	
184	16.61	
185	17.00	
186	17.40	
187	17.80	
188	18.20	
189	18.60	
190	19.00	
191	19.42	
192	19.86	
193	20.32	
194	20.77	
195	21.22	
196	21.68	
197	22.13	
198	22.69	
199	23.16	
200	23.64	
201	24.12	
202	24.61	
203	25.10	
204	25.61	
205	26.13	
206	26.66	
207	27.20	
208	27.74	
209	28.29	
210	28.84	
211	29.41	
212	30.00	Ether 137.0 D. as water 84° higher. Alc. 58.5 D. as water 35° higher.

		Biker.	
213		31.3	
214		31.9	
215		32.5	
216		33.2	
217		33.7	
218		34.6	

Heat.	Elasticity of steam in perpendicular inches of mercury.	Biker.	
219°		35.1	
220		35.9	Alc. as water 42° higher. Robison.
221		36.4	
222	36.25	37.0	
230		43.2	
231			Muriate of lime 30 D. as water 18° lower.
232	43.24	44.8	
240		52.2	Alc. as water 46° higher. Robison.
242	51.34	53.9	
248			60.76 Schmidt.
250		62.7	66.8 Robison.
252	60.05	64.8	
257			71.57 Schmidt; 76.9 Bettancourt.
260		75.0	80.3 Robison.
262	69.72	77.0	
266			83.81 Schmidt; 90 Bettancourt.
270		88.6	94.0 Robison.
272	79.94	92.3	
275			98.53 Schmidt.
278		105.2	
280			109 Schmidt: 105.9 Robison; 106 Bettan.
282	90.99		
284			116.98 Schmidt.
286			120.5 Schmidt.
290			126 Schmidt.
292	102.45		
302	114.15		

We shall not in this article take any notice of the elastic powers of the electric fluid, of the magnetic fluid, of light, or of caloric, because the nature of those powers is merely hypothetical, and their properties will be described elsewhere.

The contemplation of the elastic powers of bodies, so common, so evident, and so useful, naturally induced philosophers to enquire into the cause of it; and accordingly various hypotheses have been formed and published in explanation of those phenomena. But as yet no satisfactory information has been obtained either from conjecture, or from the result of the numerous experiments that have been instituted expressly for that purpose. Air being one of the most elastic substances known, the speculations of philosophers were principally directed towards it; but of the hypotheses previous to sir I. Newton's, we need not take any particular notice, since their insufficiency is too evident to need any formal refutation; it was thought, for instance, that the particles of air were like waten springs coiled up, or that they were a kind of elastic flakes, &c. Newton contented himself with saying, that the phenomena of the air's elasticity could not be solved on any other supposition, but that of a repulsive power diffused all round each of its particles, which became stronger as they approached, and weaker as they receded, from each other. And he farther supposed, that this repulsive power was increased by heat.

A similar uncertainty exists with respect to the elastic power of solids; it being absolutely unknown how the particles

ticles of a ſolid can approach one another on one ſide of it, and recede from each other on the oppoſite ſide of the ſame body; (for this muſt actually take place when an elaſtic body is bent;) and then recover their former poſition when the preſſure is removed. Or how the pores of the elaſtic body can undergo an alteration, and a ſubſequent reſtoration of their forms. The Carteſians account for it from the effort of a *materia ſubtilis*, to paſs through pores that are too narrow for it. But as neither the mechanical action of this effort, nor the exiſtence of their materia ſubtilis is at all known, we need not delineate their hypotheſis more at large. Other philoſophers have endeavoured to modify the Carteſian hypotheſis by ſubſtituting an etherial elaſtic fluid to the materia ſubtilis; but if the elaſtic property of a ſolid is ſaid to depend upon the elaſticity of that ether; the cauſe of elaſticity ſtill remains unexplained. But the exiſtence of this ether is merely hypothetical. The preſſure of the atmoſphere certainly is unconcerned in it; for the elaſtic power of bodies is the ſame either in vacuo, or in the open air. Malebranche's idea of the elaſticity being cauſed by vortices of matter included within all bodies, is too ſtrange to require long examination. The particles of all ſolid bodies have been ſuppoſed to be endowed with a ſort of polarity ſomewhat like magnets; ſo that they are diſpoſed to attract each other with their friendly poles or extremities, and to repel each other with their oppoſite extremities; and this indeed ſeems to be corroborated by the phenomena of cryſtallization; for the particles of almoſt all bodies, in the act of aſſuming a ſolid form, arrange, or endeavour to arrange, themſelves in particular orders. Thus all metallic ſubſtances, after fuſion, ſhew that tendency;—earthy and ſaline particles, ſlowly depoſited from their ſolution in water, ſhew the ſame tendency;—the ſame thing takes place in ſublimations; and even water, in the act of freezing, (which may be conſidered as a depoſition from its ſolution in caloric,) aſſumes a peculiar cryſtallized form. This tendency, however, of the particles of bodies to arrange themſelves in certain orders, will go a very ſhort way towards elucidating the phenomena of elaſtic bodies; for, in the firſt place, it is not applicable to thoſe bodies which become elaſtic by hammering, or by being put in a ſtate of tenſion; and ſecondly, it would, even in the moſt favourable caſes, go no further than to explain the cauſe of elaſticity by another unintelligible property; meaning the attraction and repulſion between the friendly or unfriendly poles of the particles of bodies. See Deſaguliers on the Cauſe of Elaſticity. Phil. Tranſ. vol. xli. for 1739.

Upon the whole it muſt be acknowledged, that the cauſe or cauſes, upon which the elaſtic property of bodies depends, are utterly unknown. Various uſeful particulars have been aſcertained with reſpect to the variety, the powers and the durability of elaſtic bodies; and whilſt we remain ſatisfied with the knowledge and the application of thoſe important facts, we muſt leave the inveſtigation of their cauſe to future exertions.

Several other obſervations reſpecting the elaſtic property of bodies, will be found under the articles STEEL, SPRINGS, and TENSION.

ELASTIC *Bitumen*. See BITUMEN.

ELASTIC *Curve*. See CATENARIA.

ELASTIC *Gum*. See CAOUTCHOUC.

ELASTICITY, or ELASTIC *Force*, is that property in natural bodies, in conſequence of which they are ſaid to be *elaſtic*; being a diſpoſition to have their form altered by preſſure, and to recover it on the removal of that preſſure. See ELASTIC *Bodies*.

ELASTICITY *of Air*.
ELASTICITY *of Fluids*.
ELASTICITY *of Solids*.
ELASTICITY *of Steam*.
} See ELASTIC *Bodies*.

ELASTICITY *of Springs*. See SPRINGS, and ELASTIC *Bodies*.

ELASUS, in *Ancient Geography*, a river of Aſia Minor, in Bithynia, the mouth of which is placed by Ptolemy between that of the Hypius and the town of Dioſpolis.

ELATAS, a river of Aſia Minor, in Bithynia, which diſcharged itſelf into the Euxine ſea, near Parthenium.

ELATE, in *Botany*, ("ſo named παρα το ελαν, from its great height; ελατη ουρανομηκης, Homer. Suppoſed to be a fir. It is however put for a palm, or perhaps rather the fruit or ſpathe of a palm, in Galen and Dioſcorides." Martyn.) Linn. Gen. 564. Schreb. 777. Willd. Sp. Pl. v. 4. 403. Ait. Hort. Kew. v. 3. 477. Mart. Mill. Dict. v. 2. Juſſ. Gen. 38. Claſs and order, *Monœcia Hexandria*. Nat. Ord. *Palmæ*.

Gen. Ch. Male, *Cal.* Spathe of two valves; ſpadix branched; perianth with three teeth. *Cor.* Petals three, roundiſh. *Stam.* Filaments none; anthers ſix, ſeſſile. Female in the ſame ſpadix, *Cal.* Spathe as above; perianth with three teeth. *Cor.* Petals three, roundiſh, permanent. *Piſt.* Germen ſuperior, roundiſh; ſtyle awl-ſhaped; ſtigmas three, *Peric.* Drupa ovate, pointed. *Seed.* Nut ovate, marked with a furrow.

Eſſ. Ch. Common ſpathe of two valves; common ſpadix branched. Male, Calyx three-toothed. Petals three, anthers ſeſſile. Female, Calyx three-toothed. Petals three. Stigmas three. Drupa with one nut.

E. *ſylveſtris*. Linn. Sp. Pl. 1659. (Katou-indel; Rheede Malab. v. 3. 15. t. 22—25. Kæmpf. Amœn. 667.) Native of the Eaſt Indies. Deſcribed in the Hortus Malabaricus, where, like other palms, it is illuſtrated with ſplendid and ample figures, as of a moderate height, about 14 feet. *Wood* white and very hard. *Leaves* pinnate, ſpinous in their lower part: leaflets oppoſite, lanceolate, acute, keeled, entire. *Spathe* thick and coriaceous; ſpadix with a thick compreſſed baſe, very much branched upwards, bearing innumerable, ſmall, greeniſh-white, ſcentleſs *flowers*. *Fruit* oval, the ſize of a ſloe, ſharp-pointed, blackiſh and ſhining; its pulp white, ſweet, farinaceous, and aſtringent. *Nut* red, with a white bitter kernel. The natives of Malabar weave hats of the leaves. Elephants are fond of the fruit ſtalks.

ELATEA, in *Ancient Geography*, a town of Greece, which was only inferior to Delphi. It was ſituated on a plain, over which paſſed the Cephiſſus, near Amphiclea; and is ſaid to have been founded by Elatus, who came from Arcadia to aſſiſt the Delphians againſt the Phlegians, in their attempt to plunder the temple. Elatea was one of the towns burned by the Perſians; but though it afterwards repulſed the enterpriſes of the Macedonians, it was ſubdued by Demetrius. It continued faithful to the Macedonians when Titus Flamininus was ſent from Rome to reſcue the Greeks from ſlavery, and ſuſtained a ſiege. The inhabitants were afterwards reconciled to the Romans, and recovered their liberty. Eſculapius had a temple in this place, and his ſtatue exhibited him with a long beard. Here were alſo a theatre and a bronze ſtatue of Minerva, which appeared to be very ancient. Minerva Carnea had a temple ſituated on a craggy rock, at the diſtance of 20 ſtadia from Elatea. The goddeſs was repreſented in the attitude of combat.

ELATER, in *Entomology*, a genus of coleopterous inſects. The antennæ are ſilform, and ſituated in a groove under the head and thorax; under ſide of the thorax terminating

minating in an elastic spine, placed in the cavity of the abdomen.

The species of this genus are generally of an elongated and subcylindrical form, and spring to a considerable distance by means of the spine at the extremity of the thorax; when placed on the back, these insects strike the spine forcibly against the body, and by the sudden jerk turn over and recover their natural position. Many of this genus afford also a strong phosphoric light in the night-time, like the glow-worm, but of greater lustre. A number of the species are found in Europe, chiefly those of small size, the larger kinds being mostly natives of hot climates.

Species.

Flabellicornis. Brown; antennæ with fan-like tuft of eight large lamina. Linn.

Native of India, and one of the largest species.

Fasciularis. Thorax mouse-colour; wing-cases pale, with brown undulated streaks; antennæ with fan-like tuft. Oliv.

The antennæ are black; wing-cases striated; body mouse-colour; legs pitchy. An American species.

Speciosus. White, spotted with black. Linn.

Native of the East Indies. In this species the antennæ are short and black.

Luridus. Downy, cinereous; wing-cases somewhat striated; end of the legs black. Olivier.

A large species found in Coromandel.

Foveatus. Black; thorax with two impressed white dots; wing-cases striated. Fabr.

Inhabits Guinea. This is a large species, entirely black; the thorax smooth; wing-cases immaculate.

Oculatus. Thorax with two black ocellate spots; body black, spotted with white. Olivier.

Native of North America.

Luscus. Thorax with two black ocellate spots; body black and immaculate. Olivier.

Inhabits the same country as the preceding.

Coecus. Black; thorax with two ocellar spots; wing-cases with two arched streaks, and a ferruginous dot behind. Fabr.

An African insect. The thorax is marked each side with a large oblong ferruginous ring; wing-cases smooth.

Lineatus. Black; thorax and wing-cases with rufous lines. Oliv.

A Brasilian insect of large size, described by Olivier from a specimen in the museum of the late French king.

Noctilucus. Sides of the thorax with a glabrous yellow spot. Oliv.

This species inhabits South America, and emits from the two glabrous spots on the thorax a vivid phosphoric light.

Phosphoreus. Thorax with two yellow spots behind. Linn.

Possesses the same luminous property as the last. The species inhabits South America.

Ignitus. Fuscous; thorax black, with yellow margin. Oliv.

Native of Cayenne.

Fuscipes. Black; antennæ and legs brown. Oliv.

A large species found in the East Indies.

4-Maculatus. Cinereous; thorax with four black dots; wing-cases with two. Fabr.

Native of Africa.

Rubiginosus. Blackish, spotted with grey; large spot on the wing-cases. Fabr.

Inhabits Sierra Leone. The head of this species is black; breast black, with the sides rust-coloured; legs black.

Ligneus. Ferruginous; wing-cases mucronate; antennæ black. Oliv.

Native of South America.

Rufus. Ferruginous; head and thorax darker. Fabr.

Inhabits Germany. The head is brown; antennæ ferruginous; thorax brown, ferruginous at the sides; wing-cases striated.

Ferrugineus. Thorax and wing-cases ferruginous; body and posterior margin of the thorax black. Oliv.

Found in Europe.

Porcatus. Brassy-green; wing-cases with villous white grooves. Fabr.

The suture of the wing-cases black and polished. Oliv. Inhabits South America.

Sulcatus. Covered with whitish down; wing-cases with three elevated black glabrous lines. Fabr.

Native of South America.

Virens. Body downy, blackish-green; antennæ black. Oliv.

Inhabits American islands.

Fulgens. Blue polished, beneath coppery; wing cases pointed. Oliv.

Native of India.

Inæquatus. Black blue; thorax uneven; wing-cases striated, red. Fabr.

The antennæ are black; thorax grooved; scutel dusky. An Italian species.

Aterrimus. Thorax black, and polished; wing-cases striated and black-brown. Oliv.

An European species.

Niger. Black-brown, and opake; wing-cases striated; antennæ and legs same colour. Linn.

Found in gardens in Europe.

Murinus. Thorax dull cinereous; wing-cases clouded with cinereous; ends of the legs rufous. Linn.

Common in gardens in Europe.

Holosericeus. Dull; thorax and wing-cases somewhat silky, and clouded with cinereous and brown. Fabr.

Inhabits Germany.

Tessellatus. Wing-cases brassy, with crowded paler spots; claws red. Linn. Oliv. &c.

Found in gardens in Europe.

Fasciatus. Thorax varied with black and pale; wing-cases blackish, with an undulated white band. Linn.

Native of Sweden, and most other parts of Europe.

Varius. Black; edge of the thorax, band on the posterior part of the wing-cases and base yellowish downy. Olivier.

Found in the vicinity of Paris.

Æneus. Thorax and wing-cases brassy; antennæ black and simple. Olivier.

An European species.

Germanus. Thorax and wing-cases black blue; body and legs black. Olivier.

Native of Europe.

Impressus. Pubescent, black; thorax with an impressed dorsal line and two dots; wing-cases striated, shining, brassy. Fabr.

Found in Sweden by Schneider.

Pectinicornis. Thorax and wing-cases brassy; antennæ of the male pectinated. Linn. *Elater fuscus viridi æneus*, Geoffr.

Native of Europe.

Furcatus. Thorax ferruginous, with a black dorsal line; wing-cases tapering; testaceous with five black streaks; head furcated. Fabr.

Inhabits India, and is of the middle size. Described from a specimen in the British Museum.

Suturalis. Thorax one-toothed each side; ferruginous, with a black dorsal line; wing-cases testaceous, with three black fillets. Fabr.

Native of Senegal.

Vittatus. Brown; band on the wing-cases and legs testaceous. Fabr.

The antennæ of this species is pitchy; head and thorax somewhat downy; abdomen ferruginous. Found in Germany.

Cupreus. Coppery; upper half of the wing-cases yellow. Olivier.

Native of Britain.

Linearis. Thorax rufous, in the middle brown; wing-cases linear and testaceous. Olivier.

Livens. Black; thorax red and glabrous; wing-cases testaceous. Olivier.

This, and the preceding, inhabit Europe, and are supposed by Hoppe to be varieties of the same species.

Cruciatus. Thorax black, with ferruginous sides; wing-cases yellow, with black edge and cross. Fabr.

Native of Europe.

Denticollis. Linear, black; wing-cases and thorax rufous. Fabr.

Inhabits Germany.

Castaneus. Thorax testaceous and pubescent; wing-cases yellow, tipped with black; body black. Olivier.

Native of Europe.

Obscurus. Piceous; thorax and wing-cases dull black. Olivier.

Found in Europe, and common in England.

Flavipes. Thorax dull black; wing-cases striated and brown; legs testaceous.

Inhabits Europe.

Castanipes. Brown, with cinereous down; antennæ and shanks testaceous. Gmel. *Elater castaneus*, Fabr.

Native of Guadaloupe. The wing-cases are striated.

Maculatus. Ferruginous; wing-cases dotted with black. Olivier.

A South American species.

Filiformis. Brownish-ash, and immaculate. Fabr.

Inhabits Italy.

Tristis. Thorax black and polished; base of the wing-cases and exterior margin livid. Fabr.

Lives in decayed wood in Europe.

Marginatus. Thorax brown; wing-cases testaceous, edged with black. Olivier.

This, and the eleven following species, inhabit Europe.

Thoracicus. Black; thorax entirely rufous. Fabr.

Ruficollis. Black; thorax, at the posterior part, red and polished. Fabr.

Brunneus. Thorax rufous, black in the middle; wing-cases and body ferruginous. Fabr.

Hæmatodes Black; thorax pubescent and fulvous; wing-cases striated and sanguineous. Olivier.

Elongatus. Black; wing-cases testaceous, with the tips black. Fabr.

Lateralis. Black and dusky; wing-cases striated, with an oblong yellowish spot at the base. Fabr.

Sanguineus. Black; wing-cases striated, sanguineous and immaculate. Olivier.

Ephippium. Black; wing-cases striated, sanguineous with a common dorsal black spot. Olivier.

Found on decayed pines.

Præustus. Black; wing-cases striated, sanguineous with black tip. Fabr.

Testaceus. Black; striated; wing-cases and legs testaceous. Fabr.

Balteatus. Anterior half of the wing-cases rufous; body black. Fabr.

Melanocephalus. Sanguineous, head, thorax, dorsal line on the wing-cases, and tips black. Olivier.

Native of Coromandel. Bankfian cabinet.

Elegans. Black; margin of the thorax and wing-cases, with the fillet on the latter, and the legs testaceous. Fabr.

An American species. The head is black; antennæ testaceous.

Variabilis. Thorax brown dusky; wing-cases striated and testaceous. Fabr.

Native of Germany. The wing cases in this insect are sometimes fuscous.

Pallipes. Brown; wing-cases striated; antennæ and legs yellow. Fabr.

A species of small size, and inhabits Tranquebar.

Striatus. Black; wing-cases brown with four pale lines. Olivier.

Native of Sweden.

Rufipes. Black; thorax polished; wing-cases striated; legs rufous. Fabr.

Inhabits Saxony. Hybner.

Minutus. Thorax deep black, and polished; wing-cases and legs blackish. Linn.

An European species of small size.

Pallens. Black; wing-cases striated, and with the legs testaceous. Geoffr.

Found by Bosc in France.

Limbatus. Thorax black, and polished; wing-cases testaceous. Thunberg.

Inhabits Kiel.

Riparius. Brassy black; wing-cases striated; legs rufous. Fabr.

Found by Paykull in Lapland, where it inhabits principally the banks of lakes and rivers.

Advena. Black; wing cases and legs dull cinereous. Fabr.

A small insect, found in Spain.

Nitidulus. Wing-cases striated with two yellow spots; antennæ and legs yellow. Fabr.

The head is black and destitute of spots; wing-cases black. The species is a native of Cayenne.

Pulchellus. Head and thorax black; wing-cases blackish with yellowish spots; legs yellow. Fabr.

Inhabits Europe in gardens.

2-Guttatus. Black; wing-cases striated, with a rufous spot in the middle. Olivier.

Found in the south of France.

2-Maculatus. Black; wing-cases testaceous, tip black with a white dot. Olivier.

Inhabits same part of Europe as the preceding.

3-Maculatus. Black; wing-cases striated, testaceous, and marked with three black spots. Fabr.

Native of Saxony. Hybner.

4-Maculatus. Above black; border of the thorax and two spots on the wing-cases testaceous. Fabr.

Inhabits Italy.

Politus. Black, and polished; wing-cases striated; anterior legs pale. Paykull.

Found on the higher mountains of Dahlikarbia, and is very small.

6-Guttatus. Smooth, black; wing-cases with three white dots. Thunberg.

Native of the Cape of Good Hope.

Buprestoides. Cylindrical, black and immaculate; head retracted. Hybner.
Inhabits Saxony.

Pygmæus. Dull black, with the ſhanks pitchy. Fabr.
Native of Germany, and is found in rotten wood.

Notatus. Thorax rufous, with two black ſpots; wing-caſes rufous at the baſe, the tip black with two white ſpots. Olivier.
Found in Coromandel.

Festivus. Thorax ferruginous; wing-caſes black with two yellowiſh bands. Forſt.
Native of Egypt.

Tetrastichon. Black ſpotted with yellow; wing-caſes with confluent ſpots; abdomen with four dots. Gmel.
Inhabits Africa.

Deustus. Teſtaceous; thorax and bind part of the wing-caſes with a branched black line. Thunberg.
Native of Ceylon.

Clavicornis. Green, antennæ clavated. Thunberg.
Native of India.

Giganteus. Depreſſed; wing-caſes braſſy green with a yellow ſpot; breaſt and abdomen yellow. Schall.
This and the following inhabit America.

Indicus. Black; thorax convex, punctured with a fulvous margin, ſinuate in the middle; wing-caſes black ſtriate punctured. Herbſt.

Vulgaris. Black; wing-caſes brown with punctured ſtriæ; ſuture black; legs pale. Herbſt.
Found at Berlin, as are likewiſe the three following ſpecies.

Griseus. Dull grey; thorax convex; wing-caſes with punctured ſtriæ; beneath black; antennæ and legs brown. Herbſt.

Cinereus. Black, with hoary down; thorax convex; tarſi ferruginous. Herbſt.

Equiseti. Black, thorax convex; wing-caſes ſtriated; legs yellowiſh. Herbſt.

Montanus. Somewhat villous, ſhining black; baſe of the antennæ and ſhanks fulvous. Scopoli.
Inhabits the alpine regions of Italy.

Pullus. Black, poliſhed and pubeſcent; wing-caſes punctured; legs cheſnut brown. Müll.
Native of Denmark.

Tuberculatus. Black, opake; thorax with two tubercles; wing-caſes finely ſtriated with ferruginous dots. Pontopp.
Inhabits Denmark.

Guineensis. Green bronzed; thorax ſub-pubeſcent; antennæ black; wing-caſes ſtriated. Gronov.
Inhabits America.

Fimbriatus. Black, thorax edged with red; wing-caſes with two yellow interrupted lines at the ſuture. Lepechin.
Found in the deſerts of Ural.

Auratus. Green-gold; legs black. Gmel.
Native of China. Drury.

Vittatus. Black, wing-caſes brown with a longitudinal fulvous ſtripe. Geoffr.
Native of France.

Piceus. Entirely black, and poliſhed; wing-caſes very ſmooth. Degeer.
Native of America.

Lividus. Pale reddiſh-brown; antennæ rufous; legs yellow-teſtaceous. Degeer.
Native of America.

Punctulatus. Dull teſtaceous; anterior part of the thorax black; wing-caſes with two irregular black ſpots. Degeer.
Native of Surinam.

Segetis. Black; antennæ and tarſi brown; wing-caſes with black and brown longitudinal lines. Act. Holm. 1779.
Deſtructive in the larva ſtate to the roots of corn.
Found in Sweden.

Punctatus. Elongated, brown; thorax punctured; wing-caſes with crenate ſtriæ; mouth and legs ferruginous. Leſke.
This and the following ſpecies are natives of Europe.

Pubescens. Pitchy and pubeſcent; wing-caſes ſtriated; ends of the legs ferruginous. Leſke.

Varians. Brown with yellow down; legs rufous; wing-caſes finely ſtriated with brown ſpots. Gmel.

Crassipes. Black, wing-caſes finely ſtriated; thighs thick. Gmel.

Cinerascens. Teſtaceous with cinereous down; thorax browniſh; legs rufous. Gmel.

Quadrisulcus. Black; wing-caſes obſoletely ſtriated with four impreſſed grooves at the baſe; antennæ, ſhanks, and ends of the fore legs ruſty-brown. Gmel.

Suturalis. Brown; margin of the thorax ferruginous; wing-caſes teſtaceous with a brown ſuture. Gmel.

Capucinus. Black; wing-caſes, anterior legs, and ſhanks teſtaceous. Gmel.

Soricinus. Mouſe-colour; thorax gibbous; wing caſes teſtaceous; antennæ and legs ferruginous. Gmel.

Funereus. Teſtaceous; wing-caſes ſtriated; head brown. Gmel.

Chalybeus. Braſſy-black, and poliſhed; baſe of the anterior thighs and ſhanks rufous. Gmel.

Obscurus. Ferruginous; head and thorax brown; the latter on the poſterior part with the wing-caſes and legs teſtaceous. Gmel.

Fuliginosus. Piceous and pubeſcent; antennæ, legs and wing-caſes teſtaceous, the latter edged with brown. Gmel.

Pusillus. Cheſnut brown; three laſt joints of the antennæ lamellate; wing-caſes finely ſtriated and pubeſcent.

Unicolor. Entirely rufous-teſtaceous; eyes black; thorax elongated with an impreſſed line in the middle. Marſh. Ent. Brit.
This with the following ſpecies are natives of Britain, and have been recently deſcribed in the Entomologia Britannica.

Fulvus. Entirely ferruginous with eyes black. Marſh.

Lateralis. Thorax ferruginous black; wing-caſes braſſy teſtaceous; margin and ſuture browniſh. Marſh.

Rugosus. Dull black; thorax rugoſe; antennæ and legs rufous. Marſh.

Nigro-Æneus. Linear, beneath black; above braſſy black; thorax poliſhed. Marſh.

Elongatus. Entirely cheſnut; wing-caſes ſtriated. Marſh.

Obsoletus. Braſſy black; wing-caſes obſoletely ſtriated; antennæ ſetaceous. Marſh.

Cyaneus. Entirely purple-blue minutely dotted; wing-caſes ſtriated. Marſh.

Nigrinus. Black; thorax punctured; wing-caſes ſtriate downy. Marſh.

ELATERIUM, in *Botany*, (ἐλατήριον, or *wild cucumber*, of the ancient Greek writers, from ἐλαύνω, *to urge, force*, or *impel*, is certainly *Momordica Elaterium* of Linnæus, well characterized by its fruit Dioſcorides; but the word being unoccupied as a generic name, was adopted by Jacquin for this American genus, whoſe elaſtic fruit agrees in that

respect with the original ελατηριον.) Jacq. Amer. 241. Linn. Gen. 477. Schreb. 619. Willd. Sp. Pl. v. 4. 192. Juss. 394. Class and order, *Monœcia Monandria*, or rather perhaps *Monœcia Monadelphia*. Nat. Ord. *Cucurbitaceæ*, Linn. Juss.

Gen. Ch. Male, *Cal.* none. *Cor.* of one petal, salver-shaped; tube cylindrical, straight, abrupt at the base; limb in five lanceolate, acute, equal, horizontal segments, whose edges are deflexed so as nearly to meet underneath, and whose intermediate notches are each furnished with a little tooth. *Stam.* Filaments simple, columnar, erect, rather shorter than the tube of the corolla; anther linear, continued in a five-folded zig-zag line, so as to make a ring crowning the filament. Female, *Cal.* none. *Cor.* as in the male. *Pist.* Germen inferior, roundish, somewhat incurved, clothed with soft prickles; style columnar, swelling upwards, inclosed within the tube; stigma capitate, large, cylindrical, convex at the summit. *Peric.* Capsule coriaceous, prickly, kidney-shaped, slightly compressed, of one cell and two unequal valves, of one cell filled with pulp; the dorsal valve is furnished with a highly elastic appendage, bearing the seeds, which it scatters at the slightest touch. *Seeds* several, about 18, imbricated, ovate, angular, flattened.

Ess. Ch. Male, Calyx none. Corolla salver-shaped. Female, Calyx none. Corolla salver-shaped. Capsule inferior, prickly, elastic, of one cell and two unequal valves. Seeds numerous, imbedded in pulp.

1. E. *carthaginense*. Jacq. Amer. 241. t. 154. Linn. Sp. Pl. 1375. "Leaves heart-shaped, angular."—Found on the summit of a hill at Carthagena by Jacquin, the only botanist who seems to have seen this plant, and from whom Linnæus adopted it. The *root* is supposed to be annual. *Stems* diffuse, or climbing by means of tendrils so as to cover all the neighbouring bushes, round, smooth, herbaceous. *Leaves* alternate, stalked, five-angular, heart-shaped, finely serrated; roughish above, smooth beneath. *Flower stalks* axillary, in pairs; one branched, bearing several male flowers; the other simple, with one female flower. *Flowers* white, fragrant in an evening only, not unlike those of Jasmine. It blossoms in October and November, soon ripening its fruit, whose pulp is watery, with the scent of a cucumber.

2. E. *trifoliatum*. Linn. Mant. 123. (Sicyos foliis ternatis; Gron. Virg. part 2. 191. "Leaves three-lobed, cut."—Gathered by Clayton in Virginia. He describes it as a small procumbent plant like a *Convolvulus*. *Leaves* on long stalks, three-lobed, cut, especially the side lobes. *Flowers* white, small, with a five-leaved hairy calyx, which, if true, does not agree with the generic character. *Capsule* brown, slightly hairy, of one cell and two valves bursting elastically when ripe. *Seeds* one or two, ovate. The elastic capsule induced Linnæus to remove this plant from his *Sicyos angulata*, with which he and others had confounded it, to the present genus. He does not appear to have seen any specimens, and he seems to mistake Clayton's description with respect to the leaves being ternate; we presume it rather expresses their being three-lobed.

Elaterium is the inspissated juice of the wild cucumber, (Momordica *Elaterium*,) an extremely violent purgative, which is sometimes employed in medicine, in dropsies, and other visceral disorders. The juice of the momordica has an unpleasant smell, and a nauseous bitter taste; on standing some hours it deposits a thick fecula. According to Beaumé, 230lbs. of the fruit will yield as much juice as when slowly evaporated to the proper consistence will produce 6½lbs. of the extract or elaterium. The dose of this powerful medicine is from one to three grains, and it generally operates violently.

ELATINE, in *Botany*, (ελατινη of the Greek writers, is thought to have been so called from ελατη, *a pine*, to which neither its form nor qualities, as mentioned by Dioscorides at least, seem to have any reference. Linnæus, however, took advantage of this allusion to apply the name to what Buxbaum had called Potamopitys, or Pond Pine, on account of its aspect.) Linn. Gen. 198. Schreb. 267. Willd. Sp. Pl. v. 2. 472. Sm. Fl. Brit. 433. Mart. Mill. Dict. v. 2. Juss. 300. Gærtn. t. 112. (Alsinastrum; Vaill. Par. 5. t. 1. f. 6.) Class and order, *Octandria Tetragynia*. Nat. Ord. *Inundatæ*, Linn. *Caryophylleæ*, Juss.

Gen. Ch. *Cal.* Perianth of four roundish, flat, permanent leaves. *Cor.* Petals four, ovate, obtuse, sessile, spreading, about the size of the calyx-leaves. *Stam.* Filaments eight, the length of the corolla; anthers simple. *Pist.* Germen superior, large, globose, a little depressed; styles four, erect, parallel, as long as the stamens; stigmas simple. *Peric.* Capsule globose, rather depressed, large, of four cells and four valves, the partitions fixed in the central column, opposite to each suture. *Seeds* numerous, oblong, curved, angular, inserted into the column.

Obs. Sometimes the flowers are only three-cleft, with six stamens.

Ess. Ch. Calyx of three or four leaves. Petals three or four. Capsule superior, of three or four cells, and as many valves; the partitions opposite to the fissures. Seeds many. *Sm. Engl. Bot.* 955.

1. E. *Hydropiper*. Linn. Sp. Pl. 527. Fl. Lapp. ed. 2. 124. Oed. in Fl. Dan. t. 156. Engl. Bot. t. 955. (Alsinastrum serpyllifolium, flore roseo tripetalo, et flore albo tetrapetalo; Vaill. Par. 5. t. 2. f. 1, 2. Hydropiper; Buxb. Cent. 2. 36. t. 37. f. 3.) Leaves in pairs.—Found in sandy inundated places throughout Europe, though not observed in Britain till the Rev. Mr. Williams found it in August 1798, on the eastern shore of Bomere pool, near Condover, Shropshire. Perhaps its close resemblance to *Montia fontana* may often have caused it to be overlooked.

The *root* is annual, white, and fibrous. *Herb* smooth in every part, generally under water, even the flowers, which remain closed to shelter the stamens. When out of the water, it appears from Vaillant that the petals assume a red tint. Luxuriant *flowers* are four-cleft, others three-cleft. The *stems* are procumbent, and take root as they go. *Leaves* opposite, spatulate, entire. *Flowers* on solitary, simple, axillary stalks.

2. E. *Alsinastrum*. Linn. Sp. Pl. 527. Sm. Fl. Brit. 433. *Huds.* 173. (Alsinastrum gratiolæ folio; Tourn. Inst. 244. Dill. in Rai Syn. 346. A. gailii folio; Vaill. Par. 6. t. 1. f. 6.) Leaves whorled.—Found in France, Switzerland, and Germany, growing in ditches and ponds. Its having been admitted into our British Floras, from whence it must now be excluded, arose from a most unaccountable error of Dillenius, whose memory, it could not be his judgment, misled him so far as to take *Centunculus minimus* for this plant, as his herbarium shews. The real E. *Alsinastrum* is a span or more in height, with hollow, round, straight, leafy *stems*, branched only at the base. *Leaves* whorled; those under water linear, narrow, about twelve in a whorl; those above the surface four, ovate, entire, ribbed. *Flowers* axillary, solitary, sessile, white. It blossoms in August, and is perennial.

What professor Leche found in ditches, near Abo, in Finland, and which Linnæus took for this plant, see Fl. Suec. ed. 2. 133, is the *Hippuris tetraphylla*, Linn. Suppl. 81, as appears from his herbarium; where also we learn that Pallas made the same mistake in Kamtschatka. This may almost excuse the above error of Dillenius. Retzius does not

not appear aware of his *Hippuris lanceolata*, fasc. 3. t. 1, being the *tetraphylla* of Linnæus, any more than the *Elatine Alsinastrum* of Fl. Suec. which last circumstance, one would think, might have occurred to this generally acute writer, when he was mentioning the similitude of the two plants being such as to render a description of his new *Hippuris* superfluous.

ELATINE, in *Medicine*, has been greatly recommended as an aperient, resolvent, and vulnerary. Its simple water has been used for the same purposes, though it retains very little of the virtues of the plant. The infusion is much better, and the expressed juice preferable still. It has been praised by some in leprous and scrofulous cases; also externally for cancerous and other eating ulcers. An ointment was made of it for these purposes. At present, however, it is very little used.

A combination of its active matter with honey, prepared by boiling four pints of the depurated juice with four pounds of clarified honey, was sometimes kept in the shops.

ELATITES, FIR-STONE, in *Natural History*, a name given by authors to that sort of petrified wood which shews the lineaments of the fir-tree wood, and has been originally either that or some wood of a like kind.

ELATITES was also a name used by the ancients for an iron ore, esteemed a species of hæmatites: it was of a yellowish white colour, and was more usually called xanthus.

ELATIUM, in *Ancient Geography*, a town of Decapolis, between Jordan to the west and Philadelphia to the east, towards the confines of Arabia Deserta; 90 miles from Damas and as far from Petra. Pliny mentions this town.

ELATMA, in *Geography*, a town of Russia, in the government of Tambof, on the Occa; 132 miles N. of Tambof. N. lat. 55° 2′. E. long. 41° 42′.

ELATOSTEMA, in *Botany*, from ελατος, *elastic*, and στημα, *the stamen of a plant*. Forst. Gen. t. 53. Juss. 403. (Procris; Commerson MSS. Juss. 403. Willd Sp. Pl. v. 4. 344. Poiret in Lamarck Encycl. v. 5. 627. tab. 763. f. 2?) A genus of plants referred by subsequent writers to *Dorstenia*, for Jussieu and Willdenow were not aware of *Procris* being precisely the same genus as Forster's *Elatostema*. How truly all the species comprized under both are really *Dorsteniæ*, we have not materials sufficient to determine. Their habit is more caulescent than the original ones, leaves undivided, lanceolate, or oblong, alternate, on short footstalks. Flowers in lateral round heads, having in one species, *Procris cephalida* Willd. 346, evidently the habit, structure, and seeds of a *Dorstenia*, but in others, *P. fagifolia* and *maculata*, more the appearance of a compound flower with an imbricated calyx, and scales between the florets. These latter species, however, do not agree with either Forster's or Commerson's generic description. Poiret has referred to *Procris* several plants still more generically distinct.

ELATRIA, in *Ancient Geography*, a town of Greece, in Thesprotia, a country of Epirus, situated at the mouth of the Aphas, in the lake of Ambracia.

ELATUM, a river of Greece, in Arcadia; the *Elaphus* of Pausanias.

ELATUS, a mountain of the island of Cephalonia. Pliny.

ELAVER, a river of Gaul; the modern Allier.

ELAY, in *Geography*, a river of Wales, in the county of Glamorgan, which runs into the Bristol channel, near Pennarth point.

ELBA, ELBE, *Elve*, an island of Italy, which, with the neighbouring islands of Capraja, La Pianosa, Palmajola, and Monte Christo, was added to the territory of France on the 26th of August, 1802, by right of conquest, and forms now a separate department, administered by a commissary general and a council of administration.

The island of Elba is situated in the Mediterranean sea, between the Etrurian or Tuscan coast, from which it is separated by a channel, 20 kiliometres, or about 12 English miles in breadth, and the island of Corsica, which is 50 kiliometres, or about 30 English miles distant from its shore. It shape is nearly triangular; its territorial extent 95 kiliometres, or about 20 leagues; and its chief towns are Porto Ferrajo, Porto Longone, Capolibri, Rio, Marciana, and Campo.

The climate of the island of Elba is milder than that of Etruria or Tuscany, on account of the sea breezes, which moderate its heat; and such is the influence of this climate, that although but 12 miles distant from the Tuscan coast, the soil produces plants and fruits which do not grow in Tuscany.

There is no river in the island, but it has a considerable number of springs. The Rio is the principal brook by which it is irrigated; it has its source near the town of Rio, flows through the celebrated mine also known by the same name, and after a course of a kiliometre runs into the sea. It is chiefly remarkable for the abundance of its waters; in its short progress it sets eighteen different mills in motion, and what is very extraordinary, the volume of its waters is increased and diminished with the length of the days; at the summer solstice, when other brooks are almost dried up, its stream is considerable.

The island of Elba is covered with high mountains, which offer a rich and spontaneous vegetation of multifarious odoriferous plants and shrubs, by which the atmosphere is perfumed. There are, however, a few extensive plains, of which that of Lacona is the principal. It opens a wide field to agricultural speculations, as the least labour would render it uncommonly fertile.

Grapes, which are plentiful, are converted into a wine resembling that of Spain; there is also a great abundance of figs and olives, Turkey corn, peafe, and beans, but little wheat. The trees which thrive best are the cork tree, the green oak, the lemon tree, the orange tree, and all the fruit trees of Europe except the apple tree; it is, however, supposed that the latter would thrive in the northern part of the mountains. Melons, particularly those known by the name of *Pastèques*, are excellent.

Notwithstanding the beauty of its climate and the fertility of its soil, the island of Elba is mostly unimproved by tillage. Pastures are scarce; there are no cattle reared, and there are very few horses and mules. Wood, owing to the carelessness of the inhabitants, is likewise scarce; pines, oaks, and other trees, would grow in the mountains, which are covered with a luxurious vegetation of various shrubs. And, notwithstanding the many flowers and odoriferous plants that cover the island, there are no bees. At the foot of the town of Porto Ferrajo is a salt work, but its harbour has a dangerous entrance; many more might be established in other parts of the island.

Nature appears to have heaped together all the treasures of mineralogy in the island of Elba. It has mines of gold, silver, copper, iron, magnet, lead, sulphur, vitriol, and quarries of marble, granite, slate, and others. But it is its iron, and chiefly the iron mine of Rio, which constitutes its principal riches. According to letters written at Vienna in 1780, on the natural history of the island of Elba, by Mr. Henry Koestlin to the Count de Borch, this small island supplied Corsica, Genoa, Tuscany, the Papal dominions, and part of the kingdom of Naples, with iron from the single mine of Rio, which afforded the prince of Piombino, to whom the

iſland belonged at that time, an annual revenue of nearly 50,000 crowns. The mines are now farmed, and produce annually 500,000 livres to the French government.

The moſt important branch of induſtry next to the mines is the Tunny fiſhery, which is extremely productive; and as its veſſels are now protected againſt the Algerine pirates by the French flag, the commerce of the iſland muſt be benefited by this circumſtance; its ſituation renders it, at leaſt, a moſt important ſtation for the French trade in general.

The whole population of the iſland of Elba amounts to 12,250 individuals; the electoral aſſembly is compoſed of 60 members. It contains three cantons, Porto Longone, Porto Ferrajo, and Marciana, and ſeven communes. Porto Longone is ſo called from the harbour, which is long and narrow, and is divided into the Upper and Lower Towns. The latter lies on the ſhore of the harbour, and the former contains a citadel on the ſummit of the hill. There is at Porto Ferrajo a court of juſtice, conſiſting of ſeven judges. Near this town, on a ſteep rock, ſtands the tower of Voltarajo, which can be reduced only by famine.

During the war, which ended at the peace of Amiens, the iſland of Elba was a long time occupied by the Engliſh; who, from this ſtation, ſucceſsfully annoyed the trade of their enemies in the Mediterranean ſea by their numerous cruizers. Herbin. Statiſtique de la France.

ELBE, a ſmall town of France, in the department of Lot and Garonne; ſix miles W. of Villefranche.

Elbe, in Latin *Albis*, and in the Bohemian language *Labe*, is one of the moſt conſiderable and important rivers in Germany. It has its ſource on the confines of Bohemia and Sileſia, in that part of the Carpathian mountains which is called the *Rieſengebürge*, or the Giants' Mountain, where the Oder and the Viſtula likewiſe take their riſe at an inconſiderable diſtance from each other. Its courſe is at firſt through Bohemia, where it receives the river Moldau above Melnick. It begins to be navigable at Leutmeritz, above which place it receives the river Eger, which comes from the Fichtelberg in Franconia. Leaving Bohemia, the Elbe enters the kingdom of Saxony, paſſes by Dreſden, and in the principality of Anhault Deſſau receives the Mulde not far from Deſſau; in the duchy of Magdeburg, it receives the Saale above Barby, flows afterwards through part of the German dominions of the king of Pruſſia, where, near Werben, not far from Havelberg, it receives the Havel, which communicates with the Oder by means of the Spree, through Berlin. The Elbe then purſues its courſe through the confines of the duchies of Luneburg and Mecklenburg Schwerin, where it receives the Elmenau, up to Hamburg, in the neighbourhood of which it divides itſelf into ſeveral branches that form ſeveral iſlands: but uniting its waters again below Hamburg, it divides Hanover from Holſtein, receives the Stör below Glückſtadt, and about one hundred Engliſh miles farther runs at laſt into the North ſea, not far from the iſland of Heiligeland or Heligoland. At its mouth, as well as in its courſe, particularly below Cuxhaven, which may be conſidered as the port of Hamburg, the Elbe forms ſeveral ſmall iſlands, and has many ſand banks, which render its navigation extremely difficult.

The principal places whoſe commerce is animated by the Elbe, are Dreſden, Lauenburg, Magdeburg, and Hamburg. The inland commerce of that great emporium of Germany by means of the Elbe was very conſiderable, before the occupation of Hanover by the French cauſed that fine river to be blockaded by an Engliſh ſquadron; it was, indeed, more extenſive than the commerce of the Rhine, or of any other river in Europe, although it laboured under ſeveral reſtrictions and inconveniences, ariſing from an exceſſive number of tolls, extravagantly high duties, and abſurd ſtaple privileges, ſuch as that of Magdeburg, where all veſſels, not under Pruſſian colours, or not laden with Pruſſian produce, were obliged to unload, and to re-ſhip their goods in Pruſſian veſſels, three hundred of which were employed by Magdeburg alone; and beſides this detention and loſs of time, goods ſent, for inſtance, from Pirna in Saxony to Hamburg had not leſs than thirty-two tolls to pay. Well might an old Engliſh chronicler ſtyle the German tolls "Mira inſania Germanorum." (Wicke's Chron. ad annum, 1260.) How far the newly created kingdom of Weſtphalia, through which the Elbe now flows in its progreſs from the kingdom of Saxony towards Hamburg, is likely to be influenced by more liberal maxims of commerce, and whether the circumſtance of both the new kings being members of the confederacy of the Rhine will lead to the adoption of leſs confined views of policy, it is impoſſible to conjecture: but the Elbe certainly appears deſtined to convey the principal commerce of Europe at ſome future period. The inland communication from Hamburg, by means of this river, extends from the weſtern and northern extremity of Germany, through the kingdoms of Weſtphalia and Pruſſia, to Auſtria, and the interior of Ruſſia, and even down the Dneiper to the Black ſea.

Many years ago, a canal was projected between the Elbe and the Weſer, to tranſport goods from Bremen to Stade, and ſo on to Hamburg. A ſluice was built at Stade: but from the nature of the ſoil the canal itſelf was found impracticable. However, the Elbe might eaſily be made to communicate with the Danube by the Moldau, which again might be connected with the Rhine, by either the Mayn or the Necker. (Oddy's European Commerce).

Elbe, a river of Germany, in the circle of the Upper Rhine, which runs into the Eder, two miles S.S.E. of Fritzlar, in the county of Waldeck.

ELBEDOUI, a town of Arabia, in the country of Yemen; 14 miles S. of Abu Ariſch.

ELBENAU, a ſmall town of the kingdom of Saxony, in that part which was formerly called the Electoral circle, (Churkocis) with a royal hunting ſeat. Together with the town of Gommern it conſtituted, in ancient times, the burggraviate of Magdeburg, which was a diſtinct province from the biſhopric of Magdeburg, which was ſecularized in favour of the electors of Brandenburg, by the title of a duchy, and now forms a valuable part of the new kingdom of Weſtphalia.

ELBERFELD, or Elverfeld, a town of Germany, in the grand duchy of Berg, which, ſince the late acceſſion of Joachim Murat to the throne of Naples, has been annexed to France. It is ſituated on the Wipper, 18 miles E. of Duſſeldorf. The new town, which is called Gemark, is remarkable for the beauty of its buildings. Its principal manufactures, which are very flouriſhing, are thoſe of linen cloth, thread, and thimbles. There are alſo ſome coal mines in its neighbourhood. Elberfeld counts 8700 inhabitants. It has 2500 weaver-looms, and 100 bleaching grounds; theſe laſt alone employ 700 individuals.

ELBERT, a county of America, in the Upper diſtrict of Georgia, between Tugulo and Broad rivers; the S.E. corner of the county is at their confluence, where ſtands the town of Peterſburgh. On the N.W. it is bounded by Franklin county. It is divided into 17 townſhips, and contains 10,094 inhabitants, of whom 2816 are ſlaves.

ELBERTON, a town in the above county, in which are the

the poſt-office and the ſeat of juſtice; 23 miles N.W. of Peterſburg.—Alſo, a poſt town of Effingham county, in the ſtate of Georgia, on the N.E. bank of Ogeechee river; about 19 miles W. of Ebenezer, 48 N.W. of Savannah, and 55 S.E. of Louiſville.

ELBEUF, a ſmall town of France, in the department of the Lower Seine, chief place of a canton in the diſtrict of Rouen, ſituated on the river Seine, 12 miles ſouth of Rouen, and 78 miles N.W. of Paris, with a population of 5400 individuals. It is particularly remarkable for its manufacture of woollen cloth, which was eſtabliſhed here under the adminiſtration of Colbert in 1666 by two Proteſtant gentlemen of the name of Le Monnier and Le Cointre, who, during the religious perſecutions, carried this manufacture to Holland. They were, however, replaced by Catholic manufacturers; the number of whom, in 1686, amounted to 28.

In 1687	Elbeuf made	3443 pieces of cloth.
1696	- -	5538
1750	- -	18,771
1768	- only	14,959

And this manufacture has declined ever ſince, and its decline has been much more ſenſible after the revolution of 1789. The canton of Elbeuf contains eight communes, and 16,096 inhabitants, upon a territorial extent of 50 kilometres.—Alſo, a ſmall town of France, in the department of Eure, 18 miles N. of Andely, with a fine caſtle.

ELBING, a conſiderable town of Pruſſia, in the circle of Marienburg, on the river Elbing, near a bay of the Baltic ſea, called the Friſche Haff. N. lat. 54° 12′. E. long. 20°, in a very fertile diſtrict; 36 miles S.E. of Dantzick, 120 miles N. by W. of Warſaw. Its origin dates from the year 1239; its firſt inhabitants were a colony from Lubeck; and Elbing was in the Hanſeatic league till the end of the 16th century. The fortifications have been demoliſhed ſince the town was ceded to Pruſſia by Poland, in the year 1772. The population in 1802 amounted to 19,200 individuals, without the garriſon, but has probably been reduced by the diſaſtrous war which terminated in the peace of Tilſit in 1807.

The trade of Elbing has always been conſiderable. From 1577 to 1660, there was an Engliſh trading ſociety at Elbing, which owed its diſſolution to political circumſtances. But it is chiefly from the year 1772, that its commercial importance had been progreſſively increaſing till 1806. Capital warehouſes have been erected in an iſland formed by the river Elbing and a moat. The corn warehouſes alone hold 30,000 laſts; and the cuſtom-houſe, which is in the ſame ſituation, keeps all goods that arrive by ſea from Pillau, at a moderate rent, till they are diſpoſed of. At the end of 1803, the ſhipping conſiſted of 7110 tons, beſides 50 coaſters and 25 lighters, which take cargoes to the ſhips loading at Pillau, diſtant about 50 miles. Veſſels of 100 tons may come up to Elbing and load the greateſt part of their cargoes at the warehouſes. But the trade with fir timber, deals, and ſtaves, is trifling, in compariſon with that of Dantzick. Flax is the principal article of exportation. Elbing has alſo a ſhare of the tranſit trade to the Ruſſian and Auſtrian provinces.

Elbing has an extenſive manufacture of ſoap, one of tobacco, two of weed-aſhes, two of ſtarch, a ſugar-houſe, and a ſaw-mill for cutting deals. The diſtrict of Elbing includes ten pariſhes. Oddy's European Commerce.

ELBINGERODE, or Elvelingerode, *Elvenigerode*, *Eilgerode*, a handſome town of Germany, in the principality of Grubenhagen, which formed part of the electorate of Hanover, is ſituated on a rivulet called the Bode, or Bude, in the Hercynian foreſt, in German the Hartz; 7 miles of Blankenburg, 5 of Wernigerode, and 15 S.W. of Halberſtadt. Its origin dates from the year 1189: but the oldeſt record which mentions Elbingerode as a walled town is of the year 1571. The walls, however, have long ago been deſtroyed. The number of houſes, which are moſtly new and handſome, having been almoſt all re-built, after a dreadful conflagration that conſumed the town on the 17th of May, 1753, amounts to 400. It contains 2500 inhabitants.

The diſtrict of Elbingerode is nearly ten miles long, and five miles broad. It abounds with wood and excellent paſtures; but is chiefly remarkable for its iron mines, two warm ſprings, quarries of marble and ſlate, and ruins of four ancient caſtles, one of which, called the Königſburg, was a hunting ſeat of the kings and emperors of Germany of the houſe of Saxony.

ELBOCORIS, or Elcoboris, a town of Spain, in the interior of Luſitania.

ELBONTIS, a town of Africa, between Egypt and Cyrene.

ELBOW, in *Anatomy*, is the joint formed between the humerus, radius, and ulna. See Extremities.

Elbow is alſo uſed by the architects, maſons, &c. for an obtuſe angle of a wall, building, or road, which diverts it from its right line.

Elbow *in the Hawſe*, in *Sea Language*, denotes a particular twiſt in the cables, by which a ſhip is moored.

Elbow *Iſland*, in *Geography*, an iſland in the north-weſtern part of lake Superior, in Upper Canada, which lies to the N.E. of the grand Portage, and W. of iſle Maurepas.

ELBUGA, a river of Ruſſia, in the government of Caucaſus, which runs into the Kagalinſk; 12 miles E. of Azoph.

ELBURG, or Elburch, a town of Guelderland, ſeated on the eaſtern ſhore of the Zuyder ſea; 34 miles N.N.E. of Utrecht. N. lat. 52° 28′. E. long. 5° 27′.

ELCESAITES, Helcesaites, or *Elceſaians*, as Theodoret calls them, ancient heretics, thus denominated from their great prophet Elceſai.

This Elceſai, by others called Elxai, was a Jew, attached to the worſhip of one god, and full of veneration for Moſes, who lived in the time of Trajan, and corrupted the religion of his anceſtors, by blending with it a multitude of fictions drawn from the oriental philoſophy; pretending alſo, after the example of the Eſſenes, to give a rational explication of the law of Moſes, he reduced it to a mere allegory. He is likewiſe ſaid to have adopted the ſentiments of the Ebionites, with regard to Jeſus Chriſt; though he altered and reformed them in ſome things, to denominate himſelf the author of a ſect.

His fundamental doctrines were, that Jeſus Chriſt, who was born from the beginning of the world, had appeared from time to time under diverſe bodies; that he was a celeſtial power, or virtue, called *the Chriſt*, whereof the Holy Spirit was ſiſter (note the Hebrew word for *ſpirit* is feminine); and that both of them had deſcended into Jeſus, the ſon of Mary, who was clothed with a corporeal appearance, but not with a real body.

The Elceſaites, according to St. Epiphanius, were by ſome alſo called *Sampſeans*, from the Hebrew word *ſames*, *ſun*. Scaliger was notoriouſly miſtaken, in holding that Elxai was no more than Eſſai, or Eſſene; on which ſuppoſition he made the Elceſaites the ſame with the ſect of Eſſenes, which is contrary to all antiquity.

Origen makes mention of the Elceſaites, in one of his homilies, as a herefy newly riſen. The retainers hereto, ſays he, do not admit all the books of the canon, but only ſome

ſome of them; they allow ſome paſſages out of the Old Teſtament and the Evangeliſts, but reject all the Epiſtles of St. Paul. Add, that they have produced a book, which they pretend deſcended to them from heaven: and maintain, that whoever perform what is enjoined therein, ſhall obtain pardon of all their ſins. See Euſebius, Hiſt. lib. vi. cap. 38, who remarks, that this hereſy became extinct almoſt as ſoon as it aroſe.

St. Epiphanius is very full on the ſubject of this ſect. Hær. 19, where he obſerves, that Elxai was a Jew by birth; and that, not being able to live according to the law of Moſes, he invented new opinions, and gained followers. He was a profeſſed enemy to virginity, and obliged all, who followed his doctrine, to marry. He tutored them to hypocriſy in times of perſecution; pretending it was lawful to adore idols, provided the heart had no ſhare therein.

Some have doubted whether the Eleeſaites ſhould be reckoned among the Chriſtian, or Jewiſh ſects; for though they acknowledged Chriſt as a great king, it is not certain whether they meant Jeſus Chriſt, or ſome other pretended Meſſiah.

ELCESIUM, in *Ancient Geography*, a town of Sicily. Ptolemy.

ELCHE, in *Geography*, a town of Spain, in the province of Valencia, in the midſt of plantains and olive-trees. The palm-trees, about the month of May, are loaded with fruit, in pendant cluſters, which, forming a complete circle, reſemble, when ripe, a crown of gold, with a plume of feathers riſing from its centre. Each cluſter, ſays Mr. Townſend, (Travels, vol. iii.) would, to appearance, nearly fill a buſhel, and is ſaid to weigh from ſix to ten arrobas. Elche is divided into three parihes, and contains 17,400 perſons. The great church is a beautiful building, with a majeſtic dome, and is elegantly fitted up. This city, which was the "Ilici" of the Romans, and may not be improperly denominated the "city of dates," from the palms that ſurround it, belongs to the count of Aldamira. It is governed by his corregidor, four regidors, as many deputies from the commons, two alcaldes, and one alguazil mayor. The ducal palace is ſituated on the brink of a deep ravin, and bears the marks of the moſt remote antiquity. It was recovered from the Moors by Peter, ſurnamed the Cruel, A. D. 1363. Elche is diſtant four or five leagues S.W. from Alicant. Its environs abound in wine and fruit.

ELCHINGEN, originally *Aichöingen*, formerly a rich imperial abbey of Germany, on a high mountain cloſe by the Danube, ſurrounded on all ſides by the territory of Ulm. At the peace of Luneville it was ſecularized and given as an indemnity to the king of Bavaria. It is from this place that the French marſhal Ney takes his new title of duke.

ELCOSIS, or Helcosis, from ἕλκος, *an ulcer*, ſometimes alſo *elcoma*, or *helcoma*, terms ſynonymous with *exulceratio*. Sauvages uſes the word *Elcoſis* as the generic title; and the ulcerations which occur in ſmall-pox, ſyphilis, ſcrofula, &c. conſtitute the ſpecies. See Noſol. Meth. claſs X. gen. 27.

ELDA, in *Geography*, a town of Spain, in the province of Valencia; 20 miles W N.W. of Alicant.

ELDAGSEN, or Eldagshausen, a town of Germany, in the circle of Lower Saxony, and principality of Calenberg; 16 miles N.E. of Hameln.

ELDANA, in *Ancient Geography*, a town of India, on the other ſide of the Ganges.—Alſo, a town of Spain, in the Tarragoneſe territory, in the country of the Vaccæans. Ptolemy.

ELDEN Hole, in *Geology*, a natural cavern in Derbyſhire, about three miles from Caſtleton, and four from Buxton, is juſtly conſidered one of the wonders in the peak. And a writer, who gives a deſcription of it from an actual ſurvey, near a century ago, properly obſerves, "would former writers have been content with one wonder inſtead of ſeven, it would have done more honour to the peak, than the adding the ſix imaginary miracles to it, that had nothing in them; and which really depreciated the whole." Indeed, the character anciently given of three will all apply to this;

"Mira alto pecco tria ſunt, barathrum, ſpecus, antrum."

And it may be added, if a modern traveller, who has given an account of this geological curioſity, had not been impoſed upon by the deſcription of thoſe fond of the marvellous, his work would not have been the leſs valued by thoſe who have too much good ſenſe to become the dupes of credulity. Elden Hole is a large, deep, perpendicular chaſm in the limeſtone ſtrata of a hill, which forms part of the elevation termed the *peak*; and from the difficulty which has attended the attempts to aſcertain its real depth, and the variation in the accounts, it has been reckoned unfathomable, or, what is vulgarly termed, without a bottom. From the buſhes, brambles, and projecting maſſes of ſtone which encumber the margin of the aperture, it is not eaſy to obtain a proper ſtation to plumb it with accuracy. More than a century ago, Mr. Cotton affirmed, that, after letting down 884 yards, he was unable to reach the bottom; the plummet ſtill drew, and the line, when drawn up, appeared to have paſſed through deep water. According to this ſtatement, it muſt have been near half a mile in depth. Another gentleman let down a line 933 yards, without diſcovering a bottom. From a probable ſuppoſition, that in all theſe inſtances the plummet might have been unſkilfully uſed, recourſe was had to another mode of diſcovering its depth. Stones were ſeverally let fall into the cavern, and the time, as accurately obſerved from the delivery out of the hand, till the reverberated ſound from the bottom of the abyſs reached the ear, was 9′ 11″ 10‴. Allowing, therefore, with Dr. Halley, that ponderous bodies fall ſixteen feet and a half in one minute, and the velocity of ſound to be 1142 feet *per* ſecond, it will follow, from the compound equation of the deſcending body, and the aſcending ſound, that the depth of the cavern is 1266 feet, or 422 yards. Dr. Short again tried to aſcertain the truth of this reſult, by plumbing from ſeven different ſtations, from ſix of which he could only ſink the plummet 192 yards; but from the ſeventh, after repeated trials, it ſunk 295 yards, forty of which the line appeared to have paſſed through water. Thus, has the depth been diminiſhing by the repetition of inveſtigation, as the marvellous part of it has been abating, by the extenſion of ſcience. An account of a perſonal deſcent, by Mr. Lloyd, into this fiſſure is given in the ſixty-firſt volume of the Philoſophical Tranſactions; which, as it appears to be a plain unexaggerated deſcription of this celebrated place, may be acceptable to ſuch as might not chooſe to gratify their curioſity, or inform their judgment, by a perſonal ſurvey of this ſubterraneous cavern, "this terrific profound abyſs of ſpace and horror." The entrance into Elden Hole conſiſts of a fiſſure in length from north to ſouth about thirty yards, and nine wide. The deſcent was for twenty yards in an oblique direction, when the aperture of the fiſſure contracted, and the paſſage became narrower, and more difficult from lateral projecting crags. Ten yards beneath this the rope, by which Mr. Lloyd was ſuſpended, reflected fall ſix yards from the perpendicular, and at this depth the length of the opening

opening appeared about ſix, and the breadth three yards. The ſides were very irregular, covered with various moſſes, and dripping continually with water. When he had deſcended forty-eight yards, the rock opened on the eaſtern ſide; and at ſixty-two yards he ſwung to the floor of the cave. The light he deſcribes as ſufficient to ſee to read the ſmalleſt print; and by means of which he was enabled to explore the interior of the cavern. This conſiſts of two parts; the one cavity being like a large oven, and the other ſimilar to the dome of a glaſs-houſe, with a vaulted communication between them. The largeſt is about fifty yards in diameter, and the height too great for aſcertaining with facility. At the entrance is a grand ſtalactitical column, ninety feet in height. To the ſouth of the ſecond cavity is a third ſmaller hole twelve feet long, and ſix feet wide, beautifully ceiled with gold-coloured ſtalactites: to the north is another ſmall hole, and a large fragment of rock ſpangled with a ſimilar ſubſtance. From the margin of the ſecond cavern projects a large maſs of rock covered with ſtalactites, and ſhaped like a buttreſs. The cavern, ſixty feet in height, is internally craggy, and lined with ſtalactitical concretions; ſome of which hang from the roof, like pendent drops and icicles, from four to five feet long, and two in diameter. In different directions are ſeveral columns with incruſtations, covering the lime-ſtone like a party coloured varniſh; the firſt a deep yellow, the ſecond a ſtone colour, and the third a rough efflorescence in the ſhape and colour of roſes. Such are the particulars of this extraordinary cavern, as delivered by Mr. Lloyd, and the account as to the depth of it is confirmed by ſeveral miners, who have ſince deſcended for the purpoſe of aſcertaining it. What was the cauſe of ſuch a cavernous ſpace, or by what convulſive throes of earth ſuch fiſſures as this have been made in the moſt ſolid parts of the ſtrata, has exerciſed the ingenuity of the moſt able philoſophers. Some have contended that they are viſible demonſtrations of the univerſality of the deluge, and of the globe having been in a ſtate of ſolution and mixture. And an advocate for this theory in its *fulleſt extent*, Mr. Catcott, conſiders them as *ſwallet holes*, by which the waters, which for the purpoſe of drowning the world had been brought from the great abyſs at the centre of the earth, again retreated at its reformation. But one queſtion does not appear to have been anſwered by the advocates of this ſyſtem. For if, as they ſtate, the power of gravity were removed, ſo that the whole ſubſtance of the globe was in a ſtate of ſolution and intermixture; how came theſe fiſſures to remain? or be again formed in the ſolid rocks, when the power of gravity had been reſtored? Another, but equally improbable account, has been given as a ſatisfactory one. "This cavern ſeems to have been occaſioned by ſome *ſhake*, as it is here provincially termed, or depreſſion of the earth, effected by the force of water. When the ſubterraneous paſſage, which carries off the circulating water from theſe inviſible caverns, is plugged up, ſo that its vent is ſtopped, being an incompreſſible body; and the impinging weight of ſeveral columns of the ſame fluid are added to the prodigious preſſure, they will force a new vent in ſome direction, and having lifted up the ſuperincumbent earth and once got vent, leave the earth to ſubſide wherever it may." The language of this account is philoſophical, but the reaſoning is unſatisfactory. For as theſe ſhakes, or caverns, are obſerved to exiſt in the drieſt parts of the earth, in indurated rocks; and almoſt invariably in lime-ſtone ſtrata, a ſubſtance of eaſy ſolubility in water; a ſimple mode of accounting for ſuch fiſſures inſtantly preſents itſelf, only admitting that at ſome period or other theſe parts of the globe were once ſubmerged, or that "the waters once prevailed over the earth." Nature is ſimple in her energies, and though ſhe exhibits infinite variety, yet a conſtant analogy prevades the whole of her operations. Theſe fiſſures evidently appear to have been formed at the departure of the waters, in the time of ſome deluge, by the ſudden abſorption of moiſture, and condenſation of the derelict matters; the ſubſtances of ſuch rocks in which they are found exhibiting, by the marine exuviæ imbedded in them and other extraneous matters, that they have once been in a ſtate of ſolution. This is clearly evinced by a fact, which often takes place in modelling, to the great annoyance of the artiſt; when the ſubſtances under his plaſtic hand, by a too ſudden evaporation of the aqueous particles, crack in various directions: or as is more viſibly exemplified in lands compoſed of argillaceous ſoils, where the ground, after great or ſudden drought, is ſeen to crack, and exhibit clefts or crannies of conſiderable length, breadth, and depth. This ſimple and eaſy ſolution of the phenomenon accords with any theory, in which the earth is ſuppoſed to have been once covered with water. But reſpecting Elden Hole it appears, whether naturally or artificially made, to have been once a mine. For in the floor of the largeſt cavern is a ſhaft now covered, which once reached to the water; and is by ſome ſuppoſed to be a continuation of the ſubterraneous river, which runs out of the cave at Caſtleton, and there diſcharges a kind of grit only found in Elden Hole.

ELDER, a word uſed in ſome parts of the kingdom for fuel. Dict. Ruſt.

Elder *Tree*, in *Botany*. See Sambucus.

The common elder will grow on any ſoil, or in any ſituation; the trees are frequently ſeen growing out of old walls, or cloſe to ditches, in very moiſt places, or from the hollow of another tree; for wherever the ſeeds are ſcattered, the plants will come up. The leaves and ſtalks are ſo bitter and nauſeous, that few animals will browſe upon them.

The young ſhoots of this tree are very full of pith; but as the trees grow old, the wood becomes very hard, and will poliſh almoſt as well as the box tree; and is often uſed for the ſame purpoſe.

The bark, leaves, flowers, and berries of this tree, are uſed in medicine. The inner bark is eſteemed good for dropſies. Sydenham directs three handfuls of the inner bark to be boiled in a quart of milk and water, till only a pint remains, of which one half is to be taken in the morning, and the other at night; and this repeated every day. Boerhaave recommends the expreſſed juice of the middle bark, given from a dram to half an ounce, as the beſt of hydragogues, when the viſcera are ſound. The leaves, which are ſaid to be purgative and emetic, are outwardly uſed for the piles and inflammations. The flowers are inwardly uſed to expel wind; infuſions made from them while freſh are gently laxative and aperient; when dry, they are ſaid to promote the cuticular excretion, and to be particularly ſerviceable in eryſipetalous and eruptive diſorders; and the berries are eſteemed cordial, and uſeful in hyſteric diſorders; and are frequently put into gargariſms for ſore mouths and throats. Miller and Lewis.

Officinal preparations of the elder, are the aqua florum ſambuci, the oleum ſambucinum, the unguentum ſambucinum, made of the leaves and inner bark, and alſo of the flowers, and the ſyrupus ſambuci. See Sambucus.

On the trunk of this tree frequently grows a fungous excreſcence, wrinkled, and turned up like an ear, whitiſh on the outſide, and black within, with ſeveral little veins. Theſe are called Jew's ears, auriculæ Judæorum; they are accounted good for inflammations and ſwellings of the tonſils, ſore throats, and quinzies.

Elder, *Marſh*, or *Water*. See Viburnum.

ELDERS, Seniors, in the *Jewish History*, were the most considerable persons, for age, experience, and virtue, among that ancient people; probably the heads of tribes, or rather of the great families of Israel, who, before the settlement of the Hebrew common-wealth, exercised government and authority over their families, and the people. Moses, we read, assembled the elders of the people together, and acquainted them with what the Lord had commanded. (Exod. xii. 16. 21. iv. 29, &c.) Moses and Aaron treat the elders of Israel as representatives of the Jewish nation. The number of these elders was 70; but we may suppose, that as there were 12 tribes, there were 72 elders, 6 of each, and that 70 is set down instead of 72; or rather Moses and Aaron made the 71st and 72d, and exclusively of them, there were but 4 elders of the tribe of Levi. This establishment of 70 elders by Moses seems to have continued, not only during his life, but under Joshua likewise, and under the Judges.

Long afterwards, those who held the first rank in the synagogues were usually called זקנים, *zekenim*, *elders*, in imitation of the seventy elders, whom Moses established for the judges of the sanhedrim. Numbers xi. 16, 17. 24, 25. Exod. xxiv. 1. 9. 14. See Sanhedrim.

The president, or chief, had, in a particular manner, the appellation of elder; being, as it were, the *decanus seniorum*, dean of the elders.

In the assemblies of the primitive Christians, those who held the first place or rank assumed the denomination of presbyters, or elders; for the word *presbyters*, which occurs so frequently in the Old Testament, and which includes alike both bishops and priests, does properly signify elders. See M. Simon's observation thereon, in his Supplement aux Ceremonies des Juifs.

The president, or bishop, as being the chief of the elders, did likewise assume the denomination of elder; whence it is, that in the New Testament the name bishop is frequently confounded with that of presbyter. See Bishop, and Presbyter.

For the like reason, the council of the first churches was called *presbyterium*, or council of the elders, where the bishop presided in quality of first elder, being seated in the middle of the other elders. The priests, or elders, who sat by him, had each his judge's chair; for which reason they are called, by the fathers, *assessores episcoporum*. Nothing of any importance was done till it had first been examined, and resolved, in this assembly, where the bishop only made one body with the other elders, or priests; the jurisdiction which we now call episcopal, not being then dependent on the bishop alone, but on all the elders, over whom he was only the president.

Elders is also a denomination still retained in the presbyterian discipline.

The elders are officers, who, in conjunction with the pastors, or ministers, and deacons, compose the consistories, or kirk-sessions, meeting to consider, inspect, and regulate matters of religion and discipline. They are chosen from among the people, and are received publicly with some degree of ceremony. In Scotland, there is an indefinite number of elders in each parish; generally about twelve. See Kirk-*Sessions*, and Presbytery.

EL DORADO, or Manoa, a fabulous region and city, supposed to exist in the Spanish dominions of America, abounding with gold, and distinguished by a community of Amazons. The late discussions of Depons concerning this city are of little moment; as it is now known that Manoa only signifies a lake or a river; and the name originally belonged to a river, which runs into the Ucaial. See Manoa.

ELDPACH, in *Geography*, a town of Germany, in the archduchy of Austria; 6 miles S. of Ips.

ELEA, or Elæe, in *Ancient Geography*, a river of Italy, in Lucania, on this side of the Apennine, which gave name to the gulf, called by the ancients "Eleates Portus" and "Eleates Sinus." It is at present *Piscista*.

ELEANOR of Guienne, in *Biography* queen of France and England, was married in 1137, at the age of fifteen, to Louis VII. king of France, to whose dominions her estates, as heiress of William, last duke of Guienne, made a very considerable addition. She had two daughters by Louis, whom she accompanied to Palestine. Her own conduct and intrigues with the prince of Antioch, and with a young handsome Turk named Saladin, led to a divorce, which took place in 1152. In the following year she married Henry duke of Normandy, who succeeded to the throne of England, in 1154, under the title of Henry II. Henry, by the possessions of his wife, became a formidable rival to the French king, who had reason ever afterwards to regret the separation for which he had pressed. From her own indiscretions Eleanor had been divorced from her first husband, yet she could not overlook similar failings in Henry, and by her jealousy of fair Rosamond, caused much uneasiness to the king. (See Rosamond.) Her jealousy has been called in by historians to account for the rebellion of her sons against the king, whose unnatural conduct has been imputed wholly to her instigation. She was at length seized, and imprisoned just as she was attempting to escape to France. In confinement she remained several years, but on the accession of Richard I. in 1189, she was set at liberty, and was, when he went upon his crusade, made regent of the kingdom. The zeal which she manifested for this prince led her to considerable exertions on his behalf: she went to Navarre to procure him, for a wife, Berengaria, daughter of the king of the country; and when Richard, on his return from Palestine, was imprisoned in Germany, she proceeded thither with a ransom accompanied by the chief justiciary in 1194. After his death she supported the succession of John her son, in prejudice of her grandson Arthur. She died in 1202; though, according to some writers, she took the veil this year, at the abbey of Fontevrault, and there finished her busy and chequered life in the year 1204. Moreri. Hume's Hist. vol. i.

ELEATIC Philosophy, among the *Ancients*, a name given to that of the Eleatic sect, so called because three of its most celebrated preceptors, Parmenides, Zeno, and Leucippus were natives of Ἐλέα, in Latin Velia, a town in Magna Grecia, built by a colony of Phocæans in the time of Cyrus.

The founder of this philosophy, or of the Eleatic sect, is supposed to have been Xenophanes, who lived about the fifty-sixth Olympiad, or between five and six hundred years before Christ. (See Xenophanes.) This sect was divided into two parties, which may be denominated metaphysical and physical; the one rejecting, and the other approving, the appeal to fact and experiment. Of the former kind were Xenophanes, Parmenides, Melissus, and Zeno, of Elea. To the latter class belonged Leucippus, Democritus, Protagoras, Diagoras, and Anaxarchus. For the peculiar and distinguishing tenets of each of these philosophers, see their respective articles. Of the writings of the Eleatic school, nothing remains except a few fragments collected by Henry Stephens; and therefore we chiefly depend for information concerning this sect upon the authority of Plato and Aristotle. We may here observe in general that the philosophers of the first class are supposed to have maintained principles not very unlike those of Spinoza; they held the eternity and immutability of the world; that whatever existed was only one

one being; that there was neither any generation nor corruption; that this one being was immoveable and immutable, and was the true God; and whatever changes seemed to happen in the universe, they considered as mere appearances and illusions of sense. However, some learned men have supposed, that Xenophanes and his followers, speaking metaphysically, understood by the universe, or the one being, not the material world, but the originating principle of all things, or the true God, whom they expressly affirm to be incorporeal. Thus, Simplicius represents them as merely metaphysical writers, who distinguished between things natural and supernatural; and who made the former to be compounded of different principles. Accordingly, Xenophanes maintained, that the earth consisted of air and fire, that all things were produced out of the earth, and the sun and stars out of clouds, and that there were four elements. Parmenides also distinguished between the doctrine concerning metaphysical objects, called truth, and that concerning physical or corporeal things, called opinion; with respect to the former, there was one immoveable principle, but in the latter two that were moveable, *viz.* fire and earth, or heat and cold; in which particulars Zeno agreed with him. The other branch of the Eleatic sect were the Atomic philosophers, who formed their system from their attention to the phenomena of nature. See ATOMIC *philosophy*, EPICUREANS, and STOICS. See a farther account of the opinions of these ancient philosophers in Cudworth's Intellectual System, and Brucker's Hist. of Philos. by Enfield, vol. i.

ELECAMPANE, in *Botany*. See INULA.

The root of the *inulo*, or elecampane, has been long famous in all disorders of the breast and lungs. It is also recommended as a sudorific and alexipharmic, and, as such, has a place in most of the compositions of that intention. Taken freely, it is said to gently loosen the belly, and increase the urinary discharge. The dose of the dry root in substance is from a scruple to a dram, or two. An ointment made of the fresh roots and leaves with lard, is also much recommended in the itch, and other cutaneous foulnesses. The roots yield in distillation an essential oil, which concretes into white flakes, resembling camphor in many of its properties, and soluble in spirit of wine. An extract may also be obtained from the dry root, both by water and spirit; an ounce yielding by water 6½ drams, and by spirit 2½.

ELECAMPANE, *Bastard*. See HELENIA.

ELECAMPANE *Wine*. See WINE.

ELECT, from *eligo*, I chuse, chosen, in the *Scripture*, is applied to the primitive Christians. In which sense, the elect are those chosen and admitted to the favour and blessing of Christianity.

ELECT, in some systems of *Theology*, is a term appropriated to the saints, or the predestinated. In which sense the elect are those persons who are said to be predestinated to glory as the end, and to sanctification as the means.

Dr. Taylor, in his excellent Paraphrase, &c. on the Epistle to the Romans (p. 96.) observes, that some of the expressions, whereby the *antecedent* blessings are signified, (that is, those benefits, which were granted to mankind by the mere grace of God, antecedently to their obedience, and without respect to it, but so that they were intended to be motives to obedience), such as *elect*, *justify*, *sanctify*, &c. may be used in a double sense; namely, either as they are applied to all Christians in general, in relation to their being translated into the kingdom of God, and made his peculiar people, enjoying the privileges of the gospel, or as they signify the *effects* of those privileges, *viz.* either that excellent disposition and character, which they are intended to produce, or that final state of happiness, which is the reward of it. Wherever any blessing is assigned to all Christians, without exception; wherever it is said, not to be of works; wherever Christians are exhorted to make a due improvement of it, and threatened with the loss of God's blessing, and of eternal life, if they do not, in this case the expressions, which signify that blessing, are to be understood in a general sense, as denoting a gospel privilege, profession, or obligation. And in this general sense, *saved*, *elect*, *chosen*, *justified*, *sanctified*, are sometimes used, and *calling*, *called*, *election* are, as this writer conceives, always used, in the New Testament. But when any blessing connotes real holiness, as actually existing in the subject, then it may be understood in the special and eminent sense, and always must be understood in this sense, when it implies the actual possession of eternal life: and in this sense *saved*, *elect*, *chosen*, *justify*, *sanctify*, *born of God*, are sometimes used. (Matt. xx. 16. xxiv. 31. xii. 36, 37. 1 Thess. v. 24. 1 John, ii. 29. iv. 7.) See ELECTION and PREDESTINATION, ARMINIANS, CALVINISTS, &c.

ELECT is likewise applied to archbishops, bishops, and other officers, who are chosen, but not yet consecrated, or actually invested with their office, or jurisdiction.

The emperor is said to be elect, before he is inaugurated and crowned; a lord mayor is elect before his predecessor's mayoralty is expired, or the sword is put in his hands.

ELECTARY, in *Pharmacy*. See ELECTUARY.

ELECTI, in *Church History*, a sect of heretics, who neither used flesh nor married. See AUDITORS.

ELECTION, a choice made of any thing, or person, whereby it is preferred to some other.

There seems this difference, however, between *choice* and *election*, that election has usually regard to a company or community, which makes the choice; whereas choice is seldom used, but when a single person makes it.

We say, the election of a bishop, a member of parliament, &c. See BISHOP, BURGESS, PARLIAMENT, *Scots* PEERS, SHERIFF, &c.

The most solemn election is that of a pope; which is performed by the cardinals in four different ways. The first by the Holy Spirit, as they call it: when the first cardinal who speaks, having given his vote for any person, proceeds to the adoration, and proclaims him pope, as by a sudden inspiration of the Holy Ghost. In which case he is deemed duly elected, if all, or at least two-thirds of the assembly, be consenting thereto.

The second, by compromise, when the whole college pitches on three cardinals, to whom they give a power of nominating the pope; which power expires upon the burning out of a candle lighted on that occasion.

The third by way of poll or scrutiny, which last is the most usual; the cardinals throwing sealed tickets, on which their votes are written, into a chalice, or cup, placed on the altar. Two-thirds of the votes are required to determine an election by scrutiny.

The fourth is by way of accession; when the votes being too much divided to elect any body, some of the cardinals desist from their first suffrage, and accede, that is, give their voices to him, who has already the majority by scrutiny.

The way of accession, however, is always added to the scrutiny; it being the constant practice for all the cardinals to give their voices, after the last scrutiny, to him whom they find to have the plurality already. So that all elections of popes are with the unanimous consent of all the cardinals. See CARDINALS, CONCLAVE, and POPE.

ELECTION *of numbers*, or *quantities*, in *Arithmetic* and *Algebra*, denotes the different methods of taking any numbers or quantities given, either separately, or in pairs, &c. or it is the sum of all the combinations that can be made

with a different number of quantities, in each set of combinations, out of any number of quantities proposed. Thus, the election of three quantities *a, b, c*, is 7: *a, b, c, ab, ac, bc, abc*; of four quantities 15; and if N represent the number of quantities given, $2^{N} - 1$ is equal to the number of elections required; but as the single quantities are equal in number to the given quantities, the number of proper elections will be $2^{N} - N - 1$. See COMBINATION.

ELECTION *of a clerk of statutes merchant*, in *Law*, a writ that lies for the choice of a clerk assigned to take bonds called statutes merchant. It is granted out of chancery, on suggestion that the clerk, formerly assigned, is gone to dwell at some other place, or is under an impediment to attend the duty of his office, or that he has not land sufficient to answer his transgressions, if he should act amiss. Fitz-Herb. Nat. Brev 164.

ELECTION *of ecclesiastical persons*. Elections for the dignities of the church ought to be free, according to the stat. 9 Ed. II. cap. 14. If any persons, that have a voice in elections, take any reward for an election in any church, college, school, &c. the election shall be void. And if any persons of such societies resign their places to others for reward, they incur a forfeiture of double the sum; and both the parties are rendered incapable of the place. Stat. 31 Eliz. cap. 6.

ELECTION *of a verderor of the forest (electione viridariorum forestæ)*, a writ that lies for the choice of a verderor, where any of the verderors of the forest are dead, or removed from their offices. This writ is directed to the sheriff, and the verderor is to be elected by the freeholders of the county, in the same manner as coroners. New Nat. Brev. 366.

ELECTION, in *Metaphysics*, is also the state of a person who is left to his own free will, to take or do either one thing or another, which he pleases. See LIBERTY.

ELECTION, in *Theology*, signifies the choice which God, of his good pleasure, makes of angels or men, for the objects of mercy and grace.

The election of the Jews was the choice God made of that people to be more immediately attached to his worship and service, and for the Messiah to be born of them.

This grand and gracious design of Providence commenced with the selection of one family of the earth, to be a repository of true knowledge, and the pattern of obedience and reward among the nations. To this family God particularly revealed himself, visited them with several public and signal dispensations of providence, and at last formed them into a nation, under his special protection, governed them by laws delivered from himself, and placed them in the open view of the world; first in Egypt, and afterwards in the land of Canaan. The head or root of this family was Abraham, who, though he had been an idolater, was selected for this important and beneficial purpose. Accordingly God established a covenant with Abraham, and his seed, or posterity after him, and appointed circumcision as a token of the certainty and perpetuity of this covenant. For about 215 years, from the time when God ordered Abraham to leave his native country, he and his son Isaac, and grandson Jacob, sojourned in the land of Canaan, under the special protection of heaven, till infinite wisdom thought fit to send the family into Egypt, which was then, as it were, the headquarters of idolatry, that they might there increase and become a great nation. At length God delivered them from the servitude of Egypt by dreadful displays of his almighty power, by which he demonstrated himself to be the one true God, in a signal and complete triumph over idols, even in their metropolis, and in a country celebrated among all surrounding nations. Thus freed from the most humiliating and oppressive bondage, he formed them into a kingdom, of which he himself was the sovereign; gave them a revelation of his nature and will, instituted sundry ordinances of worship, taught them the way of truth and of life, and set before them various motives to duty; promising singular blessings to their obedience and fidelity, and threatening apostacy and disobedience, or revolt from his government, with very awful judgments. Having settled their constitution, he led them through the wilderness, where he disciplined them for 40 years, caused them to triumph over every kind of opposition, and at last brought them to the promised land. It is here to be observed, that God did not choose the Israelites from any partial regard to that nation, nor because they were better than other people, (Deut. ix. 4, 5) and would always observe his laws. Indeed, he knew the contrary (Deut. xxxi. 29. xxxii. 5, 6. 15.) It was, indeed, with great propriety, that, among other advantages, he gave them also that of being descended from progenitors illustrious for piety and virtue; and that he grounded the extraordinary favours they enjoyed upon Abraham's faith and obedience (Gen. xxii. 16. 17, 18.) But it was not on account of the moral character of the Jewish nation that God made choice of these people; any other nation would have served as well in this respect; but as he thought fit to select one nation of the world, to answer the purposes of his all-wise and benevolent providence in the moral administration of the world, he selected the Israelites, from respect to the virtue and piety of their ancestors. (Exod. iii. 15. vi. 3, 4, 5. Deut. iv. 37.) It should also be observed, that God selected the Israelitish nation, and manifested himself to them by various displays of his power and goodness, not principally for their own sakes, to make them a happy and flourishing people; but to be subservient to his own great and kind designs with regard to all mankind. The selection of this nation, and the divine dispensations respecting it, would serve as a public voucher of the being and providence of God, and of the truth of the revelation delivered to them in all ages, and in all parts of the world. Accordingly the divine scheme, in relation to the Jewish polity, had reference to other people, and even to us at this day, as well as to the Jews themselves. In proof of which we may add, that the situation of this nation, lying upon the borders of Asia, Europe, and Africa, was very convenient for such a general purpose. This scheme was also wisely calculated to answer great ends under all events. If this nation continued *obedient*, their visible prosperity, under the guardianship of an extraordinary providence, would afford very extensive and useful instruction to the nations of the earth. If these people were *disobedient*, their calamities and dispersions would answer a similar purpose, by spreading the knowledge of the true God, and of revelation, in the countries where before they were not known. So wisely was this scheme laid at first, with regard to the laws of the nation, both civil and religious, and so carefully has it all along been conducted by the divine Providence, that at this day, more than 3600 years from the time when it first took place, it is of great importance and of public use, for confirming the truth of revelation: not only because the Christian profession, diffused over a great part of the world, has grown out of this scheme, but as the Jews themselves, in virtue of it, after a dispersion of about 1800 years, over the whole face of the earth, every where in a state of ignominy and contempt, have, notwithstanding, subsisted in great numbers, distinct and separate from all other nations. This small nation, generally despised

and hated, harassed and persecuted, has subsisted in a body, distinct and separate from all other people, even in a state of dispersion and of general contempt and oppression, for nearly 1800 years, agreeably to the prediction. (Is. xlvi. 28.) Hence we derive a demonstration, that the wisdom, which so formed them into a peculiar body, and the providence, which has so preserved them, that they have, almost ever since the deluge, subsisted in a state divided from the rest of mankind, and are still likely so to remain for a longer period, is not human, but divine. For no human wisdom or power, could form, or, however, could execute, such a vast, extensive design.

As God, in his infinite wisdom and goodness, was pleased to prefer the Israelites before any other people, and to single them out for the purposes of revelation, and for preserving the knowledge, worship, and obedience of the true God, he is said to *choose* them, and they are represented as his *chosen*, or *elect* people. (Deut. iv. 37. vii. 6. x. 15. 1 Kings, iii. 8. 1 Chron. xvi. 13. Ps. xxxiii. 12. cv. 6. 43. cvi. 5. cxxxv 4. Is. xli. 8, 9. xlii. 20. xliv. 1, 2. xlv. 4. Ezek. xx. 5. Is. xiv. 1. Zech. i. 17. ii. 12.) The first step that was taken by the almighty sovereign, in execution of his purpose of election, was to rescue them from their state of bondage and idolatry in Egypt, with a view to which they are said to be *delivered, saved, bought*, or *purchased*, and *redeemed*. Moreover, as they were not only rescued from Egypt, but invited by the Almighty to the honour and happiness of his people, and by many express declarations and acts of mercy engaged to adhere to him as their God, he is said to *call* them, and they were his *called;* and many other expressions occur, which describe not only their deliverance from an oppressed condition, but their establishment in a more happy, and their investiture with many privileges and honours. All the blessings, to which we have already referred, and others of a similar kind which might have been enumerated, were conferred on the Israelites, as the elect people of God by his mere grace or free-favour; they were *antecedent* to their obedience, and had no respect to it; nevertheless, they were intended to be motives to obedience. It they produced this effect, their election and redemption were confirmed; and they were entitled to all the blessings promised in the covenant subsisting between God and them; which blessings, contrasted against the former, or considered in reference to them, may be called *consequent:* because they were given only in consequence of their obedience.

All the honours and privileges pertaining to the Jews as a people elected by God, and assigned to the whole body of them, do not import an absolute, final state of happiness and favour of *any* kind; but they are to be considered as displays and instances of God's love and goodness to them, which were to operate as means of holiness and motives to obedience. We may further observe, that this selection of the Jewish nation, and their introduction into a peculiar relation to God, was a scheme for promoting true religion and virtue in all its principles and branches, upon motives adapted to the rational nature of mankind, which principles and branches of true religion are particularly specified in their law. Nor was this constitution in favour of the Jews in any respect prejudicial to the rest of mankind; so far otherwise, it was erected and maintained for the good of the whole world, and the Jews themselves were instructed and commanded to exercise kindness and hospitality towards those who might be considered, with regard to them, as aliens and strangers. However, though the Jews were directed and required to exercise benevolence towards persons of other nations, yet about the time when the gospel was promulged, they were unduly elevated on account of their distinguishing privileges, looked upon themselves as the peculiar favourites of heaven, and regarded the rest of mankind with a sovereign contempt. Their constitution, they were ready to imagine, was permanent and immutable; and those who did not submit to their law, were in their estimation unworthy of a place in the church, and unfit for the kingdom of heaven. But the Jewish dispensation, as they ought to have considered, which lasted, if we reckon from the call of Abraham, 430 years before the law was given on mount Sinai, to the coming of Christ, about 1921 years, was introductory to another more perfect and more permanent, to be introduced and established by the promised Messiah. Accordingly, Abraham, the head, or root, of the Jewish nation, is represented as the "father of us all," (Rom. iv. 16, 17.) Gentiles as well as Jews; and the believing Gentiles are said to partake of all the spiritual privileges which the Jews enjoyed, and from which the unbelieving Jews fell; and to be taken into that kingdom and church of God out of which they were cast. Hence, the state, privileges, and honours, &c. of professed Christians, particularly of the believing Gentiles, are expressed by the same phrases with those of the ancient Jewish church. Thus, as God *chose* or *elected* his ancient people the Jews, and they were his *chosen* and *elect;* so now the whole body of Christians, Gentiles as well as Jews, are admitted to the same honour; as they are selected from the rest of the world, and taken into the kingdom of God, for the knowledge, worship, and obedience of God, in hopes of eternal life. (Rom. viii. 33. Eph. i. 4. Col. iii. 12. 2 Thess. ii. 13. Tit. i. 1. 2 Tim. ii. 10. 1 Pet. i. 1. 2. ii. 9. v. 13.) The same and similar expressions are applied to Christians under the dispensation of the gospel, which were applied to the Jews under their dispensation, and which described the outward privileges and benefits with which they were invested; and in the same manner particular nations are *elected* to the participation of the outward blessings of Christianity. The advocates of this opinion maintain, that the election, which the apostle Paul states and defends in the 9th chapter of the Epistle to the Romans, and in some other places, is not an election by the absolute decree and purpose of God, to eternal life, but only election to the present privileges and external advantages of the kingdom of God in this world; and that reprobation, or rejection, is not that by an absolute decree to eternal misery, but that it signifies the not being favoured with the forementioned privileges and advantages. To the same purpose we shall here subjoin the following passage from Mr. Pyle's preface to the Epistle to the Romans, cited by Dr. Tomline, the present bishop of Lincoln, in his "Elements of Christian Theology," (vol. ii. p. 304.)

"The errors and vain disputes," says Mr. Pyle, "that have arisen in the latter ages of Christianity concerning faith and works, justification and sanctification, election and reprobation, that have distracted the minds of many Christians, have proceeded from applying particular phrases or passages in the Epistles to particular persons, which originally referred to the state and condition not of particular persons, but of whole churches in their collective capacity. Thus the body of heathens, while in their heathen state, are called aliens, strangers, enemies to God, &c. but such of them as were converted (the churches to whom the apostles wrote) are styled no longer strangers, but of the household of God, a chosen or elected generation, a royal priesthood, justified, sanctified, saints, &c. So the major part of the Jewish nation, who obstinately rejected the gospel of Christ, instead of being any longer the holy nation, the people of God, are called the vessels of wrath, fitted (by their

their own obstinacy) for destruction, reprobate; while the believing Jews becames vessels of mercy, fore-ordained, predestinated, to be called into the kingdom or covenant of the gospel, chosen to eternal life; which expressions mean no more than their having been offered the means and opportunities of attaining to the future happiness of heaven, by their knowledge and practice of Christ's religion. Their actual enjoyment of future happiness depended entirely on their virtuous obedience to the gospel; on their diligence to make their calling and election sure, that is, effectual to their salvation. No private persons are ever mentioned in these writings as elected to eternal life by any absolute decree of God. Paul was a chosen vessel; but he was chosen as a proper minister of Christ's gospel, to bear his name to the Gentiles; his being chosen to the crown of life hereafter, was the fruit of his earnest endeavours to keep the faith, (his fidelity) to finish his course, and of his labouring abundantly. To take these expressions otherwise, is to pervert the design of these writings. It is this mistake that has diverted the minds of many good men from attending to the more excellent parts of these writings, the moral and weighty exhortations given to Christians; and by puzzling them about former controversies that do very little, if at all, concern us now, have turned off their thoughts from the great matters of the Christian law, which are most easy to be understood, and requisite to be put in practice." For a farther illustration of these observations, in their peculiar reference to the state of Christians, the reader may consult Dr. Taylor's Key to the Epistle to the Romans, *passim*. Locke on the Epistles. See the next article.

Election also, in the language of some divines, signifies a predestination to grace and glory, and sometimes to glory only. And it has been enjoined as an article of faith, that predestination to grace is gratuitous, merely and simply so; *gratia, quia gratis data*. But the divines are much divided as to the point, whether election to glory be gratuitous, or whether it supposes obedience and good works, *i. e.* whether it be before, or after, the provision of our obedience. For an account of the different opinions that have been maintained on this subject, see Grace, Predestination, and Reprobation.

Election is also used for a part of *Pharmacy*, being that which teaches how to chuse the medicinal simples, drugs, &c. and to distinguish the good from the bad.

Some distinguish a general election, which gives the rules and marks for all medicines in general; and a particular one for each medicine in particular. Pomet, in his History of Drugs, gives very good rules for this election.

ELECTIVE, something that is done, or passes, by election. See Elector.

Elective *Attraction*, in *Chemistry*. See Affinity.

ELECTOR, formed of the Latin *eligere*, to choose, any person who has a right to choose or elect another to an office of honour or trust. But the term elector used to be applied more particularly, and by way of eminence, to those few princes of the German empire, in whom was vested the right of electing or choosing the head of the empire. They were all sovereign princes, and the principal members of the Germanic body. The German name is *Churfürst*, *Kurfürst*, or *Wahlfürst*.

The origin of the electoral dignity, and of the right inherent in the same, is not exactly ascertained. Some place it in the year 996, and attribute the institution to an edict of Otho III. confirmed by pope Gregory V. But this opinion is contradicted by history. It appears, that from the earliest period in the history of Germany, the person who was to reign over all was elected by the suffrage of all. Thus, Conrad I. was elected either by all the princes and chief men, or by the whole nation. In 1204, posterior to the supposed regulations of Otho III., Conrad II. was elected by all the chief men, and his election was approved of and confirmed by the people; and at the election of Lotharius II., in 1225, 60,000 persons of all ranks were present, and he was named by the chief men, whose nomination was approved by the people.

Others refer the origin of the electoral dignity and exclusive function to Frederick II. who died in 1250: and the first author who mentions the seven electors is Martinus Polonus, who flourished in this reign. It appears, after all, that this restrictive privilege was obtained by degrees. The princes of greater authority were first allowed to name the person whom they wished to be chosen emperor, and the nation retained the right of approving or disapproving the nomination. When they had thus secured the right of voting first, it became needless for the inferior ecclesiastics or barons to attend merely to confirm their choice, more especially as their attendance would be troublesome and expensive. And as the electors were sovereign princes, possessed of most extensive territories, they were strongly supported by their numerous attendants and allies, and considered as the representatives of all the higher classes of German nobility. See Robertson's Charles V., vol. i. chap. 5.

The institution of electors has also been ascribed to Rudolph of Habsburgh, the founder of the house of Austria, in 1280. Their number, however, was unsettled till the fourteenth century; it was Charles IV. who, by his golden bull of the year 1356, limited the same to seven, three ecclesiastical, *viz.* the archbishops of Mayence or Mentz, Treves, and Cologne; and four secular, *viz.* the king of Bohemia, the count Palatine, the duke of Saxony, and the margrave of Brandenburg. In 1648, the duke of Bavaria was put in the place of the count Palatine, who was outlawed by the emperor for having accepted the crown of Bohemia: but as he was at length restored to his rank, and a new electoral dignity was created for the duke of Bavaria, which increased the number of electors to eight. In 1692 a ninth electorate was added by the emperor Leopold, in favour of the duke of Hanover, of the house of Brunswick Luneburg. From that period to the year 1777, the electoral college consisted of the three ecclesiastical electors, Mentz, Treves, and Cologne, and the six secular, Bohemia, the palatinate of the Rhine, Saxony, Brandenburg, Bavaria, and Hanover.

The dominions of the last elector palatine of the Rhine, having devolved, in December 1777, to the elector of Bavaria, the electoral college was again reduced to eight members, until the peace of Luneville; when the three ecclesiastical electorates were secularized, the archbishop of Ratisbon introduced as a new elector arch-chancellor, and the duke of Wirtemberg, the landgrave of Hesse Cassel, the margrave of Baden, and the grand duke of Toscany, as duke of Saltzburg, raised to the electoral dignity. This increased the number of electors to ten, *viz.* the elector arch-chancellor, Bohemia, Bavaria, Saxony, Brandenburg, Hanover, Wirtemberg, Hesse Cassel, Baden, and Saltzburg.

But this arrangement was not of long duration. In the year 1806 the German empire was dissolved. Bavaria and Wirtemberg, on joining the Confederation of the Rhine, under the protection of the French empire, assumed the royal dignity; Hanover was in possession of the French; Baden and Saltzburg took the titles of grand dukes; the elector arch-chancellor that of the prince primate of the Confederacy of the Rhine; and the year following Saxony likewise

likewise assumed the royal dignity; Hesse Cassel was annexed to the new kingdom of Westphalia; Bohemia as part of the dominions of Austria, and Brandenburg as part of those of Prussia, reverted to these two houses as independent monarchical states. Thus the electoral college was not only dissolved with the dissolution of the German empire: but the title of elector, a title which for so long a series of years conferred a rank equal to that of the old kings of Europe, became altogether extinct.

Besides the power of electing an emperor, the electors had a right to capitulate with the new head of the empire, to dictate the conditions on which he was to reign, and to depose him if he broke those conditions. They actually deposed Adolphus of Nassau in 1298, and Wenceslaus in 1401. They were sovereign and independent princes in their respective dominions, had the "privilegium de non appellando illimitatum," that of making war, coining, and exercising every act of sovereingty. They formed a separate college in the diet of the empire, and had among themselves a particular covenant, or league, called the "Kur verein." They had precedence of all the other princes of the empire, even of cardinals, and ranked with kings. There was, however, a difference between the secular and ecclesiastical electors; none of the latter could be chosen emperor, and they were to be thirty years of age before they could attain the electoral dignity, whilst the majority of the secular electors was fixed at eighteen years of age, and any of them might be placed at the head of the empire; indeed they might even vote in their own favour.

The several functions of the electors were exercised by deputies. The elector of Mentz was arch-chancellor in Germany; Treves, in Gaul and the kingdom of Arles; Cologne, in Italy; Bohemia was arch-cupbearer; Bavaria, arch-sewer, or officer who serves out the feasts; Saxony, arch-marshal; Brandenburg, arch-chamberlain; Hanover, arch-treasurer. During the vacancy of the imperial throne, the elector of Saxony used to be vicar of the empire in the north, and the elector of Bavaria ruled as vicar over the southern circles.

The last electors of the German empire were; 1. Charles Theodore, baron Dahlberg, elector of Ratisbon and arch-chancellor, now prince primate. 2. Frederick William III. king of Prussia, elector of Brandenburg. 3. George III. king of Great Britain, elector of Hanover. 4. Ferdinand Joseph, elector of Saltzburg, now duke of Saltzburg. 5. Frederick II. elector, now king of Wirtemberg. 6. Charles Frederick, elector, now grand duke of Baden. 7. William IX. elector of Hesse Cassel, driven from his dominions by the French. 8. Maximilian Joseph, elector, at present king of Bavaria. 9. Frederick Augustus IV. elector, at present king of Saxony; and, 10. Francis II. elector of Bohemia, at present emperor of Austria.

ELECTOR *of Bavaria, the late*, son of the emperor Charles VII., was not only a very fine performer on the viol da gamba, but a good composer. And it is but justice to the memory of that prince to say, that upon an examination of the score of an entire mass for four voices, with instrumental accompaniments, which is now before us, we find the design and composition much superior to the generality of dilettanti productions.

ELECTORAL CROWN, or *Coronet*. See CROWN.

ELECTORATE, a term used formerly to denote the dignity of an elector of the German empire, *die Churfürstliche Würde*, or the territories belonging to an elector of Germany, *ein Churfürstenthum*. See ELECTOR.

ELECTRA, in *Ancient Geography*, a small town of the Peloponnesus, in Messenia, upon the route from Andania to Cyparissiæ, according to Pausanias. It was watered by two rivers, one of the same name, and another called *Coeus*.

ELECTRAS, a river placed by Ptolemy in the southern part of the isle of Crete.

ELECTRESS DOWAGER *of Saxony, the late*, daughter of the emperor Charles VII. and sister of the late elector of Bavaria, was not only an illustrious dilettanti in music, but a princess of great knowledge and talents in the art. After the decease of her consort, when her time was no longer occupied by cares of state, applying herself wholly to the study of the fine arts, and travelling into Italy, she not only wrote two serious dramas in the Italian language, "Talestri," and "Il Trionfo della Fedeltà," but set them to music, and performed the principal part: both were printed in score at Leipsig, and much admired all over Germany, where they have frequently been performed. This princess had learned to sing at an early period of her life of Porpora, and been taught the principles of composition by Hasse, and both sung and wrote in such a manner as did honour to those great masters, as well as her own genius and application.

This princess was celebrated all over Europe for her talents, and the progress she had made in the arts, of which she was a constant protectress. Her electoral highness was a poetess, a paintress, and so able a musician, that she played, sung, and composed, in a manner at which dilettanti seldom arrive.

ELECTRIA, in *Ancient Geography*, one of the ancient names of the isle of Samos.

ELECTRIC, or ELECTRICAL, *adj.* (from the Latin *electrum*, amber, or from ἤλεκτρον, the Greek name of the same natural substance,) belonging to that branch of natural philosophy which has been denominated *electricity*. Thus we hear of the electric fluid, electric attraction and repulsion, electrical machine, electrical apparatus, &c.

ELECTRIC, *subst.* denotes a body capable of being excited (either by means of friction or otherwise) so as to exhibit the phenomena of electricity; and which body is at the same time impervious to that power. Some of the phenomena of electricity are said to have been first observed in amber, hence the word electric was derived from the Latin or Greek name of that substance.

All the bodies which come under our notice are more or less capable of being excited so as to exhibit electrical phenomena; and are more or less pervious to that power. And it is to be remarked, that those bodies, which are less pervious, are more capable of being excited: whilst, on the other hand, those which are more pervious, are less capable of being excited. Those bodies, in which the capability of being excited is more conspicuous than their permeability, are called *electrics*, or *non-conductors*, and those in which the capability of being pervaded is more conspicuous than that of being excited, are called *conductors*, or *non-electrics*.

Both these classes of bodies contain a vast gradation from the most perfect to the most imperfect of each kind; the most perfect conductors, or non-electrics, being those through which the passage of the electric power meets with the least resistance; and the most perfect electrics, or non-conductors, being those which oppose the greatest resistance to the passage of that power. These may also be more powerfully excited. But it must be observed, 1st, that, strictly speaking, there is no substance known, which may be considered as a perfect electric, or a perfect conductor; for the electric power finds some resistance in going through the best conductors, and it will, in some measure, pass through, or, at least, over the surface of, the best electrics; and, 2dly, that the limits of the above-mentioned two classes of bodies come

ſo near to each other, that ſeveral bodies may, by the leaſt alteration of temperature, or of ſome other circumſtance, be rendered either more of the nature of an electric, or more of the nature of a conductor. See CONDUCTORS *of electricity*. We ſhall now arrange the electrics, or (as they are ſometimes called) the *electrics per ſe*, in the following liſt, and in the order of their perfection, commencing with the beſt; as far as ſuch arrangement is practicable; we ſhall then add ſeveral neceſſary remarks reſpecting ſome of theſe bodies.

Electrics.

Glaſs, and all vitrifications, even thoſe of metallic ſubſtances.

All precious ſtones, the moſt tranſparent of which are generally the beſt; ſuch as diamonds, rubies, emeralds, topazes, ſapphires, garnets, &c.

Amber,

Sulphur,

Shell-lac, and all reſins, or reſinous compounds,

All bituminous ſubſtances,

Silk,

Wax,

Cotton,

All dry animal ſubſtances, as feathers, wool, hair, &c.

Paper,

White ſugar, and ſugar-candy,

Air, and gaſſes,

The vapour of quickſilver, according to Dr. Prieſtley,

A perfect Torricellian vacuum,

Ice of diſtilled water at the temperature of 13° below 0 of Fahrenheit's thermometer.

Oils,

Metallic oxyds,

The aſhes of animal and vegetable ſubſtances,

All dry vegetable ſubſtances,

All hard ſtones, the hardeſt of which are the beſt.

It has been ſaid above, that, in general, the electrics are ſuch as will not conduct the electric power, and are at the ſame time capable of being excited. This laſt property, however, muſt not be conſidered as belonging to them all, or rather, that they may all be ſubjected to the trial, for ſeveral of them, though impervious to the electric power, are not capable of being excited on account of their peculiar confirmation, and ſuch are air, oils, the Torricellian vacuum, &c.

Moſt of the above-mentioned ſubſtances, and probably all thoſe which are capable of being ſubject to experiments, when rendered very hot, loſe their electric property, and become quite, though not equally, good conductors. The degree of heat at which this change of property takes place is various in various bodies. Thus, red-hot glaſs, melted reſin, baked wood made very hot, ice in a temperature above 0 of Fahrenheit's thermometer, and water, &c. are conductors of the electric power. It is rather ſupriſing that the focus of a burning glaſs is not a conductor. It has been obſerved, that glaſs, eſpecially the hardeſt and beſt vitrified, often is a very imperfect electric, or even a pretty good conductor. The abbé Nollet and others have endeavoured to inveſtigate the cauſe of this occurrence in glaſs by means of experiments; but they have not been able to aſcertain it. Glaſs veſſels, made for electrical purpoſes, are often rendered very good electrics by uſe and time, though they were bad electrics when new. And, on the other hand, ſome glaſs veſſels, which had been long uſed for excitation, have ſometimes loſt nearly all their power.

With reſpect to the non conducting property of a vacuum, the following obſervations deſerve the attention of the ſcientific reader. It is well known that the vacuum produced by means of an air-pump, even of the moſt perfect conſtruction, is a conductor of the electric power: or that the more the air is rarefied within a given veſſel, the more eaſily will the electric power paſs through that veſſel. But Mr. Walſh, aſſiſted by Mr. De Luc, boiled the quickſilver in a double barometer, *viz.* in an arched glaſs tube, the legs of which formed two barometers, connected at top by the curved part, in which the vacuum or abſence of air was as perfect as could be effected; and they found that the electric power would not paſs through this vacuum (Prieſtley's Obſervations on Air, &c. vol. i.) Mr. Morgan, ſome time after, made ſeveral experiments of the like ſort, which confirmed the above-mentioned diſcovery; (Phil. Tranſ. vol. 73.) ſo that the fact ſeems to be fully aſcertained, though one cannot comprehend why it ſhould be ſo; for if the electric power can paſs eaſier and eaſier through a given ſpace, in proportion as the air in it is more and more rarefied, why does it not paſs in the eaſieſt manner poſſible when the air has been entirely removed? And this fact appears ſtill more ſurpriſing, if it be admitted that the electric phenomena are produced by a fluid highly elaſtic.

The various tranſitions of water from the ſtate of a conductor to that of a non-conductor, or an electric, are alſo deſerving of notice. Ice, as we have already mentioned, is an electric below a certain temperature, and ſo much ſo, that Mr. Achard, who diſcovered this property of it in the year 1776, whirled a ſpheroid of ice in a proper machine with a rubber, &c. like the glaſs cylinders of a common electrical machine, and by this means he electrified the prime conductor, ſo as to attract, repel, give ſparks, &c. Above that degree of temperature, the ice begins to conduct, and this conducting property increaſes as the temperature is raiſed, ſo that the water, when pretty hot or near boiling, is a moſt excellent conductor; but as ſoon as it is converted into vapour, the conducting property diminiſhes, and when the vapour is mixed with the air, ſo as to become inviſible, its conducting power ceaſes altogether; as is indicated by the high electric ſtate of the atmoſphere in dry weather, when it is known that a great deal of aqueous vapour is mixed with the air.

After the preceding diſcrimination of ſubſtances, with reſpect to their electric, or their non-conducting property, the reader may naturally aſk, how is it to be aſcertained whether a body is or is not an electric? The anſwer is, that there are various methods of determining theſe properties in bodies, and which can not all be applied indiſcriminately in all caſes. For common purpoſes, when an electrical machine, (furniſhed with a prime conductor, to which an electrometer is affixed,) is in action, in which caſe, the electrometer is diverging, if you touch the prime conductor with any given ſubſtance, you will eaſily perceive whether that ſubſtance is an electric, or a conductor; for, in the firſt caſe, the electrometer will continue in a ſtate of divergency; whereas in the latter it will collapſe. For this purpoſe, the ſubſtance in queſtion muſt have a certain extenſion; and whilſt one extremity is preſented to the prime conductor, the other extremity of it muſt communicate with the ground, either through the body of the perſon that holds it, or otherwiſe; for, if it be too ſhort, though an electric, the electricity from the prime conductor will paſs over its ſurface to the hand that holds it, and the electrometer will of courſe collapſe. The experiment may be performed nearly as well without an electrometer; *viz.* by drawing ſparks from the prime conductor with one hand, or

or with a knobbed wire, and presenting the substance in question with the other hand; for if that substance is a conductor, the sparks will cease; and if an electric, the sparks will continue. Thus, the electric nature of any substance may be determined in a gross manner; but when an accurate determination is required, then recourse must be had to other means, which must be diversified according to the substance in question. Thus, if it be an elastic fluid, a glass vessel may be filled with it, and an electrified electrometer may be admitted to it. If it be a liquid, a glass tube may be filled with it; putting a cork at each end, and passing a pin through each cork, so as to touch the liquid; with this tube, then, you must repeatedly touch the electrified prime conductor of an electrical machine, and mark the effects produced upon the electrometer; you must also try how it will convey the shock of a charged jar, *viz.* whether silently, or with a report, &c. The best way of determining the electric property of solids is, by rubbing them against the hand, or a piece of silk, or woollen cloth, and the like. But in conducting these experiments, the operator may be easily deceived by the moisture which several substances absorb with great readiness; and in consequence of which, these bodies will appear as pretty good conductors. Thus, white paper, and especially the thick brown paper, in its common state, will be found to be a conductor, and, of course, incapable of being excited; but when well dried before a fire, and whilst it remains in a hot state, it is quite a non-conductor, and it may be powerfully excited by friction. Even baked wood, if not well varnished, (which ought to be done immediately after its being taken out of the oven,) will easily absorb moisture, and in consequence of which it will lose its non-conducting property. The various methods of exciting electrics are described under the article Excitation.

A natural transition from the effect to the cause will induce the human mind to inquire why are certain bodies electrics, whilst others are conductors of the electric power? But though innumerable experiments have been instituted expressly for that purpose, and various conjectures have been offered, yet, it must be acknowledged, that no satisfactory information has been obtained; for no peculiar property has been discovered to belong exclusively to either of the above-mentioned classes of bodies. When the catalogue of electrics and conductors was very short and imperfect, it was supposed that the two conducting principles were metals and water; so that whatever contained a certain quantity of either of these substances, or of both, was a conductor; otherwise it was an electric. But in a more advanced state of the subject, the fallacy of the above-mentioned supposition was readily manifested; nor, in truth, has any thing else been substituted which might furnish a satisfactory explanation of the question.

The word *electric* is often used to denote that part of the electrical machine which furnishes the electric power, when rubbed, &c. *viz.* an electric body of a particular configuration, which, being moved against a rubber by the mechanism which is annexed to it, is thereby excited, and communicates the electric power to the prime conductor. (See Electrical *Machine*.) For this purpose, various substances and various forms have been tried and often used; such as glass, sulphur, rosin, sealing-wax, varnished pasteboard, varnished silk, and baked wood: and these have been formed into globes, spheroids, cylinders, plates, &c. When the two electricities were first discovered, and it was found that glass, or vitrifications in general, produced one kind of electricity, which was thereby called the *vitreous electricity*; whilst sulphur and resinous bodies produced the other kind, called the *resinous electricity*; then electrical machines were mounted with electrics of one of these materials, or of the other, according as one or the other of those kinds of electricities was required. But when it was found that a machine, mounted with a single electric of any kind, would produce both electricities at the same time; for if the prime conductor acquires the vitreous electricity, the insulated rubber would acquire the resinous, and *vice versâ*; then the necessity of using two different electrics was removed, and the only thing which was attended to was the choice of an electric that might be very durable, and at the same time capable of a powerful excitation. After an innumerable variety of experiments made with the above-mentioned, and various other substances, glass has been found to be the material fittest for the purpose, and altogether preferable to all others. Its shape has also been often varied; but the forms which are at present principally used, as having been found more advantageous, are cylinders, globes, and flat circular plates, especially the first and the last; for now one hardly ever finds a machine mounted with a globe. Amongst the various kinds of glass which have been tried for this purpose, the preference has been given to the best flint glass; and, accordingly, of this material the cylinders, or the plates, for electrical machines, are at present mostly made. The abbé Nollet observes, that the hardest, most compact, and best vitrified kind of French glass, is the most difficult to be excited. But Dr. Priestley says, "I have some reason to think that common bottle metal is fittest for the purpose of excitation; at least, the best globe I have yet seen is one that I have of that metal. Its virtue is certainly exceeding great, and I attribute it in part to the great hardness of the metal, and in part to its exquisite polish."

Though a glass vessel exhausted of air does not shew any signs of electricity on its external surface, yet it has been found, that the electric power of a glass globe, or cylinder, is strongest, when the air within it is a little rarefied.

It has long been questioned, whether a coating of some electric substance, as rosin, turpentine, &c. on the inside surface of the glass, had any effect towards increasing its electric power; and, after a great many trials, it seems, that if it does not increase the power of a good glass globe, or cylinder, it does at least improve a bad one. The most approved composition for this purpose consists of four parts of Venice turpentine, one part of rosin, and one part of bees' wax. This composition must be boiled gently over a fire, stirring it continually for about an hour; afterwards it is left to cool, and reserved for use. When a globe, or a cylinder, is to be lined with it, some small pieces of it are introduced into the glass; then, by holding the glass near the fire, the mixture is melted, and is equally spread over its internal surface to about the thickness of a six-pence. In this operation, care must be taken that the glass be heated gradually, and be continually turned, so as to heat it pretty equally in all its parts, otherwise it is apt to break.

At present, however, this resinous lining is hardly ever applied; for, with a pretty good cylinder, or globe, and the zinc amalgam upon the rubber, the modern electrical machines furnish as much electricity as can reasonably be expected.

Electric *Charge*. See Charge and Leyden Phial.

ELECTRICAL-Air-*Thermometer*, is an instrument contrived by Mr. Kinnersley of Philadelphia, for the purpose of observing the effects of electrization upon air, and with this instrument Mr. K. made several experiments, which he describes in a letter to Dr. Franklin, dated March the 12th, 1761. *Fig.* 26. of *Plate* IV. *Electricity*, represents this

this inſtrument; the body of which conſiſts of a glaſs tube A B, about eleven or twelve inches long, and about two inches in diameter. It is cloſed air-tight at top and bottom by two braſs caps, the lower one of which is faſtened to the wooden ſtand D. Through a hole in the upper cap, a ſmall glaſs tube H O, open at both ends, is introduced, and its lower aperture is immerſed in a ſmall quantity of water at the bottom of the large tube. Two wires F G, I E, proceed through the braſs caps within the tube A B, and their extremities G, I, are furniſhed with braſs balls, which may be ſituated nearer or farther from each other, by ſliding F G up or down through the hole in the upper braſs cap. The external part of the wire F G is alſo furniſhed with a ball F, that of the wire I E terminates in a hook. The holes through which the tube H O, and the wires F G, I E, paſs, muſt be ſecured, ſo as to prevent the paſſage of any air. It will be eaſily comprehended, that when the air within the tube A B is rarefied, it will preſs upon the water at the bottom B of the tube, and will force it to riſe in the cavity of the ſmall tube H O; then, according as the water riſes more or leſs in the ſmall tube, ſo it ſhews the greater or leſs rarefact on of the air within the tube A B.

If the water, when this inſtrument is to be uſed, is all at the bottom of the large tube, and none of it has riſen within the ſmall tube, it will be proper to blow into the ſmall tube, by applying the mouth at H; after which, on removing the mouth, the water will be found to riſe a little within the ſmall tube; and a mark may be fixed on the outſide againſt the ſurface of the water that has thus riſen within the ſmall tube. The experiments which Mr. Kinnerſley made with this inſtrument are as follows:

He ſituated this thermometer on an electric ſtand, and connected the wire F with the prime conductor of an electrical machine in action. Thus he kept it well electrified for a conſiderable time, but it produced no remarkable effect; from whence he inferred that the electric virtue, when in a ſtate of reſt, had no more heat than the air, and other matter wherein it reſides.

When the two wires within the tube A B were in contact, a large charge of electricity, from above thirty ſquare feet of coated glaſs, produced no rarefaction in the air; which ſhewed, that the wires were not heated by the electric power paſſing through them.

When the wires were about two inches aſunder, the charge of a three pint bottle, darting from one to the other, rarefied the air very evidently; which ſhewed, that the electric fire produced heat in itſelf, as Mr. Kinnerſley ſays, as well as in the air, by its rapid motion.

The charge of a jar, which contained about five gallons and a half, darting from wire to wire, would cauſe a prodigious expanſion of the air; and the charge of his battery of thirty ſquare feet of coated glaſs would raiſe the water in the ſmall tube quite to the top. Upon the coaleſcing of the air, the column of water, by its gravity, inſtantly ſubſided, till it was in equilibrio with the rarefied air. It then gradually deſcended, as the air cooled, and ſettled where it ſtood before. By carefully obſerving at what height the deſcending water firſt ſtopped, the degree of rarefaction, he ſays, might be diſcovered, which, in great exploſions, was very conſiderable. Mr. Kinnerſley obviouſly remarks, that the firſt ſudden riſe of the water, upon an exploſion being made in the veſſel A B, is not to be aſcribed to the rarefaction of the air by heat, but to the quantity of air actually diſplaced by the electrical flaſh. It is only when that firſt ſudden riſe has ſubſided, that the degree of its rarefaction by the heat can be eſtimated, *viz.* by the height at which the water then ſtands above the common level.

If the experiments be performed in a room, wherein the temperature is variable, then an allowance muſt be made for this circumſtance in eſtimating the effect of the electrization; for the electrical air-thermometer is affected by heat or cold in general, as well as by that which is occaſioned by an electrical exploſion.

Since this inſtrument was firſt made known to the ſcientific world, the philoſophical inſtrument makers have often varied its form; but this variation of ſhape has not been accompanied with any real improvement.

Electrical *Apparatus*, is an aſſortment of all the electrical inſtruments that have been invented for the purpoſe of performing any experiments that belong to the ſcience of electricity; comprehending even the materials neceſſary for conſtructing theſe and other inſtruments that may be occaſionally ſuggeſted in the courſe of any experimental inquiry. For the ſake of diſtinction, the articles of an electrical apparatus may be arranged under the following diviſions.

1. Inſtruments and materials neceſſary for producing electricity.
2. Inſtruments neceſſary for aſcertaining its quality, and for meaſuring its quantity.
3. Inſtruments neceſſary for the accumulation, retention, and employment of electricity.
4. Inſtruments neceſſary for the experimental demonſtration of the laws that have been aſcertained in the ſcience of electricity.
5. Inſtruments uſeful in the performance of entertaining experiments.
6. Inſtruments neceſſary for atmoſpherical electricity.
7. Inſtruments belonging to that branch which has been denominated *Galvanic electricity*, or *Galvaniſm*.
8. Inſtruments peculiarly uſeful in medical electricity.
9. Materials and tools principally uſeful to a practical electrician.

As moſt of theſe inſtruments have obtained, and are known by particular names, their deſcriptions will be found under thoſe names; therefore, the preſent article needs not contain more than an enumeration of them, accompanied with general remarks, and ſome explanation of ſuch inſtruments, materials, &c. which are not commonly known under any particular appellations.

1. The principal inſtrument for the production of electricity is the electrical machine, *viz.* a machine containing an electric, and a mechaniſm, by means of which that electric may be whirled or moved againſt a rubber, ſo as to excite and to communicate the electricity, which is thereby produced, to an inſulated conductor, called the *prime conductor*. The ſize and form of theſe machines have been continually varied, according as experience, and new diſcoveries, have pointed out any old defects, or ſome new advantages; and likewiſe according to the fancy, the wants, and the opulence of the proprietor. The deſcription of the principal electrical machines, together with the inſtructions neceſſary for the proper uſe and management of the ſame, will be found under the article Electrical *Machine*.

Next to the electrical machine, properly ſo called, comes the electrophorus, which, when its ſize is upwards of ſix inches in diameter, and it is properly managed, will furniſh electricity ſufficient for a variety of experiments, for it will give pretty long ſparks, it will charge a Leyden phial, &c. See the article Electrophorus.

But a great variety of experiments, eſpecially of the theoretical kind, (*viz.* ſuch as tend to explain the principles of the ſcience,) may be performed with inſtruments much ſimpler

ſimpler than the electrical machine or the electrophorus; and theſe are a few glaſs tubes, and a ſtick of ſealing wax. In order to obtain a great deal of electricity, theſe tubes ſhould be made as long as a perſon can well draw through his hand at one ſtroke, (which is about three feet,) and about two inches in diameter. The thickneſs of the metal is not material, but if it be equal to that of common window glaſs, it may be reckoned ſufficient both for ſtrength and for excitation. Theſe tubes ſhould be cloſed at one end; and it will be uſeful to have a braſs cap with a ſtop-cock fitted to the other extremity of at leaſt one of theſe tubes; for in this caſe, the air within the tube may be rarefied or condenſed by means of an air-pump, or a condenſing ſyringe; and experiments may then be tried with it in thoſe different ſtates. One or two other tubes ought to have the poliſh taken off from their external ſurface, (which may be accompliſhed by means of emery, or a grinding-ſtone,) for the purpoſe of producing negative electricity. This, however, may alſo be obtained by rubbing a ſtick of ſealing wax, or even a ſtick of baked wood, as long as this is preſerved free from moiſture.

The glaſs tubes for excitation muſt be kept perfectly clean, and dry both within and without. They act beſt when they are a little warmer than the ambient air. If the operator hold one of theſe tubes with one hand by one extremity, and draw his other hand (provided this be clean and dry) gently over the tube from one extremity to the other, a few times repeatedly; the tube will ſoon ſhew ſigns of excitation, by attracting light bodies, giving ſparks, affecting an electrometer, &c. The application of a proper rubber is better than the human hand, and will occaſion a more powerful excitation. The beſt rubber for a ſmooth glaſs tube is the rough ſide of black oiled ſilk, eſpecially when a little amalgam of mercury and tin, or rather of mercury and zinc, is ſpread upon it. The beſt rubber for a rough glaſs tube, for a ſtick of ſealing-wax, or of ſulphur, or of baked wood, is ſoft new flannel, or rather ſkins, ſuch as hare ſkins, cat ſkins, &c. tanned with the hair on.

2. The inſtruments neceſſary for aſcertaining the quality, and the quantity of electricity, are called *Electrometers*, which ſee.

3. The inſtruments proper for accumulating, retaining, and employing the electric power, are very numerous, but they may be comprehended under the following general appellations, *viz.* inſulated conductors, and inſulating ſtands; coated electrics, or the Leyden phial in its various ſhapes; diſcharging rods, and the univerſal diſcharger. See INSULATION, LEYDEN PHIAL, ELECTRICAL BATTERY, and DISCHARGER of *Electricity*.

4. Under the appellation of inſtruments neceſſary for the illuſtration of the laws of electricity, in a general ſenſe, one ſhould comprehend all thoſe which are enumerated in the other ſections of the preſent article; ſince the experiments that are made with them do all tend to illuſtrate the laws of electricity; excepting, however, a few, which are mere variations of others.

5. The inſtruments uſeful for the performance of entertaining experiments are likewiſe very numerous; but they will be found deſcribed under the article ELECTRICAL *Experiments*.

6. The inſtruments neceſſary for exploring the electricity of the atmoſphere, are deſcribed under the article ELECTRICITY, *Atmoſpherical*.

7. The apparatus peculiar to that branch of electricity, which has been called *Galvaniſm*, will be found deſcribed under that name.

8. The application of electricity to medical purpoſes requires very few particular inſtruments, beſides thoſe which are commonly in uſe for other experiments. They conſiſt of a few directors, a diſcharging electrometer, a few wooden points, and ſome other trifling appendages, for which ſee *Medical* ELECTRICITY.

9. The extenſive and fertile ſcience of electricity perhaps furniſhes more opportunities for ſignalizing the genius of the operator, than any other branch of natural philoſophy. There is hardly an electrician whoſe mind does not ſuggeſt ſome alteration, or ſome contrivance, entirely new, in the courſe of his experiments. His ideas may ſometimes be ill founded, and may at other times be proper and uſeful. In either caſe a prompt and ready conſtruction is deſirable;—the aid of regular workmen is dilatory and expenſive; and, though in an imperfect ſtate, the workmanſhip of the electrician himſelf may, in moſt caſes, expeditiouſly put his ideas to the teſt of actual trial. Therefore, for the accompliſhment of this object, he ought to furniſh himſelf with ſeveral articles or materials ready to be worked upon, and ſome tools to work with. The articles moſt uſeful are, glaſs tubes, and glaſs ſticks of various ſizes, glaſs plates, and ſlips of flat glaſs, and glaſs phials of different ſizes; (ſome of thoſe uſed by apothecaries will frequently be found very uſeful;) ſealing wax, roſin, ſulphur, ſhell-lac, and Venice turpentine; tin-foil; braſs and iron wire, ſome braſs balls of different diameters. Each of theſe balls ought to have a hole, in order to fix it, or ſcrew it upon a wire. Alſo ſome electrical cement, and ſome electrical varniſh, the firſt of which is deſcribed under the article CAEMENT, and the ſecond under the article COATING *of Electrics*. To theſe there may be alſo added ſilk threads, ſmall pith-balls, and cork-balls, gold and ſilver leaf, gilt paper, &c. But, beſides all theſe, a variety of other materials may be ſuggeſted by new diſcoveries, or new ideas, which cannot be foreſeen. With reſpect to tools, it is not poſſible to ſtate the preciſe number and kind that may be wanted; but for moſt purpoſes, thoſe which are uſually put in the middle ſized tool chests, that are ſold by ironmongers, will be found fully ſufficient.

ELECTRICAL *Atmoſphere*. See ATMOSPHERE, in *Electricity*.

ELECTRICAL *Attraction and Repulſion*. This kind of attraction takes place between bodies that are electrified, and all other kinds of bodies, in certain circumſtances; or, more properly ſpeaking, it takes place between bodies poſſeſſed of different electricities; that is, between bodies poſſeſſed of the poſitive or vitreous electricity, and bodies poſſeſſed of the negative or reſinous electricity. The repulſion takes place only between bodies poſſeſſed of the ſame kind of electricity. The various peculiar phenomena, which attend both this attraction and this repulſion, are highly deſerving of attentive conſideration, for upon them the ſubject of electricity principally depends. But though their effects are evident and ſtriking, though they have been exhibited under an endleſs variety of forms and combinations, though innumerable experiments have been made, and many hypotheſes have been offered for their explanation; yet the true cauſe upon which they depend is by no means underſtood. In order to proceed with that regularity, which ſeems more likely to be attended with perſpicuity, we ſhall, in the firſt place, briefly endeavour to point out the difference between this and all other kinds of attraction and repulſion; we ſhall, in the next place, deſcribe the phenomena of this kind of attraction and repulſion, to which we ſhall annex the explanation according to the moſt approved hypotheſis, *viz.* that of a ſingle electric fluid, which goes under the name of the Franklinian hypotheſis; and we ſhall, laſtly,

 examine

examine some of the other hypotheses that have been advanced in explanation of those phenomena.

Five kinds of attraction have been observed amongst natural bodies; *viz.* 1st, the attraction of gravitation, which forces all bodies, when not hindered, to fall towards the centre of the earth. This attraction is mutual between all bodies; but unless one body be vastly larger than the other, this attraction between them cannot be discerned; 2dly, the attraction of cohesion, by which the particles of bodies adhere to each other, and form the different forms of bodies, or lumps of matter. This kind of attraction vanishes at a distance vastly small; so that though a body be very hard, yet if once broken, and the parts be adapted to each other, the cohesion cannot thereby be restored; 3dly, the chemical attraction, or affinity, which takes place between certain heterogeneous substances when they come in contact with each other; 4thly, the magnetic attraction, which takes place principally between the opposite poles of magnets, or between a magnet and iron, including such compound bodies as contain iron. We have said *principally* between those substances, because a few other bodies, which are said not to contain any iron, are slightly attracted by the magnet. The magnetic repulsion takes place between the homologous poles of magnets only; 5thly, the electric attraction, which takes place between bodies of every kind, provided they are possessed of different electricities; for though in common experiments an electrified body attracts another body which appears to be in a natural, or unelectrified, state; yet, on a closer examination, it will be found, that the latter body does actually acquire the electricity contrary to that of the former, before any attraction takes place, as will be shewn in the sequel. From the above-mentioned properties peculiar to each kind of attraction, that of electricity may be easily distinguished from the rest. We shall now proceed to describe the phenomena.

If light bodies of any kind, such as pieces of paper, of straw, of thread, of metallic leaves, feathers, &c. be strewed upon a table, and an excited glass tube be held horizontally over them at the distance of four or five inches, as in *fig.* 27, the small bodies will instantly fly towards the tube, and after having touched the surface of it, several of them will be instantly repelled by it; whilst others will adhere to it a considerable time before they are repelled; and some of them will continue to adhere to it without their being ever repelled. Those bodies which have been repelled, as soon as they come in contact with the table, or with some other conducting body, at no great distance from the excited tube, will soon after be attracted again by the tube, then they will be repelled a second time, and so on repeatedly for a considerable number of times, or until the electric power of the tube is in great measure exhausted. The same thing takes place, if, instead of the excited glass tube, an electrified and insulated conductor, such as the prime conductor of an electrical machine, be presented to the light bodies; or if an excited electric of any other kind be used.

The general explanation of these apparently strange and contradictory phenomena, upon the Franklinian theory of a single electric fluid, is as follows. The positive, or *plus*, electricity of the excited glass tube, forces the light bodies, which come within its sphere of action, to deposit their natural share of electric fluid upon the table, in consequence of which they become electrified negatively, or *minus*, and in that state they are attracted by the tube; which explains the assertion, that electric attraction takes place only between bodies possessed of different electricities. When the bodies, on being attracted, come in contact with the tube, they acquire the electricity of the tube, *viz.* become positive, and in that state they are repelled, which explains the other assertion, namely, that repulsion takes place between bodies possessed of the same kind of electricity. If the bodies thus repelled come in contact with the table, or with any conductor, they deposit their positive electricity upon it, become electrified negatively for the reason already alleged, and in that state are again attracted by the tube. The reason why some bodies adhere to the tube longer than others, is, that their being bad conductors prevents their acquiring the electricity of the tube so soon as other bodies that are better conductors. A few bodies remain adhering to the tube without any tendency to fly off, when, in consequence of their having some sharp corners or projection a little removed from the surface of the tube, they throw out the electric fluid into the ambient air as fast as they receive it from the excited tube; hence they cannot actually become possessed of the same kind of electricity as the tube, and, of course, cannot be repelled. If, instead of the excited glass tube, which, in the usual way of rubbing it, is possessed of the positive electricity, you use an excited stick of sealing wax, which is negatively electrified, the light bodies will be attracted and repelled exactly in the same manner, and the explanation is the same, excepting that the acquisition and deposition of the electric fluid must be reversed; *viz.* the stick of sealing wax being negative will oblige the small bodies to acquire some electric fluid from the table, which renders them positively electrified, and, of course, capable of being attracted by the sealing wax; then on their touching the sealing wax, they deposit their electric fluid upon it, become negative, and are repelled, and so forth. This experiment exhibits all the phenomena of electric attraction and repulsion; but in order to prove the various assertions that have been made with respect to the acquisition and deposition of electricity, &c. every one of the various phenomena must be shewn apart, by a particular experiment: and these experiments now follow.

Experiment 1.—Fasten a small body, as, for instance, a small piece of cork, to a silk thread of about eight or ten inches in length; and holding the thread by its extremity, let the small body hang at the distance of about seven or eight inches from the prime conductor, when this is moderately electrified. This small body will not, in this case, be attracted, because, being insulated, it cannot, by depositing its fluid upon, or by receiving it from, some other body (when the prime conductor is electrified negatively,) become possessed of the contrary electricity. But if a finger or any conducting substance be presented to that side of the small body which is farthest from the prime conductor, then the small body will be immediately attracted; for it has now deposited its own fluid upon, or has acquired some (if the prime conductor be negative) from the body that has been presented to it. And when this suspended body has touched the prime conductor, it will instantly fly from it, on account of the repulsion which takes place between bodies possessed of the same kind of electricity. It must, however, be observed, that if the insulated small body be brought too near to the prime conductor, or the latter be too powerfully electrified, then the small insulated body will be attracted, though no conducting body has been presented to it. But in this case its natural quantity of electric fluid will be either propelled into the contiguous air, or will be crowded on that part of the body which is farthest from the conductor, when the prime conductor is electrified *positively*; but if it be electrified *negatively*, then the additional quantity of fluid, which is required to render the small body positive, will be acquired from the air; or the natural quantity of fluid belonging to that body will be all crowded on that side

ſide of it, which is neareſt to the prime conductor. If, inſtead of the ſilk thread, this ſmall body be ſuſpended by a linen thread, then the attraction will take place at a much greater diſtance, as in this caſe the electric fluid will be eaſily conducted by the linen thread, &c.

Experiment 2.—Put a ſmall light body upon a pane of glaſs, and, holding the glaſs by one corner, place it under an electrified conductor, or an excited electric, at a moderate diſtance from it; which muſt be proportionate to the intenſity of the electricity. The ſmall body thus ſituated will not be attracted; but if in this ſtate you apply a finger to the lower ſurface of the glaſs plate, juſt againſt the place where the body ſtands, then the attraction will take place immediately; becauſe the lower ſurface of the glaſs will give its electric fluid to the finger, in conſequence of which its upper ſurface is enabled to receive the electric fluid from the ſmall body, and then that body is attracted by the conductor, or by the excited electric. In fact, if the pane of glaſs be examined by means of an electrometer, that part of its ſurface, which has been contiguous to the ſmall body, will be found electrified poſitively, and its oppoſite ſurface will be found negative. In this diſpoſition of the apparatus, the ſmall body, though acted upon by the electricity of the conductor, could not diveſt itſelf of its own electric fluid, becauſe the glaſs being an electric could not receive that fluid on one ſurface, unleſs its oppoſite ſurface could depoſit its own fluid upon ſome other conductor. (See LEYDEN PHIAL.) It muſt be obſerved, however, that when the electricity of the conductor, or of the excited electric, is too powerful, and is brought too near, the ſmall body will be attracted though the finger be not applied to the lower ſurface of the pane of glaſs. But in this caſe the electric fluid of the lower part of the glaſs will be forced into the air.

Experiment 3.—A B and B C, (*fig.* 28.) are two pieces of thick iron or braſs wire, inſulated upon two ſticks of ſealing wax, which are ſtuck faſt upon two pieces of wood, ſo as to form two inſulating ſtands. Each of the wires has a cork-ball electrometer affixed to one end. Place theſe two wires in contact with each other at B, and in one direction, as ſhewn in the figure, with the electrometers at their farther extremities A, C. Bring an excited glaſs tube D within ſeven or eight inches of the electrometer C, and it will be found that both the electrometers at A and C will diverge; with this difference, that the electrometer at C diverges with negative, and the electrometer at A with poſitive electricity, which may be proved by preſenting an excited ſtick of ſealing wax to each electrometer, as will be ſhewn in experiment 6. Theſe electricities ariſe from the action of the excited tube D, which, being poſitive, drives the electric fluid from the electrometer C, and the wire B C, to the electrometer A, and wire A B; thence the former becomes undercharged or negative, and the latter overcharged or poſitive. If the tube D be removed, both the electrometers will collapſe; for the electric fluid will return from A B to B C, and both the wires, &c. will remain in the ſame ſtate as they were before. But if whilst the tube D remains near the end C, as in the figure, and the electrometers are diverging, the two wires with their ſtands be ſeparated, then, on withdrawing the glaſs tube, the electrometers will continue to diverge C with negative, and A with poſitive electricity; becauſe now the contact of the wires at B being interrupted, the electric fluid cannot return from the wire A B to the wire B C; and this plainly ſhews the effect which an electrified body produces upon other bodies that are brought within its ſphere of action. If in the above deſcribed experiment an excited ſtick of ſealing-wax be uſed inſtead of the glaſs tube, the ſame appearances will take place; excepting that the electrometer C will be poſitive, and A negative.

Experiment 4.—This experiment ſhews, that a body, once repelled by an electrified body, will not be again attracted by it, unleſs it firſt depoſits its electricity upon ſome other body.

Take a glaſs tube (whether ſmooth or rough is not material), and after having excited it by rubbing, let a ſmall light feather be let out of your fingers at the diſtance of about eight or ten inches from it. This feather will be immediately attracted by the tube, and will ſtick very cloſe to its ſurface, for a few ſeconds, and ſometimes longer; after which time it will be repelled, and if the tube be kept under it, the feather will continue to float in the air at a conſiderable diſtance from the tube, without ever coming near it, excepting when it comes in contact with ſome conducting body, upon which it may depoſit its electricity; for after that it will be readily attracted again. If the excited tube be managed dextrouſly, the feather may be driven at pleaſure through the air of a room from one part of it to another. The reaſon why, when the feather is firſt attracted by the glaſs tube, it remains adhering to it for a conſiderable time, and ſometimes will not fly from it without ſhaking the tube, is, that being an electric, it will not eaſily acquire the electricity from the tube.

This experiment is attended with a remarkable circumſtance, which is, that when the feather is kept floating in the air at a diſtance from the excited tube, by the force of electric repulſion, it always preſents the ſame part towards the tube; ſomewhat like the moon, which always preſents the ſame part of its ſurface towards the earth. You may move the excited tube ſwiftly about the feather, and yet the ſame ſide of the feather will be conſtantly turned towards it. The reaſon of this phenomenon is, that the equilibrium of the electric fluid in the various parts of the feather, being once diſturbed, cannot be eaſily reſtored, becauſe the feather is an electric, or, at leaſt, a very imperfect conductor. When the feather has acquired a certain quantity of electricity from the tube, it is plain that the action of the excited tube will drive that ſuper-induced electricity to that ſide of the feather which happens to be fartheſt; hence, that part will always be repelled the fartheſt.

Experiment 5.—Hold a common linen thread by one end, and preſent it to an excited electric, or to an electrified conductor, ſuch as the prime conductor of an electrical machine, the thread will be attracted by it, and will remain adhering to it as long as the electric or the conductor continues electrified. The reaſon why in this experiment the thread, after having been attracted, is not repelled by the electrified body, is, that it cannot become poſſeſſed of the ſame kind of electricity with the electrified body, on account of its being held by the hand of the operator; for whatever kind of electricity is communicated to it, will be conveyed to the hand of the operator, and from it to the ground, &c. In this experiment care muſt be had that the thread be not very dry; for, in that caſe, the paſſage of the electricity through it, being partially interrupted, the lower extremity of the thread may, for a ſhort time, acquire the ſame electricity as the electrified body poſſeſſes, and may of courſe be repelled.

Experiment 6.—Place an electrometer, conſiſting of two cork balls ſuſpended by threads, upon an inſulating ſtand, as in *fig.* 29, and the threads of the electrometer will hang down parallel to each other. If then you bring an electrified body near it, the cork balls will be inſtantly attracted, and having acquired ſome electricity from it, will ſoon after be repelled, and will afterwards, when the electrified body has been removed, continue diverging, which is the ſtate exhibited

bited in the figure. If now you bring any electrified body near them, they will either fly from it, as in *fig.* 30; when that body is poſſeſſed of the ſame kind of electricity, or they will fly to it, as in *fig.* 31, when that body is poſſeſſed of the other kind of electricity. And this is the method by which it may be determined, whether an electrified body is poſitive or negative. It muſt, however, be obſerved, that if the body in queſtion be powerfully electrified, and be brought too near to the cork-balls, the latter will at laſt be attracted by it; for in this caſe, the action of the electricity in that body is ſufficient to drive the natural fluid of the electrometer, together with that which occaſioned its divergency, to the remoteſt part of it; or is capable of attracting the fluid when negatively electrified, &c.

That the repulſion amongſt bodies poſſeſſed of the ſame kind of electricity is more conſpicuous when the electricity is ſtronger, and *vice verſâ*, nobody will doubt; but it may be enquired, whether the angle of divergency of an electrometer bears any aſſignable proportion to the intenſity of the electricity which actuates it. The determination of this queſtion was attempted by the ingenious Fr. Beccaria, of Turin, and his experiments were performed in the following manner.

Experiment 7.—In the middle of a large room he inſulated a cylinder of tin, which meaſured about four feet in length, and about three inches in diameter; and to it he affixed a very delicate electrometer: another tin cylinder, exactly equal and ſimilar to the former, and having a long inſulating handle, was held by an aſſiſtant. Things being thus prepared, this philoſopher communicated ſome electricity to the former cylinder, in conſequence of which the electrometer, which had been affixed to it, diverged; in this ſtate, by means of ſights placed upon a ruler at a diſtance, he meaſured the angle of divergency, and noted it. He then deſired the aſſiſtant to touch the firſt cylinder, which was electrified, with the ſecond, which was not; and immediately to withdraw. By this means it is evident, that the electricity of the firſt cylinder muſt have been divided into two equal parts, and that this cylinder muſt now retain only the half of what it contained before. In this ſtate Fr. Beccaria meaſured the angle of divergency of the electrometer in the ſame manner as he had done before, and alſo noted it. The whole of this experiment he repeated ſeveral times both in the ſame, and in different days, and from the concurrence of the reſults, he found that the chord of half the angle of divergency was proportionate to the quantity of electricity in the cylinder; *viz.* the chord of half the large angle was double the chord of half the ſmall angle; anſwering to the quantities of electricity in the cylinder. See Beccaria's Elettriciſmo Artificiale, chap. vi. p. 1. art. 1.

M. De Sauſſure attempted the determination of the ſame queſtion in the following manner. He took two electrometers as equal and ſimilar as could be made; and electrified one of them, ſo that the balls were ſeparated by about ſix lines. He then touched the top of the electrified electrometer with the top of that which was not electrified; by which means the electricity was equally divided between the two electrometers; and in this ſtate each pair of balls diverged four lines; conſequently a diminution of half the denſity of electricity had leſſened the ſeparation of the balls by one-third. One of theſe electrometers was then deprived of its electricity, and was afterwards brought in contact with the other as before, in conſequence of which the electricity was divided, and the divergency of the balls was diminiſhed likewiſe by one-third, &c. This experiment being repeated ſeveral times, either with poſitive or negative electricity, was conſtantly attended with the ſame reſults.

Upon the Franklinian hypotheſis of a ſingle electric fluid, the attraction of bodies differently electrified is eaſily explained, for, according to that hypotheſis, the electric fluid is elaſtic, *viz.* repulſive of its own particles; but attractive of all other kinds of matter; therefore it is eaſy to conceive that the electric fluid, ſuper-induced upon a body electrified poſitively, attracts the undercharged matter of a body electrified negatively. The attraction between a body poſitively, and another negatively electrified, is ſo obvious as to require no farther illuſtration.

The repulſion of bodies electrified poſitively is alſo eaſily explained; but the repulſion of bodies electrified negatively requires much more attentive conſideration. The firſt explanation which occurred to thoſe who adopted the above-mentioned hypotheſis is, that when bodies are electrified poſitively, that exceſs of electric fluid which reſides upon their ſurfaces forms two atmoſpheres repulſive of each other, and the bodies remaining in the centres of their reſpective atmoſpheres muſt neceſſarily recede from each other. If the bodies are electrified negatively (*viz.* are in part exhauſted of their natural ſhare of electric fluid,) then they are attracted by the denſer fluid exiſting either in the atmoſphere contiguous to them, or to other neighbouring bodies, which occaſions them ſtill to recede from one another. Other patrons of the ſame hypotheſis obſerved, that as the denſer electric fluid ſurrounding two bodies negatively electrified, acts equally on all ſides of thoſe bodies, it cannot occaſion their repulſion. Is not the repulſion, they ſay, owing rather to an accumulation of electric fluid on the ſurfaces of the two bodies; which accumulation is produced by the attraction of the bodies, and the difficulty the fluid finds in entering them. This difficulty in entering was ſuppoſed to be owing chiefly to the air on the ſurface of bodies, which is probably a little condenſed there.

Lord Mahon, in his Principles of Electricity, explains the electrical attraction and repulſion in a very ingenious manner. He placed an electrified electrometer under the receiver of an air-pump; then began to exhauſt the receiver, in conſequence of which the divergency of the electrometer decreaſed. He then let the air return into the receiver, and this circumſtance alone cauſed the electrometer to increaſe its angle of divergency. "From theſe experiments, he ſays, it appears, that when bodies are charged with electricity, it is the *particles of circumambient air being electrified*, that conſtitutes the electrical atmoſphere which exiſts around thoſe bodies.

"Now ſince an electrical atmoſphere, (whether negative or poſitive,) conſiſts of electrified air; it evidently follows that the denſity of the electricity of that air muſt be in ſome inverſe ratio of the diſtance from the charged body, which cauſes that electrical atmoſphere.

"From theſe ſimple conſiderations, it is eaſy to reduce all the different phenomena of electrical attraction and repulſion to one plain and convenient principle, derived from the very nature of a diſturbed electrical equilibrium; namely, to the elaſtic tendency of the electrical fluid, to impel every body, charged either *in plus* or *in minus*, towards that part of its electrical atmoſphere where its natural electrical equilibrium would be the moſt eaſily reſtored.

"From this ſimple principle, it is evident, that bodies, which are charged with contrary electricities, muſt tend to approach each other, whenever the ſkirts of their oppoſitely electrified atmoſpheres interfere.

"From the ſame ſimple principle, it is alſo eaſy to underſtand, why bodies, that are charged with the ſame kind of electricity, tend to diverge from each other. Every body that is electrified, (whether *in plus* or *in minus*,) has a conſtant tendency to return to its natural ſtate; and this cauſes it to electrify,

electrify, in a certain degree, other bodies in contact with it, and the air in its vicinity, in a manner similar to that explained above.

"If two bodies (for example) be both positive; neither body will be able to deposit its superabundant electricity upon the other body, which is also similarly electrified *in plus*. It is, therefore, evident, from the simple principle mentioned above, that if these bodies be brought near each other, each body will be impelled towards the particles of air on its other side, which are electrified *in plus* only in a small degree. That is to say, that each body will tend to diverge from the other.

"If the bodies, on the contrary, be both negative; neither body will be able to have its deficient electricity supplied from the other body, which is also similarly electrified *in minus*. It is therefore evident, from the simple principle mentioned above, that if these bodies be brought near each other, each body will be impelled towards the particles of air on its other side, which are electrified *in minus* only in a small degree. That is to say, that each body will tend to diverge from the other. So that bodies, which are charged with the same kind of electricity, (whether positive or negative,) must necessarily tend to diverge from each other."

Mr. Cavallo explains the repulsion of bodies negatively electrified in the following manner. (Treatise on Electr. vol. iii. p. 193. of the 4th edit.)

"Proposition I.—*No electricity can appear on the surface of a body, or no body can be electrified either positively or negatively, unless the contrary electricity can take place on other bodies contiguous to it.*

"This proposition may be proved by a great many experiments and observations, such as may be seen in vols. i. and ii. of this my work.

"Prop. II.—*There is something on the surface of bodies which prevents the sudden incorporation of the two electricities;* viz. *of that possessed by the electrified body, with the contrary electricity possessed by the contiguous air, or other surrounding bodies.*

"Without examining the nature, the extent, and the laws of this property in bodies, it will be sufficient, for the present purpose, to observe, that the fact is certainly so; for otherwise a body could not possibly be electrified, or it would not remain electrified for a single moment.

"Prop. III.—*Supposing that every particle of a fluid has an attraction towards every particle of a solid; if the solid be left at liberty in a certain quantity of that fluid, it will be attracted towards the common centre of attraction of all the particles of the fluid.*

"Let the body be extremely small, and it is evident that it must be drawn towards the common centre of attraction; for if it be placed on one side of the said centre, the attractive particles on the opposite side, being more numerous, will naturally draw it that way. If the body be large, the same reasoning shews that the effect must be the same; for the attractive force of all its particles being concentered in a point or centre, will draw that centre towards the centre of attraction of all the particles of the fluid. Thus, if the fluid be of a spherical form, and the solid body be likewise spherical, the centre of the latter will coincide with that of the former.

"*Corollary* 1.—The same thing must happen, when the quantity of fluid is smaller than the bulk of the body; in which case the former must be within the latter.

"*Cor.* 2.—If the attraction of the particles of the fluid be exerted only towards the surface of the solid, and not towards its internal parts; the effect will be the same; when the body is of a regular shape, as spherical, cubical, &c. but with very irregular shapes, the difference will be very trifling, and not deserving of notice in this place.

"The application of the foregoing propositions in explanation of the repulsion which takes place between bodies possessed of the same kind of electricity is very easy, and, in my opinion, conclusive. According to the Franklinian hypothesis, the electric fluid is elastic, or repulsive of its own particles, and attractive of the particles of other matter. Let then A and B. (*fig.* 32.) be two spheres of metal suspended in the open air, contiguous to each other, and capable of being easily moved. Let some electricity be communicated to them, and by Prop. I. it will appear, that whilst the bodies touch each other, as shewn in *fig.* 32, the electricity which is communicated cannot be dispersed equally all over their surfaces, but must be thicker, or more condensed, on the parts that are remote from the mutual point of contact, because there the air is at liberty to acquire a contrary electricity; whereas, near the point of contact the electricity cannot be manifested, because in that place there is no air or other body that can acquire the contrary electricity. Therefore the atmospheres of contrary electricity cannot be concentric with the spheres A and B; but must be situated as in *fig.* 32. It follows, therefore, by Prop. III. that the spherical bodies, being attracted towards the centre of these atmospheres, appear to repel each other, as shewn in *fig.* 33; so that when the bodies are electrified positively, in which case, according to the hypothesis, they have acquired an additional quantity of electric fluid, negative atmospheres will be formed round them, and the additional or superfluous electric fluid of the bodies will attract, and be attracted by, those negative atmospheres. And when the bodies are electrified negatively, in which case, according to the hypothesis, they have lost part of their usual quantity of electric fluid, positive atmospheres will be formed round them, which will attract the under-charged bodies."

Experiment 8.—This experiment shews the attraction and repulsion by means of the electric light.

Fix a pointed wire upon the prime conductor of an electrical machine, having the point outward, and fix another pointed wire in the like manner upon the insulated rubber of the same machine; then let the machine be put in action, and the points of both wires will appear illumined; *viz.* the former with a pencil, and the latter with a star. In this situation, bring an excited glass tube sideway of the point which proceeds from the prime conductor, and it will be found that the luminous pencil issuing from that point is turned sideway; *viz.* is repelled by the atmosphere of the tube. If the excited tube be held just opposite to the point, the luminous pencil will vanish entirely, because both the tube and the point are electrified positively. If the excited tube be brought near the point of the wire which proceeds from the rubber, the star upon it will turn itself towards the tube; for this wire is electrified negatively, and the tube positively. If instead of the tube, a stick of sealing wax, or any other electric possessed of the negative electricity, be used; then the pencil of light will be attracted by it, and the star will be repelled, or it may be entirely suppressed if the stick of sealing wax be placed directly before it.

Hitherto we have treated of experiments performed in the ambient air; but it is now necessary to add a brief account of the manner in which electric attraction and repulsion are affected in rarefied air.

Towards the end of the 17th century, Mr. Boyle observed, that excited electrics would attract in the vacuum of his air-pump; whence he concluded, that the presence, or absence of air, did not interfere with electric attraction. Not long after, Mr. Grey repeated Boyle's experiments with the

air-pump, and obtained a ſimilar effect; but at that time the air pumps were very imperfect; their exhauſtion was very moderate; and, of courſe, the concluſions from the experiments that were made within their receivers could not furniſh much uſeful inſtruction. It ſeems that F. Beccaria was the firſt perſon who aſſerted, that in a perfect vacuum there would be no electric attraction. Lord Mahon ſuſpended a cork-ball electrometer within the receiver of an air-pump, and electrified it. "I then (he ſays) began to exhauſt the receiver; upon doing which, the balls ſoon began to divaricate gradually *leſs and leſs*. And as ſoon as the ſhort barometer gauge was got down to about one quarter of an inch (the barometer being that day at the height of $29\frac{1}{4}$ inches), the divarication of the balls from each other became reduced to leſs than one quarter of an inch.

"So that by $\frac{116}{117}$ parts of the natural quantity of air contained in the receiver being exhauſted, the divarication of the electrometrical balls was diminiſhed to leſs than one-tenth part. For the chord of the angle of divarication was decreaſed from above $2\frac{1}{2}$ inches to leſs than one quarter of an inch. That is to ſay, that the verſed ſine of the angle of divarication was decreaſed conſiderably more than an hundred times; becauſe the verſed ſines are always as the ſquares of the chords.

"I ſhould be inclined to imagine, if this experiment were made with great accuracy, and with a proper electrometer, that the verſed ſine of the angle of divarication would always be in the ſame ratio as the denſity of the air in the receiver, provided that proper means were taken to keep the apparatus ſufficiently free from moiſture during the experiments." Principles of Electricity, p. 10.

Mr. Cavallo deſcribes a ſeries of experiments which he made with an excellent air-pump, (Phil. Tranſ. vol. lxxiii.) from which he deduced the following concluſion. "It ſeems (he ſays) deducible from thoſe experiments, that electric attraction and repulſion take place in every degree of rarefaction, from the loweſt to about one thouſand, but that the effect diminiſhes in proportion as the air is more rarefied; and by following this law, we may, perhaps, conclude with Beccaria, that there is no electric attraction, nor repulſion in a perfect vacuum; though this will, perhaps, be impoſſible to be verified experimentally, becauſe, when in an exhauſted receiver, no attraction, or repulſion, is obſerved between bodies to which electricity is communicated, it will be only ſuſpected that thoſe bodies are not ſufficiently ſmall and light. But, from reaſoning, it ſeems likely that electric attraction and repulſion cannot take place in a perfect vacuum, by which I only mean a perfect abſence of air. For either this vacuum is a conductor, or a non-conductor of electricity. If a conductor, and as much nearer to perfection as it becomes more free from air, it muſt be a perfect conductor at the ſame time that it becomes a perfect vacuum; in which caſe, electric attraction, or repulſion, cannot take place amongſt bodies incloſed in it; for, according to every notion we have of electricity, thoſe motions indicate, or are the conſequence of the intervening ſpace, in ſome meaſure, obſtructing the free paſſage of the electric fluid. And if the perfect vacuum be a perfect non-conductor, then neither electric attraction nor repulſion can take place in it."

Such are the facts which have been obſerved reſpecting electric attraction and repulſion, either in the ambient, or in rarefied air. The only thing which now remains to be added, is a ſhort account of the various explanations of theſe phenomena, which have been advanced, beſides the explanation upon the Franklinian hypotheſis, which has been already annexed to them.

When the knowledge of electricity was in its infancy, electricians ſuppoſed that certain *unctuous effluvia* were emitted by excited electrics, and that theſe effluvia would adhere to all light bodies which happened to be in their way, and would carry them back to the electric. We need not loſe time in endeavouring to manifeſt the abſurdity of this hypotheſis.

When Mr. Du Fay diſcovered the two oppoſite electricities, which he called the *vitreous* and the *reſinous electricities*, the idea of two diſtinct electric fluids was naturally adopted. Each of theſe fluids was ſuppoſed to be elaſtic, *viz.* repulſive, with reſpect to its own particles, but attractive of the other fluid. Theſe two fluids were ſuppoſed to be equally attracted by all bodies, and while they continue in their union to exhibit no mark of their exiſtence. It was then imagined, that by the excitation of an electric, theſe two fluids were ſeparated from each other, and one body became ſurcharged with one, whilſt another body became ſurcharged with the other elaſtic fluid. The two electric fluids being thus ſeparated, would ſhew their reſpective powers, and their eagerneſs to ruſh into re union with one another. When bodies are charged with either of theſe fluids, they are diſpoſed to repel each other in conſequence of the elaſtic nature of the fluid, be it the vitreous, or the reſinous. But they are attracted by all other bodies, *viz.* they are attracted by bodies which have a leſſer ſhare of that particular fluid with which they are charged, and they are much more powerfully attracted by thoſe bodies which are overcharged with the oppoſite fluid.

The theory of Æpinus is a modification of the Franklinian hypotheſis. For he admits a ſingle elaſtic electric fluid; but he thinks that all the particles of matter, when diveſted of their natural ſhare of that electric fluid, muſt repel one another; for that otherwiſe (ſince all ſubſtances have in them a certain quantity of the electric fluid, the particles of which repel one another, and are attracted by all other matter), it could happen that bodies, in their natural ſtate, with reſpect to electricity, ſhould neither retract nor repel one another. According to this author, then, the repulſion of bodies negatively electrified, is in conſequence of the repulſion exiſting between the particles of matter, which manifeſts itſelf when thoſe particles are deprived of their natural ſhare of electric fluid; for the mutual repulſive property of the particles of the electric fluid, and the mutual repulſive property of the particles of matter, ſeem to neutralize each other when combined, and to act when ſeparated. See Æpini Tentamen Theoriæ Electricitatis et Magnetiſmi.

ELECTRICAL *Balance*. See ELECTROMETER.

ELECTRICAL *Balls*. See ELECTROMETER.

ELECTRICAL *Battery*. See BATTERY.

ELECTRICAL *Beatification*. See BEATIFICATION.

ELECTRICAL *Bells*. See BELLS.

ELECTRICAL *Bruſh*. See BRUSH.

ELECTRICAL *Cement*. See CAEMENT.

ELECTRICAL *Circuit*. See CIRCUIT.

ELECTRICAL *Coating*. See COATING.

ELECTRICAL *Conductors*. See CONDUCTORS *of Electricity*.

ELECTRICAL *Eel*. See GYMNOTUS.

ELECTRICAL *Excitation*. See EXCITATION.

ELECTRICAL *Experiments*. The hiſtory of the ſciences clearly ſhews that the human ſpecies has obtained a much greater ſhare of knowledge reſpecting the works of nature, within the laſt two hundred years, than during the twenty or more centuries preceding them. If it be inquired how came this great ſcientific advancement to be made in a period ſo very ſhort, it will be found that this is entirely owing to the

the happy ſubſtitution of experiments to opinions; or of matter of fact to the wanderings of the imagination. When the learner was accuſtomed implicitly to believe, and to repeat, the fanciful explanations of the teacher, errors and abſurdities were propagated without the poſſibility of correction or of improvement. But when the ſtudent of nature adopted the motto of "Nullius in verba," and liſtened only to the reſults of experiments, or to the unerring mathematical deductions from thoſe reſults, then the temple of ſcience was raiſed with rapidity and triumph, by the accumulation of facts upon facts, which were firmly cemented by the ſtricteſt reaſoning.

The ſcience of electricity is a ſtriking inſtance of the above-mentioned obſervation; for whatever is known of it has been acquired by means of a laborious experimental inquiry: and it is to be remarked, that the reſults of experiments have generally turned out different from any pre-conceived hypotheſis. The general and comprehenſive deductions which have been pointed out by the concurrence of many experiments are called the Laws of Electricity, and in mentioning theſe laws under their various denominations, we ſhall deſcribe the experiments which are neceſſary for their demonſtration; but there are ſeveral other experiments, which, though not abſolutely neceſſary for the demonſtration of theſe laws, are, nevertheleſs, either entertaining or uſeful in ſome other point of view; and theſe will be deſcribed in the preſent article.

Experiments relating to Electrics and Conductors.

The principal method of diſcriminating theſe two kinds of bodies from each other is deſcribed under the article

ELECTRICAL *Attraction* and *Repulſion;* but the following experiments will ſhew how to determine theſe and other analogous properties in particular caſes, where the above-mentioned general method cannot be applied.

Experiment 1.—*Mr. Henley's method of ſhewing the ſlight conducting power of ſmoke, and of the vapour of water.*

Suſpend a cork ball electrometer from the ceiling of a room, ſo as to ſtand about four or five feet above the conductor of an electrical machine; then put the machine in action very gently, ſo that the balls of the electrometer may not be affected by it. Stick a ſhort piece of wax taper, juſt blown out, upon the prime conductor, and under the electrometer, ſo that the ſmoke may aſcend to the latter. In this ſituation, if the machine be put in action as gently as before, the electrometer will open with the ſame kind of electricity with which the prime conductor is charged, which ſhews that the ſmoke is a conductor in a ſmall degree. If, inſtead of the wax taper, a metallic veſſel full of hot water be placed upon the conductor, and the machine be put in action as before, the electrometer will alſo be cauſed to diverge, ſhewing that the vapour of the water is a partial conductor.

Experiment 2.—*To prove that certain electrics become conductors when they are made very hot.*

Take a glaſs tube of about one-twentieth of an inch in diameter, and above a foot in length; let it be hermetically cloſed at one end, and introduce a wire in it, ſo as to be extended through its whole length. Let two or three inches of this wire project above the open end of the tube, and there faſten it with a cork. Tie round the cloſed end of the tube another wire, which will be ſeparated from the wire within the tube by the thickneſs of the glaſs tube. In theſe circumſtances, if you endeavour to ſend a ſhock through the two wires, (*viz.* the wire within the glaſs tube, and that which is twiſted on the outſide of it,) by connecting one of them with the outſide, and the other with the knob of a charged Leyden phial, you will find that the diſcharge cannot be made unleſs the tube be broken, becauſe the circuit is interrupted by the thickneſs of the glaſs at the end of the tube, which is interpoſed between the two wires. But put that end of the tube to which the external wire is faſtened into the fire, heating it gradually until it becomes barely red hot; then endeavour to diſcharge the jar again through the wires, and you will find that the charge is eaſily tranſmitted from wire to wire, through the ſubſtance of the glaſs, which, by being made red-hot, is become a conductor.

When the conducting power of hot reſinous ſubſtances, oils, &c. is to be examined, bend a glaſs tube in the form of an arch C E F D, *fig.* 34, and faſten a ſilk ſtring G C D to it, which ſerves to hold it by when it is to be ſet near the fire. Fill the middle part of this tube with the ſubſtance in queſtion, be it roſin, ſealing-wax, &c.; then introduce two wires A E, B F, through the apertures, ſo that they may touch the roſin, &c. or penetrate a little way into it. This done, let a perſon hold the tube, by the ſilk ſtring G, over a clear fire, ſo as to melt the roſin, or other ſubſtance, in it; and at the ſame time, by connecting one of the wires, A or B, with the outſide of a charged Leyden phial, and touching the other wire with the knob of the phial, endeavour to make the diſcharge through the roſin, and it will be found, that while the roſin is cold no charge can be tranſmitted through it. As the roſin melts, the conducting power will begin to be manifeſted, and when the roſin is quite melted, the ſhocks will paſs freely through it.

Experiment 3.—*To try the conducting or non-conducting property of hot air.*

The conducting property of air has by no means been fully determined, but the reader may form what judgment he thinks proper upon the following facts.

Electrify an inſulated cork ball electrometer, or electrify the prime conductor of an electrical machine, when the quadrant electrometer is ſet upon it; then bring a red-hot iron within leſs than an inch diſtance from the electrometer, or prime conductor, and either of them will ſoon loſe its electricity, which is conducted by the hot air contiguous to the iron; for if the experiment be repeated with the ſame iron when cold, the electricity will not be conducted away. It has been obſerved, that a battery may be diſcharged by introducing a red-hot iron between two knobs communicating with the inſide and outſide coating of the battery, and ſtanding at ſome diſtance from each other. But if, inſtead of iron, there be introduced a piece of red-hot glaſs between the two knobs, (the diſtance between them remaining as at firſt,) then the battery cannot be diſcharged; whence we may infer, that either hot air is not ſo good a conductor as has been generally believed, or that air heated by iron (perhaps in conſequence of its containing ignited iron particles) is a better conductor than when heated by red-hot glaſs.

Mr. Read endeavours to prove that hot air is not a conductor, and his experiments we ſhall now ſubjoin in his own words.

"It has been alſo commonly ſaid that hot air conducts electricity. With a view to aſcertain this matter, the following experiments were made: To one end of a long piece of wood (which ſerved as a handle) was fixed a glaſs rod ſifteen inches long; to the remote end of the glaſs was fixed a pith-ball electrometer. Having electrified the balls, I held them by the wooden handle, and projected them into a large oven, immediately after the fire was drawn out of it; the conſequence was, that when I performed the operation ſlowly, the balls loſt their electricity; but that when done quick, with as little delay as poſſible, their electric charge was not diminiſhed. The electricity, in the firſt caſe, was found to have eſcaped along the glaſs into the wooden handle,

dle, and so to the earth owing to the great heat the glass rod had acquired, by which it became a conductor of the fluid, for until it had cooled a little, the balls could not be charged again.

"I shall lay before the reader one circumstance more, because it may tend to throw light on what degree of heat the oven was in at the time the observations were made. The baker having pointed out to me the hottest part of the oven, with a quick motion in and out, I plunged the electrified balls into that part of it, by which one thread and ball was burned off, but the remaining ball shewed that it still retained its electric charge, because it was strongly attracted on the approach of my finger." Read's Summary View of Spontaneous Electricity, p. 8.

Experiment 4.—To shew that metallic substances conduct the electric power through their substance.

Take a wire of any kind of metal, and cover part of it with some electric substance, as rosin, sealing-wax, &c.; then discharge a Leyden phial through it, and it will be found that the wire conducts as well with as without that electric coating.

Experiment 5.—To shew that the fluids of the human body are better conductors of electricity than water.

Take a glass tube, about one-fortieth of an inch in diameter, and about six inches long, or rather take two such tubes, exactly equal in length and diameter, and holding one of them with one extremity in water, let it be filled with that fluid. The water will soon fill the tube, in virtue of the capillary attraction, especially if the tube be held inclined to the surface of the water. After the same manner let the other tube be filled with blood, or some other fluid of the human body. Now let an electric jar be charged, and let the circuit through which the jar is to be discharged be formed by the interposition of one of those tubes, (to the extremities of which slender wires may be fitted, so as just to touch the fluid contained in it,) and likewise by the interposition of a person who may be desirous of trying the experiment. In this manner, if the discharge of the jar be made several times, alternately changing the glass tube, *viz.* using once that which is filled with water, then the other which is filled with blood, &c., it will be found that the shock is felt more sensibly when the glass tube filled with the animal fluid forms part of the circuit, than when the tube filled with water is used.

The person who tries this experiment needs not be afraid of the shocks, because their force is much weakened by passing through that small quantity of fluid which is contained in the glass tube. Besides, the strength of the shocks should not be greater than may be just felt. It is only necessary to charge the Leyden phial always equally high, which is easily done by using Mr. Lane's discharging electrometer. See DISCHARGER *of electricity*.

After the same manner the degree of conducting power of various substances may be ascertained. Thus it may be observed, that sea-water conducts better than fresh water, and that common fresh water conducts better than distilled water. The conducting powers of certain powders may also be tried in this manner.

Experiment 6. To determine the different conducting powers of metallic substances.

Connect with the hook, which communicates with the outside coating of a battery, containing at least thirty square feet of coated surface, a wire of about one-fiftieth part of an inch in diameter, and about two feet long. The other end of the wire must be fastened to one end of the discharging rod; this done, charge the battery, and then, by bringing the discharging rod near its wires, send the explosion through the small wire, which by this means will be made red-hot, and melted, so as to fall upon the floor in different glowing pieces. When a wire is melted in this manner, sparks are frequently seen at a considerable distance from it, which are red-hot particles of the metal, that by the violence of the explosion are scattered in all directions. If the force of the battery be very great, the wire will be entirely dispersed by the explosion, so that none of it can afterwards be found.

By repeating this experiment with wires of different metals, and using the same force of explosion, it will be found that some metals are fused more readily than others, whilst some are not sensibly affected; which shews the difference of their conducting powers. But in conducting such experiments, the power of the battery must be adjusted to the size of the wires, which must be of equal diameters and lengths. It is also to be remarked, that when every thing is properly adjusted, and the battery is charged always equally high; some wires are melted through their whole length, whilst others are barely melted at their extremities, or are only rendered red-hot.

No person seems to have succeeded so well as Mr. Van Marum in the determination of the conducting powers of metallic substances; for which purpose he employed the famous electrical machine belonging to the museum of Teyler, and an electrical battery, which contained 225 square feet of coated surface. Mr. Van Marum had wires of different metals drawn of the same diameter, which was equal to one-thirty second part of an inch; and, by exposing equal lengths of them successively to the above-mentioned battery, which was charged equally high in every experiment; he found, that of the leaden wire 120 inches were melted, of tin wire the like quantity, of iron wire five inches were fused, of gold wire three inches and a half, and of silver wire, or brass, or copper, a quarter of an inch only was melted, which shews a pretty good estimate of their fusibility by the action of electricity, whence the conducting power may be inferred, by considering this to be in the inverse ratio of their fusibility.

In order to compare this electrical fusibility of the metallic substances with their fusibility by the common fire, we shall now add the latter; which, according to the academicians of Dijon, is as follows.

Tin melts at 170° of Reaumur's thermometer.

Lead	-	230
Silver	-	450
Gold	-	563
Copper	-	630
Iron	-	696

According to Mr. Wedgwood's experiments,

Brass melts at 3807° of Fahrenheit's thermometer.

Swedish copper		4587
Fine silver	-	4717
Fine gold	-	5237
Cast iron	-	17,977. Phil. Transf. vol. 72.

From the above-mentioned and other electrical experiments, made with the same electrical machine and battery, Mr. Van Marum deduces the following conclusions, *viz.* that lead is the worst, and upon the whole, copper is the most eligible metal for the construction of a conductor of lightning.—That he could not possibly determine the proportion between the lengths and diameters of metallic wires, that could be melted by the power of the Teylerian machine.—That iron, tin, and copper, were melted into globules; but this was not the case with the other metals.—That the metallic globules were sometimes thrown to the distance of thirty feet and upwards.—That the globules of tin remained red-hot

red-hot for about eight or ten ſeconds; and that when the wires were very long, the fuſion was but partial.

Mr. Van Marum had the curioſity of trying whether the metallic wires could be fuſed and calcined in water; *viz.* by ſending the charge of the battery through them whilſt ſtanding under water; and he ſucceeded whenever he uſed the eighth part of that length of wire, which would have been calcined if the experiment had been performed in air.

The facility with which iron and ſteel are fuſed by means of electricity, and the violence with which ſmall particles of them burn, renders them peculiarly uſeful in entertaining experiments. The filaments produced in turning articles of ſteel are ſo very readily ignited by an electric ſhock, that ſome of the fineſt of them may be burned by the diſcharge of a ſix ounce coated phial, or even a ſmaller one. They may be alſo burned by a ſingle ſpark from a large prime-conductor.

Experiment 7. *To ſhew that the focus of a burning glaſs is not a conductor of electricity.*

Let a wire, that proceeds from the outſide of a charged Leyden phial, come within an inch of the knob of that phial, or, in ſhort, ſo as to be very little farther from it than the ſtriking diſtance. Let then the focus of the ſolar rays, that are collected by a lens or mirror, fall midway between the knob of the phial and the wire which proceeds from its outſide, and it will be found that the charge of the phial is by no means diſſipated; whereas if the flame of a candle, or any other conductor, be interpoſed between the knob and the wire, the diſcharge will take place immediately. This experiment ſeems to corroborate the ſuppoſition, that the rays of the ſun, or of light in general, have no heat in themſelves, but that they only extricate the caloric from ſuch bodies as they happen to fall upon, provided thoſe bodies obſtruct their courſe and are not tranſparent.

Experiments relating to electric Attraction and Repulſion.

The laws of electric attraction and repulſion are as follow. Bodies poſſeſſed of the ſame kind of electricity (whether poſitive or negative) repel each other; but bodies poſſeſſed of different kinds of electricity attract each other. See the article ELECTRIC *Attraction and Repulſion.*

Experiment 1. *The dancing images.*

Fig. 35. repreſents two flat circular plates, either of braſs or copper, about ſix inches in diameter. The plate A is ſuſpended horizontally from the prime conductor by means of a chain, or wire. The lower plate B, which is generally made a little larger in diameter, is ſituated parallel to the former at the diſtance of about three inches. This lower plate is fixed to the ſtand C, ſo that it may be raiſed higher or lower, which is accompliſhed by the following ſimple conſtruction. A ſmooth and ſtraight wire is rivetted in the centre of the plate B, and moves in a hole made through the axis of the ſtand C, which, by being ſlit along an inch or two from the top, is rendered ſpringy, ſo as to hold the above-mentioned wire pretty tight in any ſituation. The ſtand C reſts upon the table, &c.

Place any kind of light bodies upon the lower plate B, ſuch as bran, bits of paper, pieces of gold-leaf, &c. then work the electrical machine which ſtands contiguous to the other end of the prime conductor, and the light bodies will ſoon move between the two plates, leaping alternately from the one to the other with conſiderable velocity. If inſtead of bran, or irregular pieces of other matter, ſmall figures of men and other things cut in paper, and painted, be put upon the lower plate, theſe will generally move in an erect poſition, but will ſometimes leap one upon another, or will exhibit different poſtures, affording a pleaſing entertainment to an obſerving company. In this experiment both the attraction and the repulſion are obſerved at the ſame time; and the reaſon of theſe phenomena is explained in the article ELECTRIC *Attraction and Repulſion.*

Experiment 2. *The electric well.*—Place upon an inſulating ſtand a metal quart mug, or ſome other conducting body nearly of the ſame form and dimenſions. Faſten a ſhort cork-ball electrometer to the extremity of a ſilk thread that proceeds from the ceiling of the room, or from ſome convenient ſtand, ſo that the electrometer may be ſuſpended within the mug, and no part of it may be above the aperture thereof. This done, electrify the mug, by giving it a ſpark with an excited electric or otherwiſe; and you will find that the electrometer, whilſt it remains in that inſulated ſituation, even if it be made to touch the ſides of the mug, is not attracted by it, nor does it acquire any electricity; but if, whilſt it ſtands ſuſpended within the mug, a conductor, ſtanding out of the mug, be made to communicate with the electrometer, or is only preſented to it, then the electrometer acquires an electricity contrary to that of the mug, and is of courſe immediately attracted by it.

The reaſon why, in this experiment, the electrometer contracts no electricity, whilſt it remains ſuſpended entirely within the cavity of the mug, is that the electricity of the mug acts upon the electrometer on all ſides, hence the electrometer has no opportunity of parting with its electric fluid, when the mug is electrified poſitively; nor of receiving any, when the mug is electrified negatively. But as ſoon as any conductor communicates with it, the electrometer becomes immediately poſſeſſed of the electricity contrary to that of the mug, &c. If, by raiſing the ſilk thread a little way, part of the electrometer, *viz.* of its linen threads, be lifted juſt above the mouth of the mug, the balls will be immediately attracted; for in this caſe the action of the electricity of the mug will enable the electrometer to receive from, or to impart to, the contiguous air, ſome electric fluid; or elſe the electric fluid of the balls may be crowded upon that part of the linen threads which project above the aperture of the mug, &c. hence the balls will acquire an electricity contrary to that of the mug, and will of courſe be attracted by it.

The electricity which is communicated to the mug reſides entirely upon its external ſurface, for the air contiguous to it can eaſily acquire the contrary electricity; but no electricity can be manifeſted on the internal ſurface of the mug, becauſe the air within that cavity, being entirely ſurrounded by the electrified mug, cannot acquire the contrary electricity, excepting towards the aperture of the mug, where in fact a little electricity is to be obſerved.

Experiment 3. *The electrified capillary ſtream.*—Let a ſmall metallic bucket, nearly full of water, be ſuſpended to the prime conductor, and let the water proceed from it, drop after drop, either by means of a glaſs capillary ſyphon, as repreſented in *fig.* 36, or by means of a hole in the bottom, as repreſented in *fig.* 37. In this diſpoſition, if the electrical machine be put in action, the water, which, when not electrified, only dropt from the aperture, will now run in a full ſtream, which will even be ſubdivided into other ſmaller ſtreams; and, if the experiment be made in the dark, it will appear beautifully illumined. The abbé Nollet, who made a vaſt number of experiments reſpecting this electrified ſtream, as well as on the action of electricity in evaporations, obtained the following reſults.

The electrified ſtream, though it divides, and carries the liquid a great way, is neither ſenſibly accelerated nor retarded, when the pipe through which it iſſues is not leſs than a French line in diameter.

Under this diameter, if the tube is wide enough to let the liquid run in a continued ſtream, electricity accelerates it a little, but leſs than a perſon would imagine, if he judged by the number of jets which are formed, and by the diſtance to which they go.

If the tube be a capillary one, from which the water only drops naturally, the electrified jet not only becomes a continued ſtream, and even divided into ſeveral ſtreams, but is alſo conſiderably accelerated; and the ſmaller the capillary tube is, the greater, in proportion, is the acceleration.

So great is the effect of the electric virtue, that it drives the water in a conſtant ſtream out of a very ſmall capillary tube, out of which it had not before been able even to drop.

Electricity augments the natural evaporation of fluids, for, excepting mercury and oil, all the others that were tried ſuffered a diminution, which could not be aſcribed to any other cauſe than electricity.

If it be communicated to inſulated fruits, fluids, and, in general, to bodies of every kind, which are actually in a ſtate of evaporation; it increaſes that evaporation in a greater or leſſer degree, according as thoſe bodies are naturally more or leſs evaporable, according as the veſſels which contain them are conductors or electrics, and as they expoſe a greater or leſſer ſurface to the open air. But from ſome very accurate experiments made by M. De Sauſſure with his hair hygrometer, it appears that the electricity promotes the evaporation of thoſe bodies which are ſuperſaturated with water, but not of thoſe which do not contain a ſuperabundant quantity of it.

Experiment 4. *The electrified bells.*—A ſhort deſcription of this experiment is contained in the article BELL, but inadvertently, without referring to the figure; we ſhall therefore ſupply the defect in this place, and ſhall add ſome other varieties of this entertaining apparatus. *Fig.* 38. *Plate* V. repreſents the bell apparatus in its ſimple and original ſtate. A B is a piece of braſs to which the three braſs bells C, E, G, and the two braſs balls, or clappers, D, F, are faſtened; the two bells C and G being ſuſpended by braſs chains; and the middle bell with the two clappers being ſuſpended by ſilk threads. A chain likewiſe proceeds from the inſide of the middle bell E, and falls upon the table. This machinery is ſuſpended at the end of the prime conductor by paſſing the knobbed wire, which is uſually affixed thereto, through the hole H.

Fig. 39. is another mode of mounting the bells. The pillar A is of glaſs; the horizontal wires at the top of it are of braſs, and are faſtened to the braſs ball *a*. The four bells *o, o, o, o*, are ſuſpended to the extremities of the horizontal wires by means of wires or chains; the four clappers are ſuſpended by ſilk threads; and the middle bell *c* is fixed to the ſtand which is a conductor. When this apparatus is to be uſed, it muſt be placed upon a table with the knob *a* in contact with the prime conductor. In that ſituation, if the electrical machine be put in action, the four bells *o, o, o, o*, becoming electrified, attract the clappers; theſe become electrified and are repelled by thoſe four bells, and ſtrike againſt the middle bell *c*, upon which they depoſit their electricity, and are then again attracted by the four bells, &c. ſo that the ringing continues as long as the electrical machine is kept in action.

Fig. 40. repreſents another ſet of bells, in which the bells are differently tuned, and they are ſtruck ſucceſſively by the ſame clapper. Theſe bells are fixed all round the bottom board *b i k*, from the middle of which a glaſs pillar riſes, to the top of which a pointed wire is faſtened, and upon this wire the flyer *b c d* reſts, like the magnetic needle of a compaſs. (The nature of this flyer will be ſhewn in the ſequel of this article.) From one arm of the flyer a wire *g* proceeds, which nearly reaches the bottom board, and a clapper, ſuſpended by a ſilk ſtring, is faſtened to the ſame arm of the flyer between the wire *g* and the apex *d*. To uſe this apparatus, the prime conductor muſt be removed from the electrical machine, and the bell apparatus is placed ſo, that the flyer *b c d* may come very near the cylinder of the machine. In this ſituation, if the machine be worked, the electricity of the cylinder will cauſe the flyer to turn in a direction contrary to the pointed extremities of its arms, and at the ſame time the clapper will ſucceſſively ſtrike each of the bells and the vertical wire *g*, the reaſon of which may be eaſily derived from what has been ſaid above reſpecting the other bells.

Experiment 5. *The artificial ſpider ſeemingly animated by electricity.*—*Fig.* 41. repreſents a Leyden phial, to the outſide of which the braſs hoop and arm *a b c* is fixed. The ball *c* of this braſs arm riſes to the ſame level as the ball *d*, which communicates with the inſide coating of the phial; *e* is an artificial ſpider made of cork, with a few ſhort threads run through, to repreſent its legs. This ſpider is ſuſpended by a ſilk thread, which proceeds from the ceiling of the room, or from any other convenient ſupport, ſo that the ſpider may hang mid-way between the two balls *d* and *c*, when the Leyden phial is not charged. Let the place of the phial upon the table be marked; then charge this phial by putting its ball *d* in contact with the prime conductor, &c. and replace it in the above-mentioned ſituation. The ſpider will now begin to move from one ball to the other, and back again, and will continue this motion for a conſiderable time; ſometimes for ſeveral hours.

The inſide of the Leyden phial being charged poſitively, the ſpider is attracted by the ball *d*, which communicates to it a ſmall quantity of electricity; the ſpider then becoming poſſeſſed of the ſame kind of electricity as the ball *d*, is repelled by it and is attracted by the ball *c*, whereupon it depoſits its electricity, and is afterwards attracted again by *d*, and ſo on. In this manner the phial is gradually diſcharged.

Experiment 6. *To ſpin ſealing-wax by means of electricity.* Stick a ſmall piece of ſealing-wax on the extremity of a wire, and warm it ſo as to render it ready to drop; and at the ſame time let the electrical machine be worked; then ſtop the motion of the machine, and inſtantly bring the hot ſealing-wax within four or five inches of the prime conductor, moving it about in a winding direction, and you will find that the ſealing-wax throws ſeveral exceedingly fine threads to the prime conductor, which appear like red wool. This experiment anſwers beſt when the conductor is covered with varniſh.

Mr. Adams deſcribes this experiment in the following manner. "Stick," he ſays, "a piece of ſealing-wax on the conductor, in ſuch a manner as it may be eaſily ſet on fire by a taper. While it is flaming, turn the cylinder, the wax will become pointed and ſhoot out an almoſt inviſible thread into the air, to the length of a yard and more. If the filaments that are thrown out by the wax are received on a ſheet of paper, the paper will be covered with them in a very curious manner, and the particles of the wax will be ſo far ſub-divided as to reſemble fine cotton. To faſten the piece of wax conveniently to the conductor, ſtick it firſt on a ſmall piece of paper, then twiſt the end of the paper ſo as to fit one of the holes which are made in the prime conductor; when it is thus placed, it may be eaſily fired by a taper."

Experiment 7.

Experiment 7. *The dancing balls.*—Fix a pointed wire upon the prime conductor, with the point outwards; then take a glafs tumbler, grafp it with your hands, and prefent its infide furface to the point of the wire upon the prime conductor, while the electrical machine is in motion. By this means the glafs tumbler will foon become charged; for its infide furface acquires the electricity from the point, and its outfide lofes its natural quantity of electric fluid through the hands, which ferve as a temporary coating. This done, put a few pith-balls upon the table, and cover them with the charged glafs tumbler. The balls will immediately begin to leap up along the fides of the glafs, as represented in *fig.* 42; and will continue that motion for a confiderable time.

In this experiment the pith-balls are attracted and repelled by the electrified infide furface of the glafs, the electricity of which they gradually conduct to the table, or other conducting body, upon which the glafs is fet; at the fame time that the contrary electricity of the external furface of the glafs is communicated to the furrounding air.

Experiment 8. *The electrified head of hair.*—If a perfon, having pretty long hair, not tied up, upon his head, be placed upon an infulating ftand, and, by means of a wire, or chain, or by touching it with his extended hand, be connected with the prime conductor, and the electrical machine be put in action, the hairs on his head, by repelling each other, will ftretch out in a furprifing manner. Inftead of a human being, a fmall wooden head, covered with hair, is placed upon the prime conductor, and, on working the machine, the hair will be all ftretched out, like the rays diverging from a centre. The fame thing will take place if a downy feather, or a bundle of threads, tied up at one end, like a taffel, be fixed to the prime conductor.

Experiment 9. *The metallic leaf fufpended in the air.*—Cut a piece of gold, or filver, or brafs leaf, in the form of a fquare, or of a lozenge, like A, *fig.* 43; place it upon a broad metallic plate B, and hold the plate under the ball of the wire, which is ufually fixed to the end of the prime conductor. On working the machine, the metallic leaf will rife from the plate B, and will remain fufpended between that plate and the ball C, with one point, or angle, towards the one, and the oppofite towards the other, without touching either. This effect is owing to the action of the points of the leaf; for the point enables the leaf to abforb the electric fluid from the prime conductor, without actually touching it, and the oppofite point difcharges that fluid upon the plate B alfo without actual contact. If the plate B be moved round the ball C, as represented at D, the leaf will alfo move round without touching either ball or plate.

Experiments relating to electric Light.

The two electricities produce peculiar luminous appearances, which are particularly defcribed under the article ELECTRIC LIGHT; but it is neceffary in this place barely to mention, that a pointed conductor, proceeding from a body pofitively electrified, is, in the dark, illuminated with a pencil of light; but, if the body be electrified negatively, the point will be illumined with a ftar, or globule of light, provided the electrified body is electrified powerfully enough. If a pointed conductor be prefented to an electrified body, the above luminous appearances are reverfed; *viz.* a pencil of light will appear upon the point when the body is electrified negatively, and a ftar when the body is electrified pofitively.

Experiment 1. *The fpiral tube.*—*Fig.* 44. represents an inftrument compofed of two glafs tubes C, D, one within the other, and clofed with two knobbed brafs cafes A and B. The innermoft of thefe tubes has a fpiral row of fmall round pieces of tin-foil, ftuck upon its outfide furface, and lying at about one-thirtieth of an inch from each other. If this inftrument be held by one of its extremities, and its other extremity be prefented to the prime conductor, every fpark that it receives from the prime conductor will caufe fmall fparks to appear between all the round pieces of tin-foil that are ftuck upon the inner tube, which, in a dark room, affords a pleafing fpectacle; the inftrument appearing encompaffed by a fpiral line of fire.

The fmall pieces of tin-foil are alfo ftuck upon a flat plate of glafs, fo as to represent curve lines, flowers, letters, &c. and they are illumined after the fame manner as the fpiral tube. But the beft way of exhibiting a luminous word is to ftick a long flip of tin-foil, in a zig-zag manner, upon a flat plate of glafs, one end of this flip communicating with a brafs knob on one of the glafs plates, and the other extremity communicating with a hook, or another brafs ball on the oppofite fide of the glaf. The letters are formed by cutting fmall interftices in the parallel flips of tin-foil. A plate of this fort is represented in *fig.* 45, where *h* is the hook to which a chain is fufpended, and G is the brafs ball which, being prefented to the prime conductor, receives the fparks, &c.

If the furface of the glafs plate, oppofite to that upon which the tin foil is ftruck, is pointed with different tranfparent colours, the fparks will appear tinged of the colours through which they are feen.

Experiment 2. *The artificial Bolonian ftone, and other phofphorefcent fubftances, illumined by the electric light.*

The penetrability of the electric light is fhewn in a very ftriking manner, either with the real, or with the artificial Bolonian ftone, which was invented by Mr. Canton, and is prepared in the following manner. "Calcine fome common oyfter-fhells, (if they be old, and half calcined by time, as are commonly found upon the fea-fhore, they are much better for this purpofe,) by keeping them in a good coal-fire for half an hour. Let the pureft part of the calx be pulverized and fifted; mix three parts of this powder with one part of flowers of fulphur; let this mixture be rammed into a crucible of about an inch and a half in depth, till it be almoft full; and let it be placed in the middle of the fire, where it muft be kept red hot for one hour, at leaft, and then fet it by to cool: when cold, turn it out of the crucible, and cutting, or breaking it to pieces, fcrape off, upon trial, the brighteft parts, which, if good phofphorus, will be a white powder, and may be preferved by keeping it in a dry phial well ftopped."

If this phofphorus, whether in or out of the phial, be kept in the dark, it will not give any light; but if it be expofed to the light either of the day, or of any luminous object, and be afterwards brought into a dark place, it will then appear lucid for a confiderable time. When good, about a quarter of an ounce of this phofphorus, in a two-ounce phial, will, after having been expofed to the light, and then brought into a dark place, afford light fufficient for reading the hour upon a watch. For farther particulars refpecting this phofphorus, fee the 58th vol. of the Phil. Tranf. See BOLONIAN *Stone* and PHOSPHORUS.

If the phial containing fome of the above defcribed phofphorus be held near the prime conductor, when a few ftrong fparks are drawn from it, within three or four inches of the phial, in a dark room; the phofphorus will be illumined by them, and will afterwards continue to fhine for about three or four minutes, the light, however, gradually decreafing. This is the fimpleft way of exhibiting this phofphorus; but, with very little trouble, various curious preparations

preparations may be made with it, which we ſhall now proceed to deſcribe, obſerving, once for all, that though ſtrong ſparks will illuminate this phoſphorus ſufficiently well, when taken near it; yet the light which is afforded by the diſcharge of a Leyden phial will produce the effect in a ſuperior manner.

This phoſphoric powder may be ſtuck upon a board by means of the white of an egg, ſo as to repreſent figures of the planets, letters, or any thing elſe at pleaſure; and theſe repreſentations may be illumined in the above-mentioned manner.

A beautiful method of expreſſing geometrical figures with the above-mentioned phoſphorus is as follows. Bend ſmall glaſs tubes, of about the tenth part of an inch in diameter, in the ſhape of the intended figures, and then fill them with the phoſphoric powder. Theſe tubes, ſo filled, may be illumined in the manner already deſcribed, and they are not nearly ſo ſubject to be ſpoiled as the figures repreſented upon a board.

When this phoſphorus is ſtuck uniformly upon a card, place a ſmall key upon it, and diſcharge a Leyden jar very near it, in a dark room. This done, lay hold of the card by one corner, and throw off the key. The phoſphorus will appear illumined all over the card, excepting where the key ſtood, and the repreſentation of the key will be ſo exact, that a ſpectator will hardly believe that the key has been removed.

When oyſter-ſhells are thrown careleſsly into the fire, and are kept therein different lengths of time, they acquire different degrees of phoſphoric power, and ſome of them, when afterwards illumined by the electric light, will exhibit the priſmatic colours in a beautiful manner. But beſides the oyſter-ſhells, almoſt all calcareous ſubſtances, when dry and hot, and eſpecially when burned to lime, have the property of being illumined by the diſcharge of a Leyden phial paſſed over their ſurfaces; and of continuing to ſhine for about a few ſeconds, or a minute, or even longer. Paper, or a card, made very dry and hot, has the ſame property. When a jar is diſcharged through a piece of loaf-ſugar, the ſugar is generally broken, and every piece is beautifully illuminated.

Experiment 3. *The aurora borealis, and Leyden vacuum* — Take a phial nearly of the ſhape and ſize of a Florence flaſk; fix a ſtop-cock to its neck, and exhauſt the air out of it by means of the air-pump. If this phial be rubbed in the common manner, ſuch as is uſed for exciting electrics, it will appear luminous within, being full of a flaſhing light, which much reſembles the aurora borealis, or northern lights. This phial may alſo be rendered luminous, by holding it by either end, and bringing the other end to the prime conductor, when the electrical machine is in action. In this caſe, all the cavity of the phial will inſtantly appear full of a flaſhing light, which remains in it for a conſiderable time after it has been removed from the prime conductor. And it is to be remarked, that if the phial, after it has been removed from the prime conductor, (and even ſeveral hours after its flaſhing light has ceaſed to appear,) be graſped with the hand, ſtrong flaſhes of light will immediately appear within it, which often reach from one of its extremities to the other.

There are two cauſes upon which this experiment depends. The firſt is the conducting nature of the vacuum, and the ſecond is the charging and diſcharging of the glaſs; for when the outſide of the glaſs phial is put in contact with the prime conductor, the electric fluid, which is communicated to the outſide of that part of the phial, cauſes the natural fluid belonging to the inſide ſurface to depart from its place, and to go to the oppoſite ſide of the phial; and this fluid, by paſſing through the partial vacuum, cauſes the light within the phial, which light is more or leſs ſubdivided, according as the vacuum is more or leſs perfect. Now, that part of the phial which has touched the prime conductor is actually charged; for its outſide ſurface has acquired an additional quantity of electric fluid, and the inſide ſurface has loſt part of its own; but ſince the outſide of the phial has no coating, therefore, when it is removed from the prime conductor, and is not graſped with the hand, or other conductor, the charged part of the glaſs can only be diſcharged gradually; that is, whilſt its outſide ſurface is communicating its ſuperfluous fluid to the contiguous air, the inſide ſurface acquires that fluid from the other end of the phial, and the paſſage of this fluid through the vacuum cauſes the flaſhing. When the phial is graſped with the hand then its diſcharge is accelerated.

When a phial of this ſort is coated with tin-foil on its outſide for about three or four inches, it is then called the Leyden vacuum, it being, in fact, an exhauſted Leyden phial. The *figs.* 46. and 47. repreſent this phial in its beſt conſtruction. A braſs ferrule, having a hole with a valve, is cemented to the neck of this phial, and a round braſs cap is ſcrewed over it. A wire, terminating in a point, though not a very ſharp one, proceeds from the ferrule a ſhort way within the phial. The inſide of this phial requires no coating, on account of the conducting nature of the vacuum.

This phial clearly exhibits the direction of the electric fluid, both in charging and diſcharging; for if it be held by its coated lower part, and its braſs knob be preſented to the prime conductor poſitively electrified, a pencil of light will be ſeen to proceed from the point of the wire, as in *fig.* 46; and when it is diſcharged, a ſtar or globule of light will appear in the place of the pencil, as in *fig.* 47. If the phial be held by its braſs cap, and its coated part be preſented to the prime conductor; then the point of the wire in its inſide will appear illumined with a ſtar when charging, and with a pencil when diſcharging. If it be preſented to a conductor negatively electrified, theſe appearances will be reverſed.

Experiment 4. *The luminous conductor.*—*Fig.* 48. repreſents a prime conductor invented by the late Mr. Henly, for the purpoſe of ſhewing the direction of the electric fluid by the appearances of its light. The middle part E F of this conductor conſiſts of a glaſs tube about eighteen inches long, and three or four inches in diameter. To both ends of this tube braſs pieces F D, B E, are cemented air-tight, one of which has a pointed wire C, which ſerves as a collector to receive the electric fluid from the machine, when the inſtrument is ſet near it, and the other has a knobbed wire G, from which a ſtrong ſpark may be drawn; and from each of the pieces F D, B E, a knobbed wire proceeds within the cavity of the glaſs tube. One of the braſs pieces, *viz.* either F D or B E, is compoſed of two parts; that is, a cap F, which is cemented to the glaſs tube, and has a hole with a valve by which the cavity of the glaſs tube may be exhauſted of air; and the ball D, which is ſcrewed upon the cap F. The ſupporters of this inſtrument are two glaſs pillars fixed into the bottom board H, and ſcrewed to the braſs caps, or having at their upper extremities two ſemicircular hollows, upon which the conductor is barely laid. When the glaſs tube of this conductor has been exhauſted by means of an air-pump, and the braſs ball is ſcrewed on, as repreſented in the figure, then it is fit for uſe, and may ſerve for a prime conductor to an electrical machine.

If the point C of this conductor is ſet before the excited glaſs cylinder of the machine, it will appear illuminated with a ſtar; at the ſame time the glaſs tube will appear throughout illumined with a weak light; but from the knobbed wire,

wire, that proceeds from the piece F D, within the glafs tube, a brighter lucid pencil iffues, and the oppofite knob appears illumined with a ftar or round body of light, which, as well as the pencil of rays, is very clear, and difcernible amidft the other light, which occupies almoft the whole cavity of the glafs tube. If the point C, inftead of being prefented to the excited cylinder, be connected with the rubber of the machine, the appearances of the light within the tube E F will be reverfed; the knob which communicates with the brafs piece F D appearing illuminated with a ftar, and the oppofite one with a pencil of rays; becaufe in this cafe the direction of the electric fluid is juft the contrary of what it was before, it then going from D to B, and now coming from B and going to D. If the wires within the tube E F, inftead of being furnifhed with balls, (which, however, need not be large,) be pointed, the appearances of the light will be the fame, but not quite fo ftrong in this as in the former cafe.

Experiment 5. The vifible electric atmofphere.—The following curious experiment is defcribed by the celebrated Beccaria; but it feems that few perfons have been able to repeat it with fuccefs; probably owing to the great delicacy and caution with which it muft be conducted.

G I, in *fig.* 49, reprefents the receiver with the brafs plate of an air-pump. In the middle of the plate F I a fhort metallic rod is fixed, bearing a metallic ball B, nicely polifhed, and about two inches in diameter. From the top of the receiver another rod A D proceeds, which is furnifhed with a like ball A, and is cemented air-tight into the neck C of the glafs receiver. The diftance between the two balls A and B is about four inches, or rather more. When the receiver is exhaufted of air, if the ball A be electrified pofitively, by touching the top D of the rod A D with the prime conductor, or with an excited glafs tube, a lucid atmofphere will appear about it, which, though it confifts of a feeble light, is, however, very confpicuous, and very well defined; at the fame time that the ball B has not the leaft light about its furface. The atmofphere does not exift all round the ball A; but it reaches from about the middle of the ball, to a fmall diftance beyond that fide of its furface which faces the oppofite ball. If the rod with the ball A be electrified negatively, then a lucid atmofphere, like that which has been defcribed above, will appear upon the ball B, reaching from its middle to a fmall diftance beyond that fide of it which faces the ball A; and at the fame time the ball A, which is electrified negatively, remains deftitute of light.

In this experiment the operator muft take care not to electrify the ball A too much, for in that cafe the electricity will pafs in the form of a fpark from one ball to the other, and the experiment will not have the defired effect.

Experiments to be performed with the Leyden Phial and the electrical Battery.

The properties of the Leyden phial are enumerated and explained under the article of that name, which fee.

Experiment 1. To pierce a card, and other fubftances by the difcharge of a Leyden phial, or charged jar.—Take a card, a quire of paper, or the cover of a book, hold it clofe to the outfide coating of a charged jar; put one knob of the difcharging rod upon the card, or quire of paper, &c. fo that between the knob and the coating of the jar the thicknefs of that card, or quire of paper only, may be interpofed; then by bringing the other knob of the difcharging rod near the knob of the jar, make the difcharge; and the electric matter rufhing through the circuit, from the pofitive to the negative furface of the jar, will pierce a hole, and often more than one hole, quite through the card or quire of paper. This hole, or holes, are larger or fmaller, according as the card, &c. is more damp or more dry. It is to be remarked, that if the noftrils be prefented immediately to it, they will be affected with a fmell fomewhat like fulphur or phofphorus, and like that which is produced, though not fo ftrongly, by an excited electric. This hole has a bur raifed on each fide, excepting when the card has been preffed too hard between the difcharging rod and the jar, which fhews, that the hole is made not in the direction of the electric fluid, but in every direction from the centre of the refifting body.

If this experiment be performed with two cards inftead of one, which two cards, however, muft be kept very little diftant from each other, (which may be eafily effected by bending a little one of the cards;) each of the cards, after the difcharge, will be found pierced with one or more holes, and each hole will be found to have burs on both furfaces of each card.

If inftead of paper, a very thin plate of glafs, rofin, fealing-wax, or the like, be interpofed between the knob of the difcharging rod, and the outfide coating of the jar; on making the difcharge, this will be broken in pieces. Small infects may be killed in this manner. They may be held between the outfide coating of the jar and the knob of the difcharging rod, like the above-mentioned card; and a fhock from a common Leyden phial, fent through one of them, will inftantly deprive it of life, if the infect be very fmall; but if larger, it will be ftunned for a time, but it will afterwards revive. This, however, depends on the quantity of the charge and fize of the jar, as well as the fize of the infect. In this experiment if the infect, difcharging rod, &c. be not managed properly, the charge of the jar will pafs not through, but over the infect, in which cafe it will not produce the defired effect.

Experiment 2. To ftain paper, or mark glafs by the difcharge of the Leyden phial.—Lay a chain, that forms part of the circuit between the two coated fides of a charged jar, upon a fheet of white paper, and after having made the difcharge, the paper will be found tinged with a blackifh tinge at the places which correfponded to the junctures of the links. If the charge be very great, the paper, inftead of being ftained with fpots, will be found burned quite through. If the chain be laid upon a pane of glafs, this will, after the difcharge, be found marked with indelible fpots, but not fo ftrongly as the paper.

When this experiment is performed in the dark, a fpark is feen at every juncture of the links of the chain, and each fpark is attended with a kind of radiation, as if particles of the metal in an ignited ftate were thrown off. When the links are fmall, and the charge of the jar is pretty high, the chain, on making the difcharge, appears like a continued luminous line; which evidently fhews that the electric fluid meets with fome refiftance, or obftruction, in paffing from one link of the chain to another.

Experiment 3. To burft fmall glafs tubes by means of a Leyden phial.—Take a narrow glafs tube, viz. lefs than a tenth of an inch in diameter, fill it with water, and infert a wire at each opening of the tube, fo that part of the wire may project out of the tube at each end, and the other extremities may come within a fmall diftance of each other within the tube. If this preparation be made part of the circuit between the infide and outfide coating of the charged Leyden phial, on making the difcharge, the glafs tube will be broken with violence. But in this experiment the fize of the phial, height of the charge, &c. muft be proportioned to the fize of the glafs tube; otherwife the tube will not be broken.

broken. In ſhort, if the diſcharge forms a viſible ſpark in the water within the tube, the latter will be broken; but if the wires are too far apart, and no ſpark takes place, then the tube will not be broken. This experiment evidently ſhews that water is a very bad conductor of electricity.

Experiment 4. *To fire gunpowder.*—Make a ſmall cartridge of paper, and fill it with gunpowder, or elſe fill the tube of a quill with it; inſert two wires, one at each extremity, ſo that their ends within the quill, or cartridge, may be about one-fifth of an inch from one another. This done, ſend the charge of a phial through the wires, and the ſpark which takes place between the extremities of the wires within the cartridge or quill, will ſet fire to the powder. If the gunpowder be mixed with ſteel filings, it will take fire more readily, and by a very ſmall ſhock.

Experiment 5. *To light a candle by the diſcharge of a jar.*—Take a wire of the ſize of a common knitting needle, and, by means of a ſlender flexible wire or chain, let one end of it communicate with the outſide coating of a Leyden jar, that contains about ten inches of coated ſurface. Twiſt, but very looſely, ſome cotton round the other extremity of the above mentioned thick wire, and ſo as entirely to conceal that extremity of the wire. This head of cotton muſt be rolled in powder of *lycopodium*, or in powder of roſin, which, indeed, anſwers better than the lycopodium, though it is not ſo clean. By this means, a good deal of the powder will adhere to the cotton. This done, the jar is charged, and then the head of cotton is brought haſtily towards the knob of the jar, ſo as to cauſe the charge to paſs through the head of cotton; on doing which the cotton will inſtantly be ſet on fire, and will continue to burn long enough to light a candle with it. This experiment was contrived by Dr. Ingenhouz.

Experiment 6. *To ſtrike metals into glaſs.*—Take two ſlips of common window glaſs, about three inches in length, and half an inch broad; put a ſmall ſlip of gold, ſilver, or braſs leaf between them, and tie them together, or preſs them between the boards of the preſs which belongs to the univerſal diſcharger (ſee DISCHARGER), leaving a little of the metallic leaf out at the two oppoſite ends of the glaſſes; then ſend a ſhock through the metallic leaf, and the force of the exploſion will drive part of the metal into ſo cloſe a contact with the glaſs, that it cannot be wiped off, or even be affected by the uſual menſtrua which would otherwiſe diſſolve it. In this experiment the glaſſes are generally ſhattered to pieces; but whether they are broken or not, the indelible metallic tinge will always be found in ſeveral places, and ſometimes all along the ſurface of the glaſſes.

Experiment 7. *To melt wires.*—We have, in a preceding part of this article, deſcribed the melting of wires by means of an electrical battery, for the purpoſe of determining their various conducting powers. We ſhall now, however, deſcribe ſome other peculiar phenomena with which the melting of wires is attended. In melting wires of a conſiderable length, it is often to be obſerved, that when the force of the battery is juſt ſufficient to render the wire red-hot, the redneſs begins at one end of it; namely, at that which communicates with the poſitive ſide of the battery, and from thence it gradually proceeds to the other end; which affords an ocular demonſtration of the theory of a ſingle electric fluid. Indeed the wire is not rendered red-hot in one place before the other, in conſequence of the electric fluid paſſing firſt through the former, and then through the latter; for that difference of time is by no means appreciable; but becauſe the electric fluid loſes ſome of its impetus, or of its velocity, in going through the wire, in conſequence of which, that part of the wire which the electric fluid enters ſuffers the greateſt effect of the ſhock, and therefore becomes red ſooner, and in a greater degree.

If a wire be ſtretched by appending weights to it, and ſuch a battery be then diſcharged through it, as will render it barely red hot, the wire will be found to be conſiderably lengthened by it. But if the wire be left looſe, then, after a ſimilar exploſion, it will be found ſhortened. (See Nairne's paper in the 70th vol. of the Phil. Tranſ.)

If a wire be thus melted upon a piece of glaſs, the glaſs, after the exploſion, will be found marked with all the priſmatic colours. But the moſt beautiful impreſſions are made upon paper. For this purpoſe, a battery muſt be uſed of ſuch a ſize as entirely to diſperſe the wire, which muſt be laid upon a piece of white paper. The exploſion will generally fix part of the metal in its metallic ſtate into the paper, and will mark the paper on both ſides of this metallic track with a ſmoky broad band of colour, which differs according to the metal that has been exploded; the gold, for inſtance, makes a purpliſh ſtain; the ſilver, a grey, or inclining to yellow, and ſo on.

Experiment 8. *To ſhew that the electric fluid prefers a ſhort paſſage through the air to a long one through the beſt conductors.*—Take a wire of about five feet in length, or more, and bend it in the form repreſented in *fig.* 50, *viz.* ſo that the parts A, B, may come within half an inch of each other; then connect the extremities of it with the hook of a battery, and with the diſcharging rod; that is, one with the former, and the other with the latter, ſo as to ſend the charge through the wire. On making the diſcharge, a ſpark will be ſeen between A and B, which ſhews that the electric fluid prefers a ſhort paſſage through the air between A and B, to a long one through the wire. The charge, however, does not paſs entirely through the air at A B; but part of it alſo goes through the wire A D B, which may be proved by interpoſing a ſhort and very fine wire between A and B; for, on making the diſcharge, this fine wire will hardly be made red hot; whereas, if the large wire A D B be cut at D, ſo as to interrupt the circuit A D B, the ſmall wire will be melted, and diſſipated by a diſcharge ſimilar to the former.

Experiment 9. *To produce globules of metal.*—Take a ſlender wire, and inſert it in a glaſs tube of about a quarter of an inch in diameter; then ſend the charge of a battery through it, and the wire will be melted and reduced into globules of different ſizes, which will be found adhering to the inſide ſurface of the glaſs tube, and may be eaſily ſeparated from it. Theſe globules, on examination with a microſcope, will be found to be moſtly hollow, and, in truth, they are little more than a mere ſcoria of the metal.

Experiment 10. *The Fairy circles.*—Fix upon each of the knobs of the univerſal diſcharger (ſee DISCHARGER *of Electricity*), or upon the wires which ſupport thoſe knobs, a flattiſh and ſmooth piece of metal, (watch caſes are very proper for this purpoſe,) ſo that the ſurfaces of thoſe pieces of metal may be near to each other ſufficiently for the charge of a battery to paſs from one to the other; then connect one wire of the diſcharger with the outſide coating of the battery, and the other wire, by the help of the diſcharging-rod, with the inſide coating of it, ſo as to make the diſcharge. This diſcharge will mark a beautiful ſpot upon the ſurfaces of the metal. It conſiſts of one central ſpot and ſome concentric circles, which are more or leſs numerous, and more or leſs diſtinct, according as the metal upon which they are marked is more or leſs fuſible, and according likewiſe to the power of the battery. The central ſpot as well as the circles lie at a little diſtance from one another, and they conſiſt of dots and cavities, indicating a true fuſion.

The moſt beautiful of theſe rings are produced by a number of diſcharges repeatedly taken from a large battery, every part of the apparatus remaining exactly in the ſame ſituation. If the pieces of metal receive the exploſion in vacuo, the ſpots which are formed upon them are very irregular and confuſed. This is an experiment of Dr. Prieſtley.

Theſe ſpots have been called *Fairy circles*, on account of their bearing ſome reſemblance to the ſpots ſo called, which are often obſerved upon the graſs in the fields. Theſe, which may be called natural Fairy circles in the fields, have been attributed to the action of lightning, on account of their bearing ſome reſemblance to the above-mentioned effects of electricity; the ſuppoſition, however, is not well founded; for the Fairy circles in the fields have no central ſpot, no concentric circles, nor, in general, are they of a circular form. The preſent prevailing idea reſpecting the origin of thoſe ſpots in the fields is, that they are formed by beds of muſhrooms. See the article.

Experiment 11. *To mark coloured rings upon metals.*—Fix a plain piece of metal of any kind upon one of the wires of the univerſal diſcharger, (ſee DISCHARGER *of Electricity*,) and upon the other wire fix a ſharp-pointed needle, with the point juſt oppoſite to the ſurface of the metal; then connect one wire of the diſcharger with the outſide of a battery, and the other wire with the diſcharging rod, &c. In this manner, if the diſcharges be repeatedly ſent either from the point of the needle to the piece of metal, or from the latter to the former, theſe diſcharges will gradually mark the ſurface of the piece of metal oppoſite to the point, with circles conſiſting of all the priſmatic colours; which are evidently occaſioned by very thin laminæ of the metal, raiſed by the force of the exploſions. Theſe colours appear ſooner, and the rings are cloſer to each other, when the point is ſituated nearer to the ſurface of the metal. The number of rings is greater or leſs according as the point of the needle is more or leſs ſharp; and they are repreſented equally well upon any of the metals. The point of the needle is alſo coloured to a conſiderable diſtance; the colours upon it returning in circles, though not very diſtinctly. See Prieſtley's paper in the 58th vol. of the Phil. Tranſ.

Experiment 12. *To ſhew the effects of the diſcharge of the Leyden phial upon colours.*—If cards or pieces of wood be painted with different colours, and a Leyden phial be diſcharged ſucceſſively over each coloured ſurface, black marks, more or leſs denſe and more or leſs broad, will be found marked upon them. Theſe experiments are commodiouſly performed with the univerſal diſcharger. The painted card is laid horizontally upon its tablet, and the points of its two wires (for the knobs muſt be removed) are laid in contact with the painted ſurface of the card, and at about two inches diſtance from each other. The other extremities of the wires are connected with the Leyden phial, and thus the charge is paſſed over the painted ſurface of the card. A Leyden phial, containing about a foot and a half of coated ſurface, is ſufficient for theſe experiments.

Mr. Cavallo, who originally made theſe experiments in a great variety of ways, ſays, "Vermilion was marked with a ſtrong black track, about one-tenth of an inch broad. The track was generally ſingle, but ſometimes it was divided in two towards the middle, and at other times, eſpecially when the wires were ſet at a conſiderable diſtance from each other, the track was interrupted in the middle. It often happened, but not always, that the impreſſion was ſtronger at the extremity of that wire which was connected with the poſitive ſide of the phial; whereas, the ſpot contiguous to the other wire was neither ſo ſtrongly marked, nor did it ſurround the point of that wire ſo much as the former.

"Carmine received a faint and ſlender impreſſion of a purple colour. Verdigris was ſhaken off from the ſurface of the card, except when it had been mixed with ſtrong gum-water, in which caſe it received a very faint impreſſion. White lead was marked with a ſtrong black track, not ſo broad as that on vermilion. Red lead was marked with a faint track, much like carmine. The other colours I tried were orpiment, gambodge, ſap-green, red ink, ultramarine, Pruſſian blue, and a few others, which were compounds of the above; but they received no impreſſion."

It has been often obſerved, that when the lightning has ſtruck the maſts of ſhips, it has paſſed over ſuch parts as were covered with lamp-black and tar, or lamp-black and oil, without the leaſt injury; at the ſame time that it has ſhivered the uncoated parts. (See the 48th and 67th vols. of the Phil. Tranſ.) In order to examine this property of black paint, Mr. Cavallo inſtituted a ſeries of experiments. "I procured," he ſays, "ſome pieces of paper painted on both ſides with oil colours, and ſending the charge of two feet of coated glaſs over each of them, by making the interruption of the circuit upon their ſurfaces, I obſerved that the pieces of paper painted with lamp-black, Pruſſian blue, vermilion, and purple brown, were torn by the exploſion; but white lead, Naples yellow, Engliſh ochre, and verdigris, remained unhurt. The ſame ſhock, ſent over a piece of paper painted very thick with lamp-black and oil, left not the leaſt impreſſion. I alſo ſent the ſhock over a piece of paper unequally painted with purple brown, and the paper was torn where the paint lay very thin, but it remained unhurt where the paint was evidently thicker. Theſe experiments I repeated ſeveral times, and with ſome little variation, which naturally produced different effects: however, they all ſeem to point out the following propoſition.

"1. A coat of oil paint, over any ſubſtance, defends it from the effects of ſuch an electric ſhock, as would otherwiſe injure it; but does by no means defend it from any electric ſhock whatever. 2. No one colour ſeems preferable to the others, if they are equal in ſubſtance, and equally well mixed with oil; but a thick coating does certainly afford a better defence than a thinner one.

"By rubbing the above-mentioned pieces of paper, I found that the paper painted with lamp-black and oil was more eaſily excited, and acquired a ſtronger electricity, than the papers painted with the other colours; and perhaps on this account it may be, that lamp-black and oil might reſiſt the ſhock ſomewhat better than the other paints.

"It is remarkable, that vermilion receives the black impreſſion when painted with lin-ſeed oil, nearly as well as when painted with water. The paper painted with white-lead and oil receives a black mark; but its nature is very ſingular. The track, when firſt made, is almoſt as dark as that marked on white lead painted with water, but it gradually loſes its blackneſs, and in about one hour's time (or longer, if the paint is not freſh) it appears without any darkneſs; and when the painted paper is laid in a proper light, appears only marked with a colourleſs track, as if made by a finger nail. I alſo ſent the ſhock over a piece of board which had been painted with white lead and oil about four years before, and the exploſion marked the black track upon this alſo; this track, however, was not ſo ſtrong, nor vaniſhed ſo ſoon, as that marked upon the painted paper; but in about two days' time it alſo vaniſhed entirely."

Experiment 13. *To magnetize steel by means of electricity* — Take a common sewing needle, which upon trial is found not to be magnetic, place it in the circuit between the inside and outside of a battery, containing about eight or ten feet of coated surface; and send the charge of it through the needle. The effects will be as follow: If the needle be struck, lying east and west, that end of it which is entered by the charge, *viz.* that end which communicates with the positive side of the battery, or jar, will afterwards point north; but if the needle be struck, lying north and south, that end of it which lay towards the north will in any case point north; and the needle will acquire a stronger virtue in this than in the former case. Lastly, if the needle is set perpendicular to the horizon, and the electric shock is given to either point of it, afterwards the lower extremity of the needle will point north. Franklin's letters, &c. p. 90; and Beccaria's Artif. Electr § 731. to 734.

Mr. Van Marum, using the very large battery of the Teylerian museum, which contained 130 square feet of coated surface, tried to magnetize needles made out of watch-springs, which measured 3 and even 6 inches in length; and likewise steel bars of 9 inches in length, from a quarter to half an inch broad, and about a 12th of an inch thick. It was observed, that, 1st, when the bar or needle was placed horizontally in the magnetic meridian, whichever way the shock entered, the end of the bar that stood towards the north acquired the north polarity, or the power of turning towards the north, when freely suspended, and the opposite end acquired the south polarity. If the bar, before it received the shock, had some polarity, and was placed with its poles contrary to the usual direction, then its natural polarity was always diminished, and often reversed, so that the extremity of it, which, in receiving the shock, looked towards the north, became the north pole, &c.

2. When the bar or needle was struck standing perpendicularly, its lowest end became the north pole in any case, even when the bar was previously possessed of some magnetic virtue, and was placed with the south pole downwards; all other circumstances being alike, the bars seemed to acquire an equal degree of magnetic power, whether they were struck whilst standing horizontally in the magnetic meridian, or perpendicular to the horizon.

3. When a bar or needle was placed in the magnetic equator, whichever way it entered, the shock never gave it any magnetism; but if the shock was passed through its width, then the needle acquired a considerable degree of magnetism, and that end of it which lay towards the west became the north pole, and the other end the south pole.

4. If a needle or bar, already magnetic, or a real magnet, was struck in any direction, its power was always diminished: and this took place with bars of considerable size; one being 7.08 inches long, 0.26 broad, and 0.05 thick.

5. Lastly, when the shock was so strong in proportion to the size of the needle, as to render it hot, then the needle either acquired a very slight magnetic power, or none at all.

Experiment 14. *To oxydate and to deoxydate metallic substances by means of electricity.*—If the charge of a battery be passed through a metallic oxyd, a partial deoxydation generally ensues; and it has already been observed in various parts of this article, that a strong shock calcines or oxydates a metallic substance. Mr. Van Marum, using the same powerful machine which has been mentioned in the preceding experiment, and the purest metallic oxyds, which were confined between glasses whilst the shock was passed over them; observed, that the oxyds were rendered metallic so far as to exhibit several grains of the metal, large enough to be discerned by the naked eye, and to be easily separated from the rest. With respect to the oxydation, whenever a shock was employed much greater than that which was barely necessary to fuse the metal, part of the latter was oxydated, and even dispersed into smoke. It is to be remarked, that this oxydation or smoke generally produced several filaments of various lengths and thickness, which swam in the air. It was farther observed, that if a conductor was presented to these flying filaments of metallic oxyd, they were soon attracted by it; but after the first contact they were instantly repelled, and were generally broke into fragments.

Experiments producing several curious configurations by means of electricity.

Some years ago, professor Lichtenberg of Gottingen produced several curious configurations by sifting or puffing certain powders upon an excited electrophorus; and since that time, several ways of producing similar effects have been discovered by various persons. The principal method of producing these impressions in general, is to electrify a perfect or an imperfect electric, and then to throw certain powders upon it, which will dispose their particles into various remarkable forms. These powders may be sifted over the electrified body from a common sieve; they may be tied up in linen rags, and shook out of them; they may be projected by means of a brush; (*viz.* by taking a little of the powder between a finger and thumb, and drawing it over the brush, or by rubbing a lump of chalk, whiting, &c. over the brush) also by means of a pair of bellows. But a more commodious method is as follows: Fix a tube of glass, or wood, or metal, to the neck of a small bottle of elastic gum, commonly called India rubber; put the powders, which you want to project, into this bottle, and then tie a double piece of flannel over the aperture of the tube. If this bottle, so prepared, be held in the hand, and be squeezed, by alternately opening and shutting the hand, the powders will be projected in a fine diffused manner. As for the nature of the powders, almost every substance that can be pulverized sufficiently fine will produce some configurations when projected upon an electrified substance. Thus chalk, sulphur, cinnabar, rosin, dragon's blood, gum arabic, evaporated decoctions of colouring woods, and many others, may be employed for this purpose either single or mixed.

Experiment 1.—Take a pane of glass, clean and dry, hold it suspended by one corner, or lay it flat upon a table, and draw over the surface of it the knob of a Leyden phial, moderately charged with positive electricity in its inside. Then lift up the glass, if laid upon a table, and, holding it suspended, project upon it, by means of the elastic gum bottle, a mixed powder, consisting of dragon's blood and gum arabic in equal parts. The two powders will be separated upon the glass; the red powder of dragon's blood falling on certain places, so as altogether to form an oblong radiated track, consisting of two colours intermixed in a thousand odd ways. The reason of this separation of the powders is, that in the act of projecting them, the powders become actually electrified, and as some of them thereby acquire the positive, whilst others acquire the negative electricity; therefore the former are attracted by those parts of the glass, or other electric, which are electrified negatively, and the latter are attracted by those parts of the electric which are possessed of the positive electricity.

If, instead of drawing the knob of the jar over the surface of the glass, you only touch the surface of it here and there with the knob of the jar, and then project the mixed powders

powders as before; separate star-like figures will be formed about those points. The stars, however, are more defined when a single powder is projected. Their rays or ramifications sometimes are few and strong; at other times they are numerous and slender; and frequently they do not go quite round the points which had been touched with the knob of the jar.

Experiment 2.—Repeat the preceding experiment with this variation only; *viz.* that now the Leyden phial be charged negatively in the inside, and the appearance of the configurations will be much different from the above described, which was produced by positive electricity. In the present, very few rays or branches will be observed: the powders mostly disposing themselves in roundish spots, and generally it will be found, that a central spot of one powder is surrounded by another powder of a different colour.

Instead of dragon's blood and gum arabic, powders of other colours may be projected upon the pane of glass, such as powdered Prussian blue, sulphur, vermilion, rosin, &c. and thus the colours of the configurations may be varied.

These powders adhere to the glass rather slightly; *viz.* so as not to bear being touched; yet, if a piece of paper be gently laid on the painted side of the glass, without rubbing it, and the edge of the paper be pasted all round the edge of the glass, the figures may be preserved without injury. But a better method is, to lay another pane of glass of the same size upon the former, and to fasten them by pasting a slip of paper all round their edges. If powders of such colours as are used by enamellers be projected upon glass or porcelain, and these be afterwards exposed to a proper degree of heat in an enameller's furnace, the configurations will thereby be rendered indelible.

Experiment 3.—Take a piece of common writing paper, hold it very near the fire, so as to render it quite dry and very hot; lay it flat upon a dry marble slab, or a very dry table, and in that situation draw over it the knob of a charged Leyden phial, then lift up the piece of paper by one corner, and holding it suspended, project upon it the mixed powder of dragon's blood and gum arabic by means of the elastic gum bottle. The configurations in this case are very beautiful, and may be made in various shapes, such as letters, stars, stripes, &c. by moving the knob of the Leyden phial in the desired direction; but they are of one colour; *viz.* red; for the gum arabic being nearly of the colour of the paper, cannot be distinguished upon it. If the paper thus painted be held very near to the fire during a few seconds, the powder of dragon's blood being a resinous substance, will be melted, and will be fastened on the paper; after which the powder of gum arabic may be wiped off with a handkerchief.

Powders of other colours may be projected upon the paper after the same manner; but unless they are of a resinous nature, so as to be easily melted by heat, it is very difficult to fasten them to the paper. In these experiments the Leyden phial must not be charged too high nor too low; for, in the former case, the figure will be too confused and irregular, and in the latter it will be too faint. In order to form a neat and determinate figure, and to leave the rest of the paper clean, the powders must not be projected perpendicularly to the paper, but the stream must be thrown in a direction parallel to the surface of the paper. It is also necessary to perform these experiments in as expeditious a manner as possible; for, if the paper be suffered to cool too much, or the electricity to dissipate, the desired effect cannot be obtained.

Experiment 4.—Instead of the paper, the impressions may be made upon marble, by drawing the knob of the charged phial over it; the marble being very dry and hot. After the same manner, these configurations may be made upon all sorts of electric, or semi-electric substances, and they may be preserved by covering them with a glass plate, or else by partially melting the substance, &c. when this is of the proper nature. It is also practicable to transpose these impressions from the electric plate to a piece of white paper; but the method is rather tedious. See Bennet's method of performing it, in his work on electricity; or in Cavallo's Elect. 4th edit. vol. iii. p. 148.

Experiment 5.—A very regular figure may be formed on the surface of a resinous plate in the following manner. Lay the resinous plate upon a table, insulate one or more pointed wires over the plate, with their points directed towards its surface, and distant about an inch and an half, or two inches. Then, by touching these wires alternately with a positive and a negative Leyden phial, throw the alternate sparks upon the resinous surface, and afterwards, by projecting powders of different colours, you will obtain very regular figures, consisting of concentric zones of different colours, which assume the forms of circles, of ellipses, or of other curves, according as one or more pointed wires are used, and according as those wires are situated nearer to, or further from, each other.

Experiment 6.—Cut a figure of any sort out of the middle of a card, as, for instance, a profile, a flower, &c. Place a piece of white silk (white satin answers very well) upon a table; lay the card upon it, and a gold leaf over the card; in which case it is evident, that the gold leaf will touch the silk only within the limits of the figure that has been cut out of the card. This done, lay another card over the gold leaf, and put a book, or something else, heavy upon it to keep it down. Care, however, must be had to leave two projections of the gold leaf out of the cards at opposite ends. Lastly, if you send the charge of a battery through the gold leaf, by connecting one of its projections with the inside, and the other with the outside of the battery, the gold leaf will be melted, and will be forced into the substance of the silk, so as to stain it with a purple spot of the shape and size of the figure cut in the card. The battery for this experiment must have force sufficient to melt the gold leaf completely. By using different metallic leaves, and different figures, various beautiful ornaments may be marked upon silk.

Experiment 7.—Hold a piece of writing paper near the fire to render it dry and warm, then lay it upon a table, and rub it with a dry hand, which operation will excite it. Now let a piece of sealing-wax be lighted, and after having suffered it to burn for about five or six seconds, lift up the excited paper from the table, and hold it up by one corner; blow out the flame of the sealing-wax, and present the melted end of it to the paper at the distance of about an inch, moving it quickly in various directions. In doing this, the electricity of the paper will attract the sealing wax in the form of exceedingly fine filaments, which may afterwards be melted and fastened to the paper, by holding the paper very near the fire for a short time. A small piece of sealing-wax, stuck upon a wire or a pin, answers better than a common stick of sealing-wax.

Some of the configurations described in the preceding experiments are exhibited in *Plate* VI.

Experiments relating to Knobs and Points.

Sharp or pointed bodies have the property of throwing off or of imbibing electricity incomparably better than flat or blunt bodies; and it is for this reason, that, in the construction of electrical machines and electrical apparatus in general, points and sharp corners, edges, &c. are avoided

as much as possible, excepting where a point or points are particularly required; as, for the example, is the case at that end of the prime conductor which faces the excited electric, where the pointed wires of the collector are required for the purpose of imbibing the electricity. The principle upon which this property of points depends, is explained under the article POINT.

Experiment 1. *To draw the electric fluid silently from the prime conductor.*—Let a person hold the knob of a brass rod at such a distance from the prime conductor that sparks may easily fly from the latter to the former, when the machine is in action; while these sparks are going off, let the sharp point of a needle be presented to the prime conductor, at about twice the distance from it that the knobbed rod is held, and you will find that no more sparks will go to the rod; remove the needle, or cover its point with a needle, and the sparks will be seen as before: present the needle, and the sparks disappear, which evidently shews, that the point of the needle draws off *silently* almost all the fluid that the cylinder of the machine throws upon the prime conductor. If, whilst the pointed needle stands presented to the prime conductor, you form the finger and thumb of your hand like a ring, and surround the point of the needle, the action of this point will be suppressed, as is manifested by the sparks, that, in this case, will go to the rod; which shews, that a point will act as a point only whilst it remains free and disencumbered; but not when surrounded by other bodies.

If the needle be fixed upon the prime conductor with the point outward, then, on working the machine, no sparks can be drawn from the prime conductor, or, perhaps, an exceedingly small one when a knobbed conductor is brought nearly in contact with it; the pointed needle dissipating the electricity in the surrounding air; and indeed this is an effectual method of electrifying the air of a room.

This experiment answers equally well with negative or with positive electricity. A pointed wire, fixed on the end of a spiral tube, such as has been described in the preceding part of this article, will draw sparks on account of the interruptions.

Experiment 2. *To discharge a Leyden phial silently.*—When a large jar is fully charged, which would give a violent shock, put one of your hands in contact with its outside coating; with the other hand hold a sharp pointed needle, and keeping the point directed towards the knob of the jar, proceed gradually towards it, until the point of the needle touches the knob. This operation discharges the jar completely, and the operator will either receive no shock at all, or so small a one as can hardly be perceived. The point of the needle, therefore, has silently and gradually drawn all the charge from the inside of the Leyden phial.

If this experiment be performed in the dark, the point of the needle will appear illumined in its way towards the knob of the phial, which is another proof of its drawing off the charge.

Experiment 3. *To observe the wind which proceeds from an electrified point.*—When a pointed wire (the sharper the better) is fixed at the end of the prime conductor, or indeed in any part of it, with the point outward, let the electrical machine be put in action, and present the face, or the palm of the hand, to the above-mentioned point, at the distance of about three inches, and a wind will be perceived to proceed from it.

Fasten five or six pieces of paper to a cork, like the leaves of a water-wheel in hydraulics; pass a needle, by way of an axis, through the cork, and suspend it by applying the end of the needle to a magnet. Let a pointed wire be fixed at the end of the prime conductor, and present the paper vanes of the cork suspended, &c. to the current of air which proceeds from that point, when the machine is in action; and the force of that wind will cause the cork to turn round.

This current of air always proceeds from the point, whether the point be electrified positively or negatively; therefore it is not the influx or the efflux of the electric fluid that occasions the wind; but it is owing to the particles of air which, acquiring the same electricity as the pointed wire, are repelled from it in virtue of the repulsion which takes place between bodies possessed of the same kind of electricity, be it positive or negative. Other particles of air succeed those which are repelled first, and these being electrified are also repelled, and so on.

When the wire, instead of a pointed termination, is furnished with a ball of about an inch and a quarter in diameter, a curious phenomenon may be observed, by presenting the flame of a candle to it, *viz.* so that the middle of the flame may be even with the middle of the ball. The machine being put in action, it will be found that the flame is blown from the ball, when the latter is electrified positively, *viz.* when connected with the positive conductor; and it will be blown towards it when the ball is electrified negatively, *viz.* when it is connected with the rubber of the machine, or with a negative prime conductor; which seems to shew the real influx and efflux of the electric fluid, according to the Franklinian theory.

Experiment 4. *The electric fly, or flyer.*—*Fig.* 51. *Plate* VII. represents a pointed wire fixed upon the prime conductor, and supporting the brass flyer, which consists of slender brass wires fixed to a brass cap, which is hollow in its under side, and rests in *equilibrio* upon the point of the wire W, like the magnetic needle of a compass. The outer terminations of the wires are pointed, and are bent all the same way. When the electrical machine is put in action, the fly will immediately begin to move round in an horizontal plane, and in the direction of the letters *a, b, c, d, viz.* contrary to the direction of the points of the wires. If the experiment be repeated with a prime conductor negatively electrified, the fly will turn the same way as before, *viz.* in the direction of the letters *a, b, c, d.* The reason of this effect depends upon the repulsion existing between bodies possessed of the same kind of electricity; for whether the fly is electrified positively or negatively, the air opposite to the points of the wires (on account of the points easily transmitting electricity) acquires a strong electricity analogous to that of the points, and therefore the air and the points must repel each other. This explanation is confirmed, by observing that the above-mentioned fly not only does not move in *vacuo*, but even if placed under a close receiver it will turn for a little while only, and will then stop; for the quantity of air within the receiver will soon acquire its maximum of electricity.

Fig. 52. represents an improved flyer, which was invented by Edward King, esq. and is described by Mr. Ferguson in his Select Mechanical Exercises. We shall transcribe Mr. Ferguson's words.

"The sun and earth go round the common centre of gravity between them in a solar year, and the earth and moon go round the common centre of gravity between them in a lunar month. These motions are represented by an electrical experiment, as follows: The ball S represents the sun, E the earth, and M the moon, connected by bended wires *a c*, and *b d*: *a* is the centre of gravity between the sun and earth, and *b* is the centre of gravity between the earth and moon. These three balls, and their connecting wires, are

are hung and ſupported on the ſharp point of a wire A, which is ſtuck upright in the prime conductor B of the electrical machine; the earth and moon hanging upon the ſharp point of the wire *c a e*, in which wire is a pointed ſhort pin, ſticking out horizontally at *e*, and there is juſt ſuch another pin at *d*, ſticking out in the ſame manner, in the wire that connects the earth and moon.

"When the cylinder of the electrical machine is turned, the above-mentioned balls and wires are electrified; and the electrical fire flying off horizontally from the points *e* and *d*, cauſes S and E to move round their common centre of gravity *a*; and E and M to move round their common centre of gravity *b*. And as E and M are light when compared with S and E, there is much leſs friction on the point *b* than upon the point *a*; ſo that E and M will make many more revolutions about the point *b* than S and E make about the point *a*. I have adjuſted the weights of the balls ſo, that E and M go twelve times round *b* in the ſame time that S and E go only once round *a*. It makes a good amuſing experiment in electricity; but it is ſo far from proving that the motions of the planets in the heavens are owing to a like cauſe, that it plainly proves they are not. For the real ſun and planets are not connected by wires or bars of metal, &c.

Experiment 5. *The electrified cotton.*—Take a ſmall lock of cotton, extend it in every direction as much as may be practicable, and by means of a linen thread, about five or ſix inches long, or by a thread drawn out of the ſame cotton, tie it to the end of the prime conductor; then let the electrical machine be put in action, and the lock of cotton, on being electrified, will immediately ſwell out, by repelling its filaments from each other, and will ſtretch itſelf towards the neareſt conductor. In this ſituation, the machine continuing in action, preſent the end of a finger, or the knob of a wire, towards the lock of cotton, and this will then immediately move towards the finger, endeavouring to touch it. But take a ſharp pointed needle in the other hand, and preſent its point towards the cotton, a little above the end of the above-mentioned finger, and you will find that the cotton immediately ſhrinks upwards, and moves towards the prime conductor. Remove the needle, and the cotton will come again towards the finger. Preſent the needle, and the cotton will ſhrink again; which clearly ſhews that the needle, being ſharp pointed, draws off the electric fluid from the cotton, and puts it in a ſtate of being attracted by the prime conductor; which effect cannot be produced by a wire having a blunted end, or a round ball for its termination.

Promiſcuous Experiments.

Experiment 1. *To cryſtallize a ſolution of pot-aſh.*—Take a glaſs tube, about four inches long, and about one quarter of an inch in diameter, open at both ends. Moiſten the inſide of it with a ſtrong ſolution of pot-aſh; adapt two corks to the extremities of the tube, and introduce a wire through each cork. The extremities of thoſe wires within the tube ſhould be about three quarters of an inch diſtant from each other. This done, connect one of the wires with the outſide coating of a pretty large electric jar, and connect the other wire with the diſcharging electrometer (ſee DISCHARGER *of Electricity*); then let the diſcharge be repeatedly paſſed through the tube, and after a certain number of diſcharges, the alkaline ſolution within the tube will give manifeſt tokens of cryſtallization.

This experiment, at an early period of the ſcience, was ſuppoſed to prove, that the electric fluid is an acid, which, combining with the alkali, neutralized it, and diſpoſed it to cryſtallize. The fact, however, is, that the exploſions, which take place within the tube, by acting on the common air, produce a certain quantity of carbonic acid, which combines with the alkali, and diſpoſes it to cryſtallize.

Experiment 2. *The inflammable-air piſtol.*—This experiment ſhews that a very ſmall electric ſpark is ſufficient to inflame hydrogen gas, or, as it was formerly called, inflammable air. The *figs.* 53. and 54. repreſent a piſtol for this purpoſe, which is made of braſs; but it is here repreſented as tranſparent, in order to ſhew its internal parts. It conſiſts of a cavity A B C, to the aperture, A, of which a cork is fitted. To the lower part of it a perforated braſs piece is ſcrewed, into which a glaſs tube D E is cemented, and within this tube a wire G F is likewiſe cemented. This wire is furniſhed with a ſmall ball at its external termination, and is bent at its other extremity, ſo as to come within about a tenth of an inch of the braſs piece. *Fig.* 54. ſhews this braſs piece with the glaſs tube, &c. ſeparate from the reſt, and it likewiſe ſhews the braſs cap I, which, when the piſtol is not uſed, is ſcrewed at H, as is ſhewn by the dotted line in *fig.* 53, and it ſerves to defend the glaſs tube E. It will be eaſily comprehended, that if a perſon holds this piſtol in one hand, and brings the ball F near the prime conductor of an electrical machine, in action, or preſents an excited glaſs tube or ſtick of ſealing-wax to it, ſo as to give a ſpark to the ſaid ball F, a ſimilar ſpark will take place between the end of the bent wire within the tube, and the braſs piece contiguous to it. When the piſtol is properly charged with the inflammable gas, and the cork is adapted to the aperture of it, if a perſon holding it by its middle, communicates a ſpark in the above deſcribed manner to the ball F; the ſpark which takes place within the piſtol will inflame the gas, which produces a loud report, and drives out the cork with great violence.

The inflammable gas for this purpoſe muſt be kept in a common bottle well corked, and when the piſtol is to be charged, the corks are removed both from the piſtol and from the bottle, the piſtol is inverted over the bottle, adapting the aperture of the one to that of the other, and after remaining in that ſituation during about 10 or 15 ſeconds, the piſtol is ſeparated from the bottle, and the corks are inſtantly replaced in both their apertures. By this operation the common air, which is in the piſtol, mixes with the inflammable gas, for this being much lighter will aſcend into the piſtol, whilſt part of the common air of the piſtol will deſcend into the bottle. The piſtol is then ready to be fired off. The form of theſe piſtols has been often diverſified. They have been rendered capable of being filled with certain determinate quantities of elaſtic fluids, and that for the purpoſe of producing the greateſt poſſible effect. They have, in fact, rendered them capable of driving a leaden bullet with conſiderable force. For the preparation of the inflammable gas, ſee the article HYDROGEN GAS.

Experiment 3. *Mr. Volta's inflammable air lamp.*—*Fig.* 55. repreſents this inſtrument, which was invented by Mr. Volta. A is a glaſs globe to contain the hydrogen gas; B is a glaſs baſon or reſervoir to hold water; D is a ſtop-cock which is to form occaſionally a communication between the water in the reſervoir B and the cavity of the veſſel A. The water paſſes into the latter through the metal pipe *g g*, which is fixed to the upper part of the reſervoir A. At S is a ſmall cock, to cut off, or open, a communication with the air in the ball and the jet K. N is a ſmall pipe to hold a piece of wax-taper; L is a braſs pillar, on the top of which is a braſs ball; *a* is a pillar of glaſs furniſhed at top with a ſocket, through which a wire *b* ſlides, and a ball is ſcrewed to the end of this wire. F is a ſtop-cock, by which the ball A is filled with the inflammable gas, and which afterwards

ſerves to confine the gas and the water that falls from the baſon B into the ball A.

To uſe this inſtrument, after having filled the reſervoir A with pure hydrogen gas, and the baſon B with water, turn the cocks D and S, and the water which falls from B will force ſome of the gas out of the jet K into the air. It then an electric ſpark is made to paſs from the braſs ball *m*, to the braſs ball *n*, the jet of gas out of the pipe K will be inflamed. And when it is required to put it out, the cock S firſt, and then the cock D muſt be ſtopped, *viz.* muſt be turned ſo as to cut off the communication.

To fill the veſſel A with inflammable gas; having previouſly filled A with water, place the foot R under water, on a board or ſtool in a large tub of water, then the gas is conveyed by a bent glaſs tube from the veſſel in which that gas is generated, to the aperture under the foot R; whence the gas aſcends into the veſſel A, and the water comes out of it at the ſame time. When A is full of the gas, the cock F is ſhut up, and the veſſel is taken out of the water, &c. (See PNEUMATIC *tub*, and HYDROGEN GAS.) This inſtrument is uſeful for lighting a candle, and of late it has been much improved, ſo that it is now ſold in London expreſsly for that purpoſe. Theſe improved inſtruments contain alſo an electrophorus, and the whole is diſpoſed ſo, that by turning a ſingle cock, the ſtream of gas is forced out of the pipe, and is lighted at the ſame time. A more particular deſcription of theſe improved inſtruments belongs to other ſubjects.

Experiment 4. *To inflame ſpirits of wine by means of electricity.*—The power of the electric ſpark is ſufficient to inflame inflammable ſpirits when it is paſſed through them, and eſpecially when the ſpirits are a little warm.

Suſpend to the prime conductor a ſhort rod, having a ſmall knob at its end; pour ſome ſpirit of wine, a little warmed, into a metal ſpoon. (The beſt way of warming the ſpirits is to hold the ſpoon over the flame of a candle during a minute at moſt.) Hold the ſpoon by the handle, and place it ſo that the above mentioned ſmall knob may ſtand at about the diſtance of one inch above the ſurface of the ſpirit. In this diſpoſition, if the electrical machine be put in action, by turning the winch, a ſpark will come from the little knob to the ſpoon, which, by paſſing through the ſpirit of wine, will ſet in on fire. Care, however, muſt be had, that the ſpark does not fly from the knob to the edge of the ſpoon; for in this caſe the ſpirit will not be inflamed. On this account it is proper to uſe a large ſpoon.

This experiment ſucceeds equally well whether the conductor be electrified poſitively or negatively; it being not the direction, but the rapid motion of the electric fluid, that ſets the ſpirit on fire.

This experiment may be varied different ways, and may be rendered very amuſing to a company of ſpectators. A perſon, for inſtance, ſtanding upon an inſulating ſtool, and communicating with the prime conductor, may hold the ſpoon with the ſpirits in his hand, and another perſon, ſtanding upon the floor, may ſet the ſpirits on fire, by bringing his finger within a ſmall diſtance of its ſurface. Inſtead of uſing his finger, he may inflame the ſpirits by preſenting a piece of ice, which will render the effect more ſurpriſing. If the ſpoon is held by the perſon who ſtands upon the floor, and the inſulated perſon brings ſome conducting ſubſtance over the ſurface of the ſpirits, the experiment will ſucceed equally well.

Mr. Winkler ſays that oil, pitch, and ſealing-wax, might be lighted by electric ſparks, provided thoſe ſubſtances were firſt heated to a degree next to kindling. Prieſtley's Hiſt. of Elect. period vii.

Experiment 5. *To cauſe the mercury to riſe in a thermometer by means of electricity.*—Fix a wooden ball to the wire that proceeds from the extremity of the prime conductor, and place another like wooden ball on a wire, or other conductor, that communicates with the earth, at about half an inch diſtance from the other ball; in which ſituation it is clear, that when the machine is in action, a ſtream of electric fluid will paſs from one ball to the other. Now if you place the bulb of a mercurial thermometer in that ſtream, *viz.* between the two wooden balls, the mercury will be gradually raiſed in it by the action of the electric ſtream. By continuing to work the machine, the mercury may be raiſed ſeveral degrees above its former ſtation.

For this experiment the bulb of the thermometer muſt be quite detached from the ſcale, ſo that the ſcale may begin at leaſt three inches above the bulb. This experiment, upon the whole, ſeems to anſwer beſt when the balls are of ſoft wood. Mr. Adams ſays, "with a cylinder of about ſeven inches and a half in diameter, the fluid paſſing from a ball of lignum vitæ to a ball of beech, and thence to the ground, elevated the quickſilver in the thermometer from 68° to 110°, repeatedly to 105°. The thermometer was raiſed from 68° to 85°, by the fluid paſſing from a point of box to a point of lignum vitæ; from 67° to 100°, from a point of box to a ball of box; from 66° to 100°, from a ball of box to a braſs point; from 69° to 100°, from ball to ball; the bulb of the thermometer covered with flannel." Adams's Eſſ. on Elect. p. 58.

Experiment 6. *The atmoſphere of ſmoke.*—Take a braſs ball, or any piece of metal that is free from points or edges, of about three or four inches in diameter, and inſulate it upon a narrow inſulating ſtand: then give it a ſpark with the knob of a charged phial, and immediately after preſent it to a wax taper juſt blown out and ſmoking. The ſmoke, in this caſe, will be attracted by the electrified body, and, by encompaſſing that body, will form a kind of atmoſphere about it. This atmoſphere will remain for a few ſeconds, and afterwards, beginning from the bottom, will gradually vaniſh, until at laſt, entirely departing from the electrified body, it goes off in a ſlender column, that ſoon rarefies and diffuſes itſelf into a conſiderable ſpace.

This experiment will not ſucceed unleſs it be performed in very dry weather, and in a room where the air is not agitated. Care muſt alſo be taken, that in blowing out the taper, and in preſenting it to the electrified body, the air be diſturbed as little as poſſible.

The effect which is produced in this experiment is far from proving the exiſtence of any electrical atmoſphere, as ſome perſons have been induced to ſuppoſe. The ſmoke is attracted by the electrified body in the ſame manner, and for the ſame reaſon, that other bodies are attracted by it. The ſmoke remains ſuſpended about that body, and cannot all come into contact with its ſurface, on account of its elaſticity. It remains ſo long ſuſpended about the electrified body, and is not immediately repelled, becauſe it is a bad conductor, and acquires the electricity very ſlowly; but when it has acquired a ſufficient quantity of that power, it begins to quit the electrified body, and aſcending in the air, expands itſelf into a large ſpace, in conſequence of the repulſion which takes place amongſt its own electrified particles.

Experiment 7. *The electrified cup and chain.*—Inſulate a metallic cup, or any other concave piece of metal, and within it place a pretty long metallic chain, having a ſilk thread tied to one of its extremities. To the handle of the cup, or to a wire proceeding from it, ſuſpend a cork ball electrometer; then electrify the cup by giving it a ſpark with the knob of a charged phial, in conſequence of which the balls of the electrometer will immediately diverge. If in this ſituation

ſituation one end of the chain, held by the ſilk thread, be gradually raiſed above the cup, the other end remaining in it, the balls of the electrometer will converge a little, and more or leſs in proportion to the elevation of the chain above the cup. Lower the chain again, and the divergency of the electrometer will be increaſed, and ſo on; which proves that the electricity of the cup and chain together is more denſe when theſe bodies are in a compact, than when they are in a more extended form; or that the denſity of the electric power is nearly, if not exactly, in the inverſe proportion of the ſurface; ſo that if equal quantities of electricity be communicated to two bodies differing in the extenſion of their ſurfaces, the electric virtue will be deſer upon the ſmall than upon the large ſurface. And two bodies of equal and ſimilar ſurfaces, but one of them hollow and the other ſolid, will acquire an equal ſhare of electricity if they are both, at the ſame time, brought in contact with the prime conductor, or with any other electrified body.

The ſame property was ſhewn by T. Ronayne, eſq. in the following different manner: He excited a long ſlip of white flannel, or a ſilk ribbon, by rubbing it with his fingers; then, by applying his hand to it, took off as many ſparks as the excited electric would give; but when the flannel, or ſilk, had loſt the power of giving ſparks in this manner, he doubled or rolled it up. In conſequence of which the contracted flannel, &c. appeared ſo ſtrongly electrical as to give ſparks even ſpontaneouſly.

Experiment 8. *To pierce holes through glaſs by means of electric ſparks.*—Take a common phial, or let a glaſs tube of any diameter, and about four or five inches long, be cloſed either hermetically, or by means of ſealing-wax, at one end, and fill about the half of it with olive oil; then ſtop the aperture with a cork, through which a wire muſt be paſſed. This wire muſt come ſo far within the tube, as to have its extremity below the ſurface of the oil, and muſt be bent ſo as to touch the ſurface of the glaſs. Things being thus prepared, bend the external part of the wire in the form of a ring, and ſuſpend it together with the phial, or tube, to the wire at the extremity of the prime conductor. Now put the electrical machine in action, and bring the knuckle of a finger, or the knob of a wire, near the outſide of the tube, juſt oppoſite to the extremity of the wire within; the conſequence will be, that a ſpark paſſes from the wire to the knuckle, which makes a hole, and ſometimes more than one hole through the glaſs. By turning the wire about, or by raiſing and lowering it, many holes may be ſucceſſively made in the ſame phial or tube, after the above-mentioned manner.

It is very remarkable, that ſo ſmall a force as a ſimple ſpark from an ordinary electrical machine ſhould perforate a ſubſtance ſo hard as glaſs. It has ſometimes made a hole through glaſs that was nearly a quarter of an inch thick. It ſeems that the oil, being an electric, prevents the electricity of the ſpark to ſpread beyond the very narrow place on the ſurface of the glaſs which touches the point of the wire, and that the ſpark becomes ſo powerful in conſequence of its being ſo confined or concentrated.

Experiment 9. *To ſhew the direction of the electric fluid in the diſcharge of a Leyden phial by the flame of a wax taper.*—Remove the circular tablet from the middle of the univerſal diſcharger. (See DISCHARGER.) Fix the two wires of that inſtrument in the ſame horizontal direction, and ſo that their knobs may be about two inches diſtant from each other. Fix a piece of wax-taper, lighted, ſo that its flame may ſtand midway between the two knobs. Having diſpoſed the apparatus in this manner, if you connect, by means of a chain or otherwiſe, the outſide of a charged jar with one of the horizontal wires of the univerſal diſcharger, and bring the knob of the jar to the other wire, you will obſerve, that on making the diſcharge, (which muſt paſs from one knob to the other, through the flame of the wax taper,) the flame is always driven in the direction of the electric fluid, that is, it will be blown upon the knob of that wire which communicates with the negative ſide of the jar.

In this experiment the jar muſt have an exceedingly ſmall charge, *viz.* juſt ſufficient to paſs from one knob to the other, which experience will preſently determine, otherwiſe the experiment will either not ſucceed, or it may be rendered equivocal. The reaſon why this experiment does not ſucceed with a high charge ſeems to be, that the high charge, in conſequence of its extended ſphere of action, diſturbs the flame of the wax taper before the actual diſcharge takes place.

Experiment 10. *To render the direction of the electric fluid conſpicuous, by the motion of a pith ball*—Bend a card lengthways over a round ruler, ſo as to form a channel or ſemicircular groove; or cut a piece of baked wood in the ſhape of an oblong channel; for this piece of wood, being painted over with lamp-black and oil, will anſwer better than the card. Lay this channel upon the tablet of the univerſal diſcharger; place a pith-ball, of about half an inch in diameter, in the middle of the channel; then at equal diſtances, about half or three-quarters of an inch from the pith-ball, lay the braſs knobs of the wires of the univerſal diſcharger, *viz.* one on one ſide, and the other on the oppoſite ſide of the pith ball. The card or piece of wood being dry and rather warm, if you connect, by means of a chain or otherwiſe, the outſide of a charged jar with one of the wires of the univerſal diſcharger, and bring the knob of the jar in contact with the other wire, you will obſerve that on making the diſcharge, which muſt paſs from one knob to the other, and through the pith-ball, the latter is always driven in the direction of the electric fluid, *viz.* it is puſhed towards that knob which communicates with the negative ſide of the jar.

This experiment demands great care and attention, and with reſpect to the charge of the jar the ſame precautions muſt be uſed in this as in the preceding experiment.

Experiment 11. *To render the direction of the electric fluid evident by the diſcharge of a Leyden phial over a card.*—Lay a wire upon a table, and place a card over the end of it. Alſo lay another ſimilar wire upon the card, ſo that the two wires may be in one direction, and their extremities at about one inch diſtance from each other. If one of thoſe wires be made to communicate with the outſide coating of a charged jar, and the other wire be made to communicate with the knob of the jar, the diſcharge muſt evidently paſs over the ſurface of the card from the extremity of one wire to that of the other; but ſince the extremities of the wires lie on oppoſite ſides of the card, it is alſo evident, that on making the diſcharge, a hole muſt be made by the electric charge in ſome part of the card. Now it will be found, that the electric fluid runs over that ſurface of the card which touches the wire that is connected with the poſitive ſide of the jar; and in order to paſs to the other wire, it breaks a hole exactly over the extremity of that wire which communicates with the negative ſide of the jar.

This curious experiment, which was invented by Mr. Lullin of Geneva, requires a jar of a moderate ſize, and moderately charged; for the diſcharge of a large Leyden phial is apt to pierce ſeveral holes, which renders the effect equivocal.

Experiment 12. *To ſhew the penetrability of the electric light.*—Let the extremities of two wires, one of which proceeds from the outſide of a charged jar, and the other is connected with one branch of the diſcharging rod, be laid upon a table at about one-tenth of an inch diſtance from

each

each other; then place the thumb exactly over that interruption of the circuit, preſſing it flat down. Now bring the diſcharging rod in contact with the knob of the jar, and on making the diſcharge, the ſpark which neceſſarily takes place under the thumb will illuminate it in ſuch a manner as to ſhew the bone and the principal blood-veſſels. In this experiment the operator needs not be afraid of receiving a ſhock, for the diſcharge of the jar paſſes from wire to wire, and, at moſt, it only affects the thumb with a ſort of tremor, which is far from being painful.

Experiment 13. *To illuminate water.*—Let every thing be diſpoſed exactly as in the preceding experiment, excepting that inſtead of the thumb, a large clear glaſs decanter full of water be laid over the interruption of the circuit. On making the diſcharge, the water will appear illumined throughout.

After the ſame manner, *viz.* by paſſing the charge of a Leyden phial over the ſurface of a variety of bodies, or under them, or laſtly through; theſe bodies will moſtly appear illuminated at the time of the diſcharge, and ſometimes for a few ſeconds after it. Eggs are beautifully illumined by the paſſage of a charge through their ſubſtance. It needs hardly be obſerved that theſe experiments muſt be made in the dark.

Experiment 14. *To ſhew that the electric fluid drives ſmall conducting bodies in its way.*—Lay ſome braſs duſt, or braſs filings, upon a metallic plate that communicates with the inſide coating of a battery; connect the outſide of the battery with the diſcharging rod by means of a wire; charge the battery, then bring the knob of the diſcharging rod over the above-mentioned braſs duſt, and the diſcharge will be made at a much greater diſtance (more than double or treble,) than when no braſs duſt is uſed, which ſhews that the electric fluid drives the conducting duſt from the plate towards the knob of the diſcharging rod, and the particles of this duſt then ſerve as ſteps to facilitate the paſſage of the fluid. Beccaria was the firſt who advanced the propoſition, that "when the electric fluid is obliged to paſs through air, or through any other ſubſtance which obſtructs its free paſſage, it throws forward all light conducting ſubſtances which happen to be at hand, in order to facilitate its own paſſage." Dr. Prieſtley made a variety of experiments with a view of aſcertaining and of elucidating this property of the electric fluid. He formed the circuit between the two ſides of the Leyden phial by trains of braſs filings, leaving a ſmall interruption in them; he formed heaps of duſt at a diſtance from one another, &c.; but after the account of all thoſe trials he ſays, "All theſe experiments ſhew that light bodies, poſſeſſed of a conſiderable ſhare of electricity, diſperſe in all directions, carrying the electric matter to places not abounding with it; and that they ſometimes promote a ſudden diſcharge of great quantities of that matter from places where it was lodged, to places where there was a defect of it."

Experiment 15. *To take a long ſpark through an exhauſted tube.*—This experiment is extracted from a valuable paper of Mr. Morgan, who made numerous electrical experiments in vacuo. "It is," he ſays, "ſurpriſing to obſerve, how readily an exhauſted tube is charged with electricity. By placing it at ten or twelve inches from the conductor, the light may be ſeen pervading its inſide, and as ſtrong a charge may ſometimes be procured as if it were in contact with the conductor; nor does it ſignify how narrow the bore of the glaſs may be; for even a thermometer tube, having the minuteſt perforation poſſible, will charge with the utmoſt facility; and in this experiment the phenomena are peculiarly beautiful.

"Let one end of a thermometer tube be ſealed hermetically; let the other end be cemented into a braſs cap with a valve, or into a braſs cock, ſo that it may be fitted to the plate of an air pump. When it is exhauſted, let the ſealed end be applied to the conductor of an electrical machine, while the other end is either held in the hand or connected with the floor. Upon the ſlighteſt excitation, the electric fluid will accumulate at the ſealed end, and be diſcharged through the inſide in the form of a ſpark, and this accumulation and diſcharge may be inceſſantly repeated till the tube is broken. By this means I have had a ſpark 42 inches long, and had I been provided with a proper tube, I do not doubt but that I might have had a ſpark of four times that length. If inſtead of the ſealed end, a bulb be blown at that extremity of the tube, the electric light will fill the whole of that bulb, and then paſs through the tube in the form of a brilliant ſpark, as in the foregoing experiment; but in this caſe I have ſeldom been able to repeat the trials above three or four times before the charge has made a ſmall perforation in the bulb.

"If, again, a thermometer filled with mercury, be inverted into a ciſtern, and the air exhauſted ſo as to form a Torricellian vacuum, the electric light in the bulb, as well as the ſpark in the tube, will be of a vivid green; but the bulb will not bear a frequent repetition of charges before it is perforated in like manner as when it has been exhauſted by an air-pump. It can hardly be neceſſary to obſerve, that in theſe caſes the electric fluid aſſumes the appearance of a ſpark from the narrowneſs of the paſſage through which it forces its way. If a tube 40 inches long be fixed into a globe 8 or 9 inches in diameter, and the whole be exhauſted, the electric fluid, after paſſing in the form of a brilliant ſpark throughout the length of the tube, will, when it gets into the inſide of the globe, expand itſelf in all directions, entirely filling it with a violet and purple light, and exhibiting a ſtriking inſtance of the vaſt elaſticity of the electric fluid."

Electrical *Fiſhes*. All the phenomena of electricity which were known in the 15th century amounted only to the attraction of light bodies by the tourmalin when heated, and by amber, and a few other bodies, after friction. The light was diſcovered ſoon after, but the greateſt diſcoveries, which indeed excited the wonder and the aſtoniſhment of the human ſpecies, ſuch as the prodigious force of the Leyden phial, the identity of electricity, and the lightning, &c. belong entirely to the laſt century. Amongſt theſe wonders we muſt undoubtedly reckon the electricity of fiſhes, which has been diſcovered within the laſt 40 years; for though the power of benumbing, or of giving a ſhock, was long known in one of thoſe animals, namely, the torpedo, from which indeed it derived its name, yet that power was not known to be an effect of electricity before Mr. Walſh proved it within the above-mentioned period.

Four different inhabitants of the ſea have hitherto been found to poſſeſs the peculiar property of giving ſhocks ſtrong enough to ſtun, or actually to kill, ſmall animals, and the moſt probable conjecture is, that nature gave them that property for the purpoſe of procuring their food, and perhaps, too, for deterring larger animals from approaching and annoying them. Three of theſe fiſhes are called the *torpedo*, the *gymnotus electricus*, and the *ſilurus electricus*. Of the fourth fiſh, which has not yet obtained a name, we have only a ſhort and imperfect account, which we ſhall ſubjoin preſently.

Whenever a communication is made by means of ſubſtances that are conductors of electricity, between one part and another of the body of any of theſe fiſhes, and a man, or other animal, is interpoſed, *viz.* forms part of the circuit; the man or other animal feels a ſhock analogous to that which is occaſioned by the diſcharge of the Leyden phial.

If

If the circuit be formed of electrics, no shock will be felt; and if a man touch any of these animals with one hand only, without completing the circuit, he will, at most, only feel a slight tremor in the hand that touches the animal. The gymnotus alone affords a luminous spark, which becomes evident by making an exceedingly small interruption in the circuit of communication. It must be observed, however, that once, and once only, the torpedo afforded a spark which was seen by a distinguished Italian philosopher and his attendant, and he even heard the crackling noise of it. (Josephi Gardinii De Electrici Ignis natura Dissertatio, p. 100.) Excepting the above-mentioned properties, it is not known that these fishes have any other property in common with artificial electricity.

Agreeably to the plan of our work, we shall particularly describe the three principal electrical fishes, together with their anatomy, electrical properties, force, &c. under the articles TORPEDO, GYMNOTUS ELECTRICUS, and SILURUS ELECTRICUS. The short account of the fourth electrical fish is as follows.

This animal was found on the coast of Johanna, one of the Comorro islands, in lat. 12° 13′ south, by lieutenant Wm. Paterson, and he thus speaks of it in the Phil. Transf. vol. 76. "The fish is described to be seven inches long, two and a half inches broad, has a long projecting mouth, and seems of the genus tetrodon. The back of the fish is a dark brown colour, the belly-part of sea-green, the sides yellow, and the fins and tail of a sandy green. The body is interspersed with red, green, and white spots, the white ones particularly bright; the eyes large, the iris red, its outer edge tinged with yellow."

Whilst the fish is living, strong shocks, like electrical shocks, are felt by a person who attempts to hold it between his hands. Three persons are mentioned in the account, as having experienced this property of one of those fishes, but the want of opportunity prevented the trial of farther experiments.

We need hardly add, with respect to all these fishes, that every electrical property vanishes with the entire death of the animal.

ELECTRICAL *Fluid*. The phenomena of electricity, so singular, so various, so extensive, and so powerful, as they are described in divers parts of this Cyclopædia; are the effects of an unknown cause, which philosophers have called the *electric*, or the *electrical fluid*. That it is a fluid, and that it is elastic, there can hardly be a doubt; for if it be communicated from one body to another, it instantly expands itself all over the two bodies, and if again other bodies (always meaning such bodies as are capable of receiving and transmitting it; *viz. conductors*) be placed in contact with the above, the electric fluid will expand itself over these also, and so on; nor do we know any limits to its expansibility. But besides this fluidity, and this elasticity, whatever else has been advanced respecting the nature of this fluid, is mere hypothesis or conjecture, and of the principal of these hypotheses we shall now endeavour to give a succinct account.

When the attraction and the repulsion were the only electrical phenomena known to philosophers, they supposed that these were occasioned by a kind of unctuous effluvia, proceeding immediately from the electrified body; but when the light, the burning quality, and the peculiar smell of electricity were discovered; then the idea of their being produced by some modification of fire was naturally suggested, and accordingly the electrical fluid was commonly called the *electrical fire*, which name even at present is used by several writers on the subject of electricity. But notwithstanding the various effects, similar to those of common fire, which are produced by electricity, an attentive examination of the concurring circumstances will easily shew that electricity, and fire, or caloric, are things quite distinct from each other. In the first place it should be considered, that friction, or the sudden attrition of bodies, produces not only heat in a moderate degree, but in a great many cases, actual combustion, accompanied with light, &c. therefore it should not be wondered that the electric fluid, which passes with astonishing rapidity through bodies, should produce the above-mentioned effects; and it is to be remarked, that it is in its passage, or motion, alone, that the electric fluid produces effects analogous to those of fire. Secondly, if heat or fire, and electricity, were the same thing, they would be always together; or, more properly speaking, the effects of the one ought to be always accompanied with the effects of the other; but we find that a body simply electrified, or a Leyden phial containing a high charge, is not sensibly heated by it; nor does a body acquire any electricity by being heated; excepting that electricity which seems to be produced in consequence of an enlargement or contraction of parts, and which is observable in a few bodies only.

Some writers of eminence have laid great stress upon an experiment of Mr. Wilson, made some years ago at the Pantheon, where an immense apparatus was erected principally for the purpose of determining whether a point or a knob was the best termination for the conductors of lightning. The apparatus consisted of an electrical machine, which, though pretty large, was not, however, of any extraordinary size: but to this machine there was annexed an immense prime conductor, which consisted of a great number of military drums, covered with tinfoil, which formed a cylinder of above 155 feet in length, and more than 16 inches in diameter; and to this vast conductor were occasionally added 4800 yards of wire. The electric fluid drawn from this conductor, after it had been fully electrified by the machine, fired gun-powder; when it was drawn off by a sharp point. The particular construction was as follows: Upon a staff of baked wood a stem of brass was fixed, which terminated in an iron point at the top. This point was put into the end of a small tube of Indian paper, made somewhat like a cartridge, about an inch and a quarter long, and two tenths of an inch in diameter. When the cartridge was filled with common gun-powder, unbruised, a wire, communicating with the earth, was fastened to the bottom of the brass stem. Whilst the charge in the great prime conductor was kept up by the continued action of the machine, the top of the cartridge was brought very near the cylinder of drums, so that it frequently even touched the tinfoil with which it was covered. In this situation a small faint luminous stream was frequently observed between the top of the cartridge and the metal. Sometimes this stream would set fire to the gun-powder the moment it was applied; at other times it would require half a minute or more before it took effect. But this difference in time was supposed to be owing to some small degree of moisture in the powder or in the paper. Tinder was fired in the same manner, but much more readily. This experiment has, since that time, been imitated by Mr. Nairne with a Leyden phial.

Now the result of this experiment was supposed to corroborate the idea of the identity of electricity and fire; but there requires no great ingenuity to remark that the great quantity of electric fluid, which in this experiment must have passed through the metallic point, heated that point sufficiently to fire the gun-powder. It has been alleged, that in this case the passage of the electricity could not have power to heat that point, because, when that fluid is drawn off by a sharp point, it has less force than in any other case; but

but it ſhould be obſerved, that when ſurrounded by other bodies, as in the preſent caſe, a pointed body ceaſes to act as a point, and that more or leſs according to the nature of the bodies which ſurround it.

If we examine the propagation of heat and of electricity, their diſſimilarity becomes more apparent: for though heat paſſes through certain conductors of electricity (ſuch as the metals) eaſier than through other bodies; yet ſooner or later it penetrates every known ſubſtance, and an exceedingly ſmall quantity of it diffuſes itſelf alike throughout bodies of every kind; and that diffuſion is performed very ſlowly; but the electric fluid pervades conductors only, and its propagation through them is performed in an immeaſurable ſmall portion of time. Mr. Henly, an ingenious electrician, whoſe labours conſiderably promoted that ſcience, made the following obſervations. We conſtantly, he ſaid, obſerve, 1. That if two bodies containing the inflammable principle in equal quantities (which is the caſe with bodies of the ſame kind, as glaſs and glaſs, metal and metal, &c.) be rubbed together, they acquire either very little electricity, or none at all. 2. That as one of the bodies contains a greater quantity of the inflammable principle than the other, ſo they acquire a greater quantity of electricity, and ſuch is the caſe when glaſs is rubbed with a metal. 3. That a certain degree of friction produces electricity, and that a more violent friction produces fire, but no electricity; and, 4. That, in general, bodies which are poſſeſſed of a greater quantity of the inflammable principle, give the electric fluid to bodies that have leſs of it, when they are rubbed together.

From theſe obſervations Mr. Henly concluded, that the electric fluid and fire are produced by ſimilar operations, and are both extracted from bodies abounding with the inflammable principle; and therefore he was led to ſuppoſe that the inflammable principle, (at that time called *phlogiſton*,) the electric fluid and fire, are only different modifications of the very ſame element; the firſt being its quieſcent ſtate of exiſtence, the ſecond its firſt active ſtate, and the laſt its more violent ſtate of agitation.

But to ſay that the electric fluid is a modification of the inflammable principle, without pointing out what that modification conſiſts of, is the ſame thing as to ſay that one does not know what the electric fluid really is.

Certain philoſophers have ſuppoſed the electric fluid to be nothing more than the *ether* mentioned by ſir Iſaac Newton; but according to Newton's ſuppoſition, the ether is an exceedingly ſubtile and elaſtic fluid, which is diſperſed throughout the univerſe, and the particles of which repel the particles of all other matter. But upon this ſuppoſition, as Dr. Prieſtley juſtly obſerves, the electric fluid is quite different from the ether, becauſe it is not repulſive like the ether, but attractive, of all other matter.

Dr. Prieſtley, obſerving that the electric exploſion taken in different kinds of air acted like other phlogiſtic proceſſes, according to the language of that time, ſuppoſed that the electric matter either is, or contains, phlogiſton; (Obſervations on different kinds of Air, vol. ii. ſect. 13.) He might, however, have, with more probability, ſuppoſed, that in his experiments the phlogiſton was extricated from the bodies which were immediately acted upon by the electric force; but ſince modern philoſophers have utterly conſigned the ſuppoſed phlogiſton to oblivion, we need not ſay any thing more about it.

The electric fluid has alſo been ſuppoſed to be of an acid nature, and the facts which have given origin to this ſuppoſition are, that electricity occaſions the cryſtallization of an alkali in certain caſes (ſee the article ELECTRICAL *Experiments*,) and it ſlightly reddens certain blue vegetable colours. But it is more likely that the ſmall quantity of acid which is thus manifeſted, is produced by the violent action of the electric fluid upon the air, or other contiguous bodies; for it is only in caſes of its quick tranſition that theſe effects are produced.

An ingenious philoſopher has endeavoured to eſtabliſh a propoſition, which (as he thinks) is warranted by the principal phenomena of electricity; namely, that the electric fluid conſiſts of two principles; *viz.* of the pureſt and nimbleſt hydrogen, a little rarefied, and of the elementary heat. All the experiments, he ſays, tend to prove, "intimam ignis electrici naturam minime contineri in acido quodam, ut ex aliquibus experimentis male digeſtis putarunt aliqui cæteroquin ſapientes; ſed hanc exurgere, et componi a duobus principiis, nempe a phlogiſto, aut ut vocant Galli, hydrogene, puriori, mobiliori, et admodum rarefacto, atque ex igne elementari ſive calore latente, (calorico,) ubique per corpora univerſa diffuſo, atque pro ipſorum capacitate in illis hoſpitante." De electr. ignis nat. Diſſert. ab Joſepho Gardinio. Mantuæ, 1792.

According to the moſt rational hypotheſis, the electric fluid ſeems to be a fluid *ſui generis*; *viz.* a fluid quite diſtinct from all other known fluids. It is imponderable, and inviſible whilſt in a quieſcent ſtate; and even the light which we ſee in its tranſition from one body to another is not, in all probability, the electric fluid itſelf; but the light which is elicited from other bodies or from the air: for in a perfect Torricellian vacuum no electric light is to be ſeen.

So far we have related the different hypotheſes that have been advanced, with reſpect to the nature of the electric fluid, upon the ſuppoſition that the phenomena of electricity are produced by a ſingle fluid; but there are ſeveral philoſophers, who are of opinion that theſe phenomena are produced by two electric fluids, *viz.* the *vitreous* and the *reſinous*. The peculiar merits of theſe two hypotheſes, *viz.* of the hypotheſis of a ſingle electric fluid, and of that of two electric fluids, will be properly examined under the article *Theory of* ELECTRICITY.

The nature of theſe two ſuppoſed electric fluids has likewiſe been ſought after with great attention by various labourers in the ample field of ſcientific inquiry; but no preciſe diſcovery has as yet determined any thing about them. It has been ſuppoſed that theſe two electrical fluids are fluids diſtinct from all others; but they have alſo been thought to be of an acid, and of an alkaline nature, *viz.* that the vitreous is of an acid, and the reſinous of an alkaline nature. And indeed there are ſome experiments which ſeem to countenance this ſuppoſition; but we muſt refer the reader to the article GALVANISM for farther information concerning this particular; it being impracticable to convey a clear idea of the nature of the above mentioned experiments, without a previous ſtatement of that new branch of electricity, which is at preſent ſucceſsfully cultivated under the name of *Galvaniſm*.

ELECTRICAL *Jar*. See LEYDEN PHIAL.

ELECTRICAL *Kite*. See KITE.

ELECTRICAL *Machine*; a mechaniſm in which an electric body, ſuch as glaſs, ſulphur, roſin, &c. is ſubjected to friction, in order to excite in it that power which is commonly known under the name of electricity.

When the attraction and the repulſion were the only phenomena of electricity known, and when thoſe phenomena had been obſerved in ſmall bodies only, ſuch as natural pieces of amber, a tourmalin, a diamond, and the like; a ſimple friction againſt the hand or the garment of the experimenter was ſufficient to excite the electric virtue; but when the

the ſame property was diſcovered in ſulphur, in reſin, and in other bodies, which might be formed into pretty large maſſes, ſo as to produce effects more ſtriking and deciſive; then ſimple friction in the manner already mentioned was found inadequate to the purpoſe, and philoſophers contrived to perform the excitation in a more commodious manner by mechanical means; and ſuch mechaniſms are what we now call electrical machines.

In the hiſtory of the original conſtruction, and of the ſubſequent improvements of thoſe machines, a contemplative mind is naturally led to admire the ingenuity of philoſophers, as well as the alternate advancements of the ſcience of electricity, and of the improvements of the machines; for if a new diſcovery pointed out a defect, or a uſeful improvement, in the machine; the improvement of the latter hardly ever failed to produce new diſcoveries, and ſo on.

The firſt mechaniſm which deſerves the name of electrical machine, was contrived by Otto Guericke, burgomaſter of Magdeburg, and the celebrated inventor of the air-pump; a contemporary of Boyle.

Fig. 1. *Plate* VII. repreſents this firſt ſmall and imperfect machine; but when we call it ſmall and imperfect, we muſt not forget to acknowledge, that to the uſe, which its inventor made of this machine, we are indebted for the diſcovery of the light, the ſmell, and the cracking noiſe of electricity.

Previous to the deſcription of this and the other electrical machines up to the preſent time, it will be neceſſary to premiſe a general idea of the parts of theſe machines, in order that the reader may be enabled to comprehend the objects for the attainment of which the different conſtructions were adopted, and may likewiſe be enabled to appreciate their peculiar advantages or defects.

An electrical machine being a mechaniſm capable of exciting an electric, ſo as to produce electrical phenomena, naturally conſiſts of the following principal parts; *viz.* of the electric, the moving engine, the rubber, and the prime conductor; that is, an inſulated conductor, which receives the electricity immediately from the excited electric body.

Formerly the electric was uſed of different ſubſtances, ſuch as glaſs, roſin, ſulphur, ſealing wax, &c. which variety was adopted on two accounts, firſt, becauſe philoſophers had not quite determined to which of theſe bodies the preference might be given, and ſecondly, on account of producing a negative or poſitive electricity at the pleaſure of the electrician; for before the electricity of the inſulated rubber was diſcovered, ſulphur, rough glaſs, ſealing-wax, or other reſinous body, was uſed for producing the negative electricity; whilſt ſmooth glaſs ſerved for the production of the poſitive or vitreous power. At preſent ſmooth glaſs ſeems to be the only ſubſtance univerſally uſed, and that on account of its power, of its durability, of its cheapneſs, and of its being eaſily formed into any ſhape which may beſt anſwer the views of the electrician. And when the machine has an inſulated rubber, the operator may obtain either poſitive or negative electricity at pleaſure without changing the electric.

The form of the glaſs has been much varied, but thoſe which are at preſent generally uſed, and have been found preferable to all others, are cylinders, and circular plates. Globes are likewiſe uſed, but leſs frequently.

The cylinders are made with two necks; they are moſtly uſed without an axis; for this is only an obſtruction, and has no real uſe; and their more uſual ſize is from four inches in diameter, and eight in length, to twelve inches in diameter and two feet in length; but ſome very powerful electrical machines have been made in London with cylinders of two feet in diameter and upwards. The globes are always made with one neck, and the circular plates have been uſed from the ſmall ſize of ſix inches in diameter to the larger ſize poſſible to be made.

With reſpect to the engine, which is to give motion to the electric, multiplying wheels have been generally uſed for machines containing a globe or a cylinder, and theſe communicate to the electric a quick motion, while they are conveniently turned by a winch. The uſual method is to fix a wheel on one ſide of the frame of the machine, which is turned by a winch or handle, and has a groove on its circumference. Upon the braſs cap which is cemented to the neck of the glaſs globe, or to one of the necks of the cylinder, a pulley is fixed, the diameter of which is about the third or fourth part of the diameter of the wheel; then a ſtring, or ſtrap, is put over the wheel and the pulley; and by this means, when the winch is turned, the globe or cylinder makes three or four revolutions for each revolution of the wheel. There is an inconvenience generally attending this conſtruction, which is, that the ſtring becomes ſometimes ſo very ſlack, that the electric will not turn round when the winch is moved. To remedy this inconvenience the wheel ſhould be made moveable with reſpect to the electric, ſo that it may be fixed at the proper diſtance; or elſe the pulley ſhould have ſeveral grooves of different diameters on its circumference; in which caſe the ſtring may be paſſed from a groove of ſmaller diameter to that of a larger, in proportion as it becomes ſlack, or extended. The motion of the electric, which has been found moſt productive of electricity, is about five revolutions in a ſecond, which cannot conveniently be performed by means of a ſimple winch applied immediately to the cap at the neck of the globe or cylinder, and therefore multiplying wheels have been uſed. Yet when the cylinders are not very large, and the mechaniſm is neatly conſtructed with the beſt rubber, rendered active by the zinc amalgam, a ſimple winch has been found fully ſufficient, and accordingly ſeveral machines have been conſtructed upon that ſimple plan, and are at preſent frequently uſed. In theſe machines the cylinder may be conveniently cauſed to make about three revolutions in a ſecond. The circular glaſs plate machines are always moved by a ſimple winch, which is fixed to the axis of the glaſs plate or plates; (for ſome of theſe machines contain two plates fixed on the ſame axis, parallel to each other.) The axis paſſes through a hole in the centre of the plate or plates, and is fixed thereto, in a ſituation perpendicular to the plate, by means of certain ſockets on either ſide of the plate.

In ſome of the machines furniſhed with a globe or a cylinder, a metal wheel and pinion, or a wheel and an endleſs ſcrew, have been uſed, inſtead of the above-mentioned pulley and ſtring. And when this conſtruction is new, and is properly executed, it anſwers very well; but it is apt to make a diſagreeable rattling noiſe, and unleſs it be frequently oiled ſoon wears away in conſequence of the great friction of its parts.

The rubber, as it is at preſent more commonly conſtructed, conſiſts of a leather cuſhion (the leather moſtly uſed is baſil ſkin, or flannel, ſtuffed with hair) and having a piece of ſilk (either varniſhed or unvarniſhed) thrown over, which being faſtened to the lower part of the cuſhion, paſſes between this and the glaſs, and projects a conſiderable way beyond the cuſhion, and over the glaſs. Another conſtruction, which was recommended by Dr. Nooth, is likewiſe not unfrequently uſed. It conſiſts of a ſilk cuſhion ſtuffed with hair, and having a piece of leather thrown over, ſo that the leather is what immediately touches the ſurface of the glaſs, and to the upper edge of this leather, a piece of ſilk is generally

 added,

added, which rests upon the glass, and covers about one-third part of its surface.

In these or similar constructions, the amalgam is always to be used, and this should be confined to that part of the rubber which the glass globe or cylinder enters as it revolves. In short, that side of the rubber which the glass enters in whirling must be made as perfect a conductor as possible, in order to furnish the glass with a plentiful supply of electricity: and the opposite part must be as much a non-conductor as possible, in order that little or none of the fluid which is accumulated upon the glass may return to the rubber. In the construction of the rubber care must also be taken that it be free from points or sharp edges; and it should be supported by a spring, by which means it may adapt itself to the inequalities of the glass. It should also be insulated for the purpose of obtaining a negative electricity.

The prime conductor, or first conductor which is applied to the excited electric, is nothing more than an insulated conducting substance furnished with one or more points at one end, for the purpose of collecting the electricity immediately from the excited electric. (See COLLECTOR *of Electricity*.) When the conductor is of a moderate size, it is usual to make it of hollow brass, or of tin plates; but when very large, it is more commonly made of wood, or tin plates, or paste board, covered with tinfoil, or even with gilt paper. The conductor is generally made of a cylindrical shape; but be the form of it what it may, it should always be made free from points, or sharp edges, and if holes are to be made in it, which on many accounts are very useful, these should be well rounded, and made perfectly smooth. If any part of the prime conductor is to be made larger than the rest, this ought to be that which stands farthest from the excited electric; for at that end the electricity endeavours mostly to escape.

It has been constantly observed, that the larger the prime conductor is, the denser or stronger spark may be drawn from it; for the quantity of electricity discharged in the form of a spark is nearly proportional to the size of the conductor; and for this reason the prime conductors have been made much larger of late years than they were made formerly. Its size, however, may be rendered too large, so that the dissipation of electricity from its surface may be little short of the supply from the electric, in which case so large a conductor would only be an unwieldy and useless incumbrance. Besides the above-mentioned parts, the machine must have a strong frame to support the electric, the rubber, and the wheel. The prime conductor should be supported by pillars of glass, or of other solid non-conductors, and not by silk strings, which admit of continual motion. In short, the machine and the prime conductor should be made to stand as steady as possible, otherwise the experiments cannot be conveniently and satisfactorily performed. We shall now proceed to describe the particular electrical machines.

Fig. 1. *Plate* VII. represents Otto Guericke's original machine. It consists of an horizontal frame, the peculiar construction of which is not mentioned in his work "De Vacuo Spatio;" for it is in that book that the electrical machine is described: *a c* and *b d* are two uprights, which support the axis of the globular electric, and such are all the parts of this machine with respect to the formation of the electric, which is of sulphur; he gives the following directions: Take, says he, a spherical glass phial of the size of the head of an infant; fill it with sulphur, which has been previously powdered in a mortar, and thus filled, expose it to the fire to liquify the sulphur, and when afterwards cooled, break the glass phial, in order to obtain the globe of sulphur. So little did he imagine, as Dr. Priestley justly observes, that the glass globe itself with or without the sulphur would have answered his purpose as well. This globe, he adds, may be perforated with a hole quite through, and an iron axis may be fixed to it, and thus the globe is ready for use.

To shew the virtue (which he calls *virtutem conservativam*) of this globe, place the axis of it upon the two supports *a*, *b*, of the little machine *a b c d*, about a foot high from the base, and place small bodies of any kind under it, such as leaves of gold, silver, paper, &c. then grasp the globe or rub it with the hand sufficiently dry, and the sulphur will then attract the small bodies, &c.

Fig. 2. *Plate* VII. represents Mr Hauksbee's electrical machine, the various parts of which will be easily comprehended by inspecting the figure. This machine has no rubber, no prime conductor, or field for making experiments; for no such things were wanted at his time; but it may be easily accommodated with them all. A conductor, for instance, may hang from the ceiling, a rubber may be supported by a spring fixed under the globe, and a table placed near the machine may receive the apparatus necessary for making experiments. The inconveniences of this construction are, that the operator cannot well turn the wheel himself. An assistant is necessary for it, who must sit to his work. This machine admits one globe only, but a considerable variety of globes, and cylinders, or spheroids, may be successively applied to it.

Fig. 3. *Plate* VII. represents the abbé Nollet's electrical machine, a construction much in use about the time that the peculiar phenomena of the Leyden phial were first discovered. In those early times electricians had no idea, that it was possible to make the electric revolve too fast. They, therefore, made the wheels of their machines very large, which of course required a large and substantial frame; the electric was rubbed by the hand, the prime conductor was a bar of iron, or a gun barrel, and sometimes a chain, suspended in silken lines from the top of the room, and the apparatus was placed upon an adjoining table.

The phenomena which were produced by the above-mentioned machines naturally excited a desire of exciting a much greater power of electricity; and with this view Dr Watson contrived the machine represented by *fig.* 4. *Plate* VII., in which four large globes might be whirled at once, and their power might be united.

N. B.—It is only for the purpose of not enlarging the plate, that the same prime conductor has been represented as belonging to two machines, *viz.* to *fig.* 3. and *fig.* 4.

This machine was furnished with proper rubbers for all the four globes, and these rubbers were adjustable by means of a screw for each rubber.

Fig. 5. *Plate* VII represents a machine contrived by Mr. Wilson. Its construction is such that the same person may turn the wheel at the same time that he performs the experiments. But the rubber is not insulated, and both the rubber and the cylinder are not sufficiently distant from other bodies. The prime conductor stands upon the same frame, which was undoubtedly an advantage over the other machines of that time; but being supported by silk strings, it was liable to a constant shake, which rendered it unfit for a great many experiments.

Fig. 6. *Plate* VIII. represents an elegant sort of electrical machine, of a very compact form, and capable of considerable power. The machinery is contained in the brass box *a*, and it consists of a brass wheel, whose teeth move an endless screw, at the lower part of the axis, which comes out of the box, and supports the glass globe *d*; there being a brass socket on the upper part of the axis, in which the neck of the

globe

globe is cemented. The brafs box *a* is ſcrewed to the table by means of a clamp, which is always fixed to it; and it will be eaſily conceived that by turning the winch *b*, the globe *d* will be cauſed to turn horizontally: *e* is the rubber which is ſupported by a brafs ſpring, and may be made to preſs more or leſs upon the glaſs globe, by means of an adjuſtment at *c*. The prime conductor *f* is ſupported by a ſeparate ſtand upon a glaſs pillar, and is to be placed upon the table adjoining to the machine. The rubber of this machine is not inſulated, yet this defect was obviated by removing the rubber *e*, and fixing another rubber upon an inſulating ſtand, which was clamped to the table cloſe to the machine. Upon the whole it muſt be acknowledged that this machine is both very portable and very uſeful, nor can any thing work more pleaſantly, as long as the work within the box *a* remains in proper order; but we have already obſerved that this conſtruction is apt to wear out pretty faſt, and is generally attended with an unpleaſant rattling. This machine is alſo attended with another inconvenience, which is the upright poſition of the globe and the rubber, in conſequence of which whatever is put upon the latter, as the amalgam, &c. is apt to drop out.

Fig. 7. *Plate* VIII. repreſents a machine contrived by Mr. Read, a philoſophical inſtrument maker. This machine may be eaſily diſtinguiſhed from the others which are repreſented upon the ſame table in the plate, by obſerving its bottom board, which is faſtened to the table by means of the two clamps *o*, *o*. The cylinder *d* of this machine ſtands perpendicular to the horizon, and is ſupported by a brafs arm *e*, which receives the upper end of the axis; and motion is given to it by means of a pulley at the lower end of the axis, and a wheel *g* which lies parallel to the table; a ſtring going round both the wheel and the pulley. The prime conductor *a* is furniſhed with teeth or points by way of collector, and is ſcrewed to the wire of the coated jar *b*, ſtanding in a ſocket, between the cylinder and the wheel; ſo that the coated jar *b* ſerves as a Leyden phial, and as a ſtand for the conductor. The rubber *r* is ſupported by a brafs ſpring, which may be adjuſted by a ſcrew that paſſes through the arm *e*. But this rubber cannot be inſulated. This machine was, ſome years ago, much uſed for medical purpoſes; for when Mr. Lane's diſcharging electrometer *c* was annexed to it, the operator might adminiſter as many ſhocks as he pleaſed, preciſely of the ſame ſtrength.

When this machine was uſed for ſimple electrization, or for other purpoſes where no ſhocks were required, then the coated jar *b* was removed, and another jar, not coated, was placed inſtead of it, which then ſerved as a mere inſulating ſtand to the conductor *a*.

Fig. 8. *Plate* VIII. exhibits Dr. Prieſtley's electrical machine, of which he gives the following deſcription in his Hiſtory of Electricity. "The machine," he ſays, "which I would adviſe a philoſopher to conſtruct for his own uſe, is the reſult of my beſt attention to this ſubject. I have uſed it above ſix months (how much I leave the reader to imagine) without ſeeing the leaſt reaſon to make any alteration of conſequence in it; and believe it to have almoſt all the advantages which an electrical machine deſigned for the cloſet can have.

"The frame conſiſts of two ſtrong boards of mahogany *a*, *a*, of the ſame length, parallel to one another, about four inches aſunder, and the lower an inch on each ſide broader than the upper. In the upper board is a groove, reaching almoſt its whole length. One of the pillars *b*, which are of baked wood, is immoveable, being let through the upper board, and firmly fixed in the lower, while the other pillar ſlides in the groove above-mentioned, in order to receive globes or cylinders of different ſizes; but it is only wanted when an axis is uſed. Both the pillars are perforated with holes, at equal diſtances, from the top to the bottom; by means of which, globes may be mounted higher or lower, according to their ſize; and they are tall, to admit the uſe of two or more globes at a time, one above the other. Four of a moderate ſize may be uſed, if two be fixed on one axis: and the wheel has ſeveral grooves for that purpoſe.

"If a globe with only one neck be uſed, as in the plate, a brafs arm with an open ſocket *c* is neceſſary to ſupport the axis beyond the pulley; and this part is alſo contrived to be put higher or lower, together with the brafs ſocket in which the axis turns. The axis *d* is made to come quite through the pillar, that it may be turned by another handle, without the wheel, if the operator chooſes. The frame being ſcrewed to the table, may be placed nearer to, or farther from, the wheel, as the length of the ſtring requires, in different ſtates of the weather. The wheel is fixed in a frame by itſelf *e*, by which it may have any ſituation with reſpect to the pulley, and be turned to one ſide, ſo as to prevent the ſtring from cutting itſelf. The hinder part of this frame is ſupported by a foot of its own.

"The rubber *f* conſiſts of a hollow piece of copper, filled with horſe hair, and covered with a baſil ſkin. It is ſupported by a ſocket, which receives the cylindrical axis of a round plate of glaſs *g*, the oppoſite part of which is inſerted into the ſocket of a bent ſteel ſpring *h*. Theſe parts are eaſily ſeparated, ſo that the rubber, or the plate of glaſs that ſerves to inſulate it, may be changed at pleaſure. The ſpring admits of a twofold alteration of poſition. It may be either ſlipped along the groove, or moved in the contrary direction, ſo as to give it every deſirable poſition with reſpect to the globe or cylinder; and it is, beſides, furniſhed with a ſcrew *i*, which makes it preſs harder or lighter, as the operator chooſes.

"The prime conductor *k* is a hollow veſſel of poliſhed copper, in the form of a pear, ſupported by a pillar, and a firm baſis of baked wood, and it receives its fire by means of a long arched wire, or rod of very ſoft brafs, *l*, eaſily bent into any ſhape, and raiſed higher or lower, as the globe requires; and it is terminated by an open ring, in which are hung ſome ſharp pointed wires *m*, playing lightly on the globe when it is in motion. The body of the conductor is furniſhed with holes, for the inſertion of metallic rods, to convey the fire wherever it is wanted, and for many other purpoſes convenient in a courſe of electrical experiments. The conductor is, by this means, ſteady, and yet may be eaſily put into any ſituation.

"When poſitive electricity is wanted, a wire, or chain, as is repreſented in the plate *n*, connects the rubber with the table or the floor. When negative electricity is wanted, that wire is connected with another conductor, which muſt be placed upon a ſeparate inſulating ſtand near to the machine, while the conductor *k* is connected by another wire or chain with the table. If the rubber be made tolerably free from points, the negative power will be as ſtrong as the poſitive.

"In ſhort, the capital advantages of this machine are, that glaſs veſſels, or any other electric body, of any ſize or form, may be uſed, with one neck, or two necks, at pleaſure; and even ſeveral of them at the ſame time, if required. All the eſſential parts of the machine, the globe, the frame, the wheel, the rubber, and conductor, are quite ſeparate; and the poſition of them to one another may be varied in every manner poſſible."

The progreſs of the ſcience of electricity ſince Dr. Prieſtley contrived the above-deſcribed machine, has ſhewn the imperfection of ſeveral of its parts, and the uſeleſs complication of

of the whole. The ſhape, and eſpecially the long neck of the prime conductor, would not at preſent be uſed by any electrician; it being ill ſuited to the performance of experiments, and very apt to diſſipate the electricity, when a great deal of that power is furniſhed by the electric, which is the caſe with moſt of the modern machines furniſhed with the zinc amalgam. The neceſſity of an intricate frame, capable of admitting more than one globe or cylinder, is alſo ſuperſeded by the obſervation, that one well formed large cylinder produces a much greater quantity of electricity, than four or more ſmall ones, and the friction is much more conſiderable in the latter than in the former caſe.

Fig. 9. *Plate* VIII. repreſents a compact machine, ſomewhat ſimilar to the laſt, but much more commodious. It conſiſts of a pillar of mahogany *a*, ſtanding upright upon three feet. This pillar divides in two plates to receive a wheel *b* in the lower part of it, and in the upper part a pulley *c*, which is turned by a leathern ſtrap *d* tightened by means of a ſmall buckle. In the centre of the pulley is a ſtrong iron ſpindle, turning in two firm braſs ſockets, faſtened to each ſide of the pillar. In one of theſe ſockets the extremity of the ſpindle turns upon a centre, by means of a piece of iron *e* ſcrewed into it, while the other is held tight by a braſs claſp, which may be made to hold it cloſer, or more looſely, at pleaſure, by means of a ſcrew *f*. The iron ſpindle terminates in a male ſcrew, anſwering to a female ſcrew in the braſs cap of the globe *g*; and by this means any globe may be taken out, and another put into the machine with very little trouble, if theſe parts be always made to the ſame pattern. The rubber *h* is ſeparated from the ſpring *i* by a plate of glaſs *j*, which effectually inſulates it; but the chain *k* connects them together when poſitive electricity is wanted, as in the uſual method of electrifying. The ſpring may be made to preſs more or leſs, by means of a ſcrew *l*; and it may be raiſed higher or lower, to ſuit globes of different ſizes, by means of a contrivance which is not repreſented in the plate. The prime conductor *m n o* is like that of the preceding machine, and it muſt be placed upon a table adjoining to the machine. When negative electricity is wanted, the chain *k* muſt be removed from the rubber, and hung upon the prime conductor, ſo as to connect it with the table; and a ſhort braſs rod, with a knob at its end, muſt be ſcrewed into a ſmall ſocket, which will be found in the rubber above the glaſs plate. This braſs rod will then ſerve for a negative prime conductor. As this machine is apt to ſhake when in action, its three feet may be ſcrewed to a large board, upon which the perſon who turns the wheel may alſo reſt his feet.

It will be obviouſly remarked that the prime conductor of this machine has the ſame imperfections that have been mentioned in the deſcription of the preceding machine.

Fig. 10. *Plate* IX. exhibits the electrical machine contrived and uſed by F. Beccaria of Turin, a diſtinguiſhed electrician. This machine comprehends all the improvements, and is conſtructed with all the precautions, which the ſtate of the ſcience at that time could ſuggeſt. But no regard whatever was paid either to ſize or portability. T S is the glaſs cylinder, to the extremities of which two wooden caps were adapted, and the whole turned round the points of the ſcrews V, V, which entered a little way the centres of the caps. One of theſe caps was formed like a pulley, to receive the ſtring which went round the wheel R. The form of the frame will be eaſily comprehended by inſpecting the figure; and as for its ſtrength and ſize, they may be eaſily derived by obſerving, that beſides the wheel and cylinder it had a place between the handle of the wheel and the front, large enough to contain two men, *viz.* one who turned the wheel, and another who rubbed the cylinder T S. And the two men with the whole machine were inſulated; for the legs E, F, G, H, were of glaſs. The circular boxes, which are ſeen on the floor round the legs, are ſemicircular boxes of tin, two of which being placed round each leg formed a whole circle. When the machine was in uſe theſe tin boxes were filled with warm aſhes for the purpoſe of keeping the glaſs legs dry. The axis of the wheel R worked in a particular frame, which might be ſcrewed into the large frame at any required diſtance from the cylinder, in order to render the ſtring ſufficiently tight.

The prime conductor, which is not drawn in the plate, conſiſted of a cylinder of tin 12 feet long and one foot in diameter; it preſented a conical termination to the middle zone of the cylinder T S, and had its oppoſite extremity of a ſemiglobular ſhape. This prime conductor was ſuſpended upon ſilk ſtrings.

The great diſparity between the ſize of the cylinder and that of the whole frame, is what will eaſily ſtrike the attentive obſerver; yet it muſt be acknowledged, that to a real philoſopher who had nothing elſe in view, but the improvement of the ſubject, this machine muſt, at that early period, have afforded ample ſatisfaction; and, in fact, whoever will peruſe Beccaria's inſtructive work, entitled "Elettricismo artificiale," will readily perceive how uſeful it proved to its inventor. It afforded either poſitive or negative electricity with equal facility; for as the whole machine was inſulated, when poſitive electricity was required, a chain was appended to the machine which formed the communication between it and the ground; and when negative electricity was wanted, the chain was placed from the prime conductor to the ground, and then the whole machine became a negative conductor. We need not point out how many parts of this machine have been rendered uſeleſs, or defective, by ſubſequent improvements.

The form of electrical machines moſtly uſed of late, is repreſented in *fig.* 11, *Plate* IX. A B C is the bottom board, which, when the machine is to be uſed, is faſtened to the table Y Z, by means of the clamp at C: D, E, are two upright pieces of wood, firmly faſtened to the bottom board A B C, and ſupporting the glaſs cylinder F G, and the wheel H. The two necks of the cylinder are furniſhed with caps, one of which has an axis, which paſſes through a hole in the upright ſupport E, and has a pulley firmly fixed to its outer extremity. The axis of the other cap runs in a ſmall hole towards the upper part of the ſupport D: O is the pillar which ſupports the rubber or cuſhion P; and is fixed with a joint to the bottom board. The middle part of this pillar is of glaſs, which renders the rubber inſulated: Q is a braſs ſcrew, which, paſſing through the lower part of the pillar O, ſcrews into a piece of wood which is firmly fixed in the bottom board. This ſerves to regulate the preſſure of the cuſhion upon the cylinder. The rubber conſiſts of a cuſhion of leather ſtuffed with hair, and fixed to a backboard, which is ſcrewed to the upper part of the pillar O. A piece of ſilk S comes from the lower edge of the rubber, and paſſing between it and the cylinder, extends itſelf over the cylinder, until it nearly meets the points of the conductor. The prime conductor W is ſeparate from the machine; it is of a cylindrical form, with globular terminations, and is ſupported by a glaſs pillar upon a circular wooden foot. That end of the prime conductor which ſtands fartheſt from the cylinder is generally furniſhed with a thick wire, about four or five inches long, and terminating in a braſs ball.

It is evident that with this machine poſitive or negative electricity may be had at pleaſure; for when poſitive electricity is wanted, the rubber is connected with the ground, and

and when negative electricity is wanted, then the prime conductor is connected with the ground, and the negative electricity is obtained from the rubber. Sometimes another conductor is connected with the rubber.

When the glafs cylinder is very large, fuch as of 18 inches, or two feet, in diameter, then the frame of the machine is made to ftand upon the ground, with this difference from the above, that inftead of the bottom board A B C, the two upright fupports reach down to the ground, where they fpread out into a double foot, and are, at about midway between the cylinder and the ground, faftened to each other by two ftrong horizontal bars. The pillar of the rubber is faftened to a projection in the upper one of thofe bars. The ftand of the prime conductor is likewife high enough to reft upon the ground.

Fig. 12. *Plate* IX. represents Nairne's electrical machine, a moft compact, fimple, and, at the fame time, powerful machine, ufeful for electrical experiments in general, but particularly adapted to the purpofes of medical electricity. A is the glafs cylinder: B, B, two glafs pillars which fupport the cylinder A: C is the handle by which the cylinder is turned: G, and R, are two metallic conductors for the pofitive and the negative electricities. Thefe conductors are fuoported by the glafs pillars D, D: E is the bottom board into which the pillars B, B, that fupport the cylinder, are firmly fixed. Underneath this board are faftened pieces of wood forming four gronves: F, F, are two pieces of board, part of which are inferted into two of the four grooves under the board E. In thefe pieces the pillars D, D, that fupport the conductors, are fixed: H is a brafs knob, one of which is foldered on the outfide of each conductor.

The cufhion or rubber is attached to the fide of the conductor R, next to the cylinder: K is a piece of filk, one end of which is glued to the under part of the cufhion, and it is turned over, fo that part of the filk ftands between the cufhion and the cylinder, and projects over the latter, as at K, until it nearly reaches the collecting pointed wires which are fixed to the fide of the other conductor.

L, L, are the heads of two wooden fcrews which pafs through the board E, and are to be fcrewed until their lower ends prefs againft the upper part of the fliding pieces F, F, when thefe are flipped into the grooves under the faid board. One of thefe fcrews ferves to keep the rubber in contact with the cylinder; for when the fliding piece F of that conductor, which carries the rubber, is pufhed into the groove, fo that the rubber may be preffed againft the cylinder, the fcrew L will confine it in that fituation. The other fcrew, L, ferves to keep the conductor G ftedy.

The ends N, N, of the conductors may be removed, and then the opening of a coated electric jar, faftened within each conductor, is difcovered, as is repreftnted in *fig.* 14. *Plate* X. where one conductor only of this machine is to be feen. In the infide of each jar a piece of cork is fitted, and in the cork a fmall glafs tube cotted, and likewife a brafs wire with a ball, as fhewn in *fig* 14.

The machine is faftened to the table by means of a ftrong iron clamp; and is worked, as the figure indicates, by a fimple winch, without any multiplying wheels. There is a remarkable nice apparatus accompanied with this machine, which may be adapted to all cafes of medical electricity. The principal parts of this apparatus are repreftnted in *figs.* 13 and 14. *Plate* X.

In *fig.* 13. part of the electrical machine is fhewn, in order to exhibit the flexible prolongations, which are fixed to the conductors for the purpofe of giving fparks to any part of the human body: *d*, *d*, are two compound joints, each of which has not only a vertical, but alfo an horizontal motion, when applied to the conductor: *f*, *f*, *f*, are three metallic tubes, connected by means of four pieces of wood, and two pliable joints. One of thofe tubes is fcrewed to the joint *d*, and to the laft a large ball *h* is fcrewed, which communicates the fpark. To the fame tube a piece of wood *g* is faftened, having a hole at right angles to the tube, and K is a glafs handle, the upper part of which fits that hole; fo that by applying the hand to the lower part of the glafs handle, the fpark may be given to any part of the body. In the figure a perfon is repreftnted, who directs the communications with the conductors, to his fhoulders, by means of the glafs handles *k*, *k*.

Fig. 14. represents a perfon paffing fhocks through his leg. In this cafe the end cover from one of the conductors is removed; the chain *b* is fufpended to the knob of the jar, and is made to communicate with the chain O, which is furnifhed with a wire at the other end *p*, and to this wire a piece of wood with a hole is attached, which fits the top of the glafs handle *k*: *n* is the difcharging electrometer, fixed for the purpofe, upon the conductor, and another wire O, with another glafs handle *k*, is fixed to it: then the two wires *p*, *p*, being applied to any part of the body through which the electric fhock is to be paffed, and the machine being worked, the fhocks will, without any alteration of the apparatus, be repeatedly fent through that part, &c. for fuppofe that the conductor, which is repreftnted in the figure, is the pofitive conductor, the external furface of the jar will be charged pofitively, whilft the fluid of the infide will pafs through the chain *b*, to the table, &c. and when the jar is charged enough for the difcharge to pafs from the conductor to the knob of the difcharging electrometer *n*, the difcharge will take place, and the fhock will pafs through the part which is interpofed between the two wires *p*, *p*.

The two additional grooves under the bottom board of the machine are ufed only for the conveniency of packing the machine into as fmall a box as poffible; and for this purpofe the fliding pieces F, F, which fupport the pillars of the conductors, are flipped into the two grooves which are fituate nearer to the handle fide of the machine.

"The *figs* 15, 16, *Plate* X. and 17, *Plate* IX. exhibit an extremely portable electrical machine and its parts, invented by the Rev. W. Pearfon, of Lincoln. This machine is intended for medical purpofes, and efpecially for the adminiftration of electricity in cafes of fufpended animation. Upon repeated trials it has proved fufficiently ufeful, and its peculiar advantages are, great portability, and a fufficient power; it is guarded fo as not to be readily affected by moifture; it is capable of being ufed without a table or ftand, in cafes of neceffity; it is rendered fit for ufe upon the fhorteft notice, and it is not very liable to be broken. In *fig.* 15. the machine is repreftnted as viewed by an eye fituated directly over it. A B C D is a fmall box $9\frac{1}{2}$ by $7\frac{1}{2}$ inches within, and 6 inches deep, made of half inch board: upon the bottom of the box lies a plate of glafs alfo $9\frac{1}{2}$ by $7\frac{1}{2}$ inches, cemented to the wood at the four corners by common electrical cement; this plate is coated on both furfaces with tin-foil feven inches by five, as repreftnted at Q, *fig.* 16. (except that the ftips of tin-foil at H and I are pafted or gummed upon the under fide only,) and is ufed as a fubftitute for a jar of 35 inches of coated furface, it being of no confequence what the fhape of the glafs be, provided it have a proper quantity of coating. M E N is a cylinder of glafs of four inches diameter, the body of which is $7\frac{1}{2}$ inches long; at M and N are brafs or boxen caps, cemented as in other machines, upon the fmall cylindrical ends of which the cylinder revolves, by means of the fimple winch C, which may be

be taken off or put on at pleasure, either by screwing, or by being inserted upon a square shoulder. The central points of revolution of N and M are at about $2\frac{1}{2}$ inches from the top of the box, the first inserted into a circular hole in one end of the box, and the other *let down* in an open place made down through the other, which has a detached piece of similar wood to fit it, and to keep the cylinder in its place. L is the cushion, and E the silk placed in the usual way; D is a screw with a milled head, which, by the assistance of a tapped nut, placed fast in the inside of the box at four inches from the bottom, presses against the elastic part of the *support* of the cushion which is hid from the eye; this support, which may be of elastic wood, coated above D with tin-foil, or of any elastic metal, is screwed fast to the back of the box near the bottom in the inside. The chain at D is hung on the screw at pleasure, as the wood is found to be in a good or bad conducting state.

"F is a piece of light wood turned very smooth, and neatly covered with tin-foil, its ends being rounded. This piece, which I shall call the collector, is furnished with about a dozen fixed pins of brass, projecting against the side of the cylinder, as represented in the figure, as near as may be without touching it. The collector is six inches long, and somewhat more than an inch in diameter, and is supported by two solid glass pieces C, C, of an inch and three-quarters in length, and nearly half an inch in diameter, cemented into the side of the box at $4\frac{1}{2}$ inches from the bottom, and each at an inch from the end of the collector: by this means the collector becomes insulated, and has a chain to be hooked on an eye of wire, fixed on any part thereof, so as to fall occasionally upon the upper insulated coating of the plate of glass in the bottom of the box; the chain, however, must not be so long as to extend beyond the coating by any motion of the box.

"B is a glass tube of about one-eighth of an inch bore, and about 3 or $3\frac{1}{2}$ inches long, with a ring of brass or horn, that has a male screw cemented upon the middle of it, to screw into another ring that has a female screw, and is cemented into the front side of the box at $4\frac{1}{2}$ inches from the bottom. Through this tube passes a brass wire, as thick as will easily move in it, about $4\frac{1}{2}$ inches long, tapped about an inch at each end, and a little smoothed; on each end of this wire is a tapped nut, which screws back or forwards to or from the ends of the tube, so as to hold the wire in any situation that may be required, with regard to the distance of its ends from those of the tube. The wire has also two brass balls, one of which has its diameter less than that of the tube, that it may move through the circular hole into the box, to prevent its falling on the glass plate, which it might do if screwed off and on within the box. O, O, are the directors, with handles of glass, each six inches long, besides the balls and wires.

"There is yet one part of the apparatus which it was not necessary to exhibit in the plate; *viz.* the insulating stool; this is made exactly of a size to cover the box, and has four feet of glass, almost six inches long. Underneath that part of the stool which covers the collector, slides a little drawer, which contains the tube, with its appendages, milled nut, chains, handles of the directors, and amalgam, and must be taken from the stool when used. When packed, the four feet of the stool go exactly into each corner, and the edge of the drawer just within the side of the box, by which means the stool is kept in its place as a cover; and lastly, the wires of the directors pass through the stool, which is of inch plank, at the middle near the two ends, and, by screwing into the fixed nuts in the edges of the box's ends at K and K, until the balls touch the wood of the stool, fix the whole so firm that a handle, such as is used in a chest of drawers, fixed on the centre of the stool, serves for carrying the whole apparatus by.

"With respect to the use, the machine being freed from moisture and dust, and amalgam applied to the cylinder, the shock is administered in the following manner; *viz.* let the small chain fall from the collector upon the upper coating of the glass plate, and place the inner ball at the required striking distance, suppose a quarter of an inch, as the case may require, and fix it there by means of the adjusting nuts, and the quantity of the charge will be limited in the same manner as by Lane's electrometer; then connect one chain with the conducting wire which passes through the tube, and the other with a brass ring connected with the slip of the under coating at H, or at I, as is most convenient, and hook the opposite ends upon the wires of the directors, whereby a shock may be sent through any particular part of the body. When the spark only is required, the small chain is removed from the collector, and also the long chain connected with the hook at H, is taken away; the inner ball is then fixed so as to touch the collector by means of the adjusting nuts; in which case the collector, the wire in the tube, and the second long chain connected therewith, form together one conductor. After the exterior end of this chain is attached to the wire of one of the directors, the spark may be directed into any particular part; when the eye is the part affected, a pointed wire must be used instead of the wire carrying the ball, which must be made to screw into the socket of the director. When a spark is taken out of the body, the patient must stand on the stool, and hold the chain, connected as before, in his hand; and then the operator or assistant may take sparks from him, as in other machines."

The last species of electrical machines are those which, instead of a globe or cylinder, contain one or more flat circular plates, fixed to an axis and turned by a simple winch.

The honour of having invented the plate electrical machines has been claimed by two distinguished persons, *viz.* by Dr. Ingenhousz, physician to the emperor of Germany, and by Mr. Ramsden, an exceedingly ingenious mathematical instrument maker, in London. Dr. Priestley was of opinion, that each of these gentlemen, independent of the other, constructed a machine, in which a circular glass plate was the electric. It has been, however, also confidently asserted, that Dr. Ingenhousz conceived the original idea, and Mr. Ramsden executed it. The glass plate of those machines which Mr. Ramsden first constructed was about nine inches in diameter. The plate turned vertically, and rubbed against four cushions, each an inch and a half long, placed in the opposite ends of the vertical diameter. The prime conductor was a brass tube, having two horizontal branches, which came within about half an inch of the circumference of the glass plate, so that each branch took off the electricity excited by two of the cushions. This original machine could not afford the negative electricity, as the rubbers could not be easily insulated. To remedy this defect, the table upon which the machine stood, and likewise the person who worked it, were placed upon a large insulating stool, and the prime conductor was connected with the ground; then the table, the operator, and whatever else stood upon the insulating stool, were in a negative state; but this negative power being communicated to a surface considerably large in proportion to the size of the machine, was of course very weak, and altogether the contrivance was but a clumsy one.

Since the first years of its invention, this plate machine has been frequently varied, and has received several essential improve-

improvements. Its size, as well as its power, has been greatly increased; and, in fact, one of the most powerful electrical machines extant, is of this kind, and belongs to the Teylerian museum at Haar'em. It was constructed under the direction of Dr. Van Marum, who performed a vast number of very interesting experiments with it.

This machine consists of two circular glass plates, each 65 inches in diameter, which being fixed parallel to each other, and $7\frac{1}{2}$ inches asunder, on a common axis, are turned by means of a winch, without any accelerated motion, and are rubbed by eight rubbers, all being fixed in a proper frame, the construction of which is clearly shewn in *Plate* I*. and *Plate* X. of *Electricity*; for the electrical machines, which are delineated in those plates, differ in no essential part from that which is at present under consideration. Each plate is rubbed on both surfaces; two rubbers being on one side, and two on the opposite side of each plate. The prime conductor is divided into two branches, which enter between the plates, and by means of points, collect the electric fluid from their inner surfaces only. Two men are in general employed to work this machine; but when it is to be kept in action for a long time, then four men are put to it.

Since its first construction this machine has undergone several alterations, and has been considerably improved.

The power of this Teylerian machine is very extraordinary, in all probability exceeding that of any other electrical machine that was ever constructed. And the following particulars will convey some idea of that power.

A very sharp steel point presented to the prime conductor of this machine, drew a luminous stream of electricity about half an inch long. When a sharp steel point was fixed to the conductor, so as to project three inches from its surface, on working the machine that point threw out streams of light about six inches in length, when a ball of three inches in diameter was presented to it; and the luminous streams were only two inches long when another point was presented instead of the ball.

The sensation, commonly called the spider's web, on the face of the by-standers, when this machine is in action, is frequently felt at the distance of eight feet from the prime conductor. A thread six feet long, suspended perpendicularly, was sensibly attracted by the prime conductor at the distance of 38 feet. A pointed wire, presented to the prime conductor, appeared luminous even at the distance of 28 feet. When another conductor was presented to the prime conductor of this machine, after the manner shewn in *Plate* X. of *Electricity*, and a communication was made between the former and the ground, by means of a long brass wire $\frac{3}{8}$ths of an inch in diameter; it was found that whilst a stream of electric fluid passed from the latter conductor to the former, the brass wire gave small sparks to conducting bodies that were placed near it. The sparks between the two conductors were generally 21, but sometimes even 24 inches long. This spark was crooked, and darted many lateral brushes, as is shewn in the above-mentioned *Plate* X. A single spark from the prime conductor melted a considerable length of gold leaf. A Leyden phial, containing about one square foot of coated surface, was fully charged by about half a turn of the winch, so as to discharge itself; and by repeated trials it was found, that in one minute's time this phial discharged itself 76, 78, and often even 80 times.

The difficulty of obtaining a negative power of electricity in the common plate electrical machines, and the necessity of having a smaller machine at hand than the above described one, induced Dr. Van Marum to contrive a small machine which might easily and expeditiously afford either a negative or a positive power; and after some consideration and a few trials, he contrived a machine which answered that object remarkably well. It is only an improvement upon the plate machine. See *fig.* 18. *Plate* XI. which shews a perspective view of it. The axis of the glass plate of this machine is supported by a single strong column A, which for that purpose is provided at top with a bearing-piece K, on which two brass collar-pieces D, D, are fixed, and carry the axis. O is a counterpoise of lead fixed to the end of the axis close to the winch, to prevent too great friction in the collar next to it. The other extremity of the axis carries the circular glass plate, which is 31 English inches in diameter.

The large ball H is supported by a glass pillar, and performs the office of prime conductor; it has a semi-circular branch, the extremities of which are furnished with two cross brass pieces, somewhat like the letter T, which, by means of points, receive the electricity from the excited plate. This semi-circular branch has an axis which passes through the ball H, and turns in it; so that the arch E E may be placed either in a vertical direction, which is the position represented in the figure, or it may be situated horizontally. P is a copper tube terminating in a ball; and it moves like a radius upon the stem of the ball S. I I is another arch of brass wire, half an inch in diameter, fixed to the extremity of the bearing-piece K, upon which it turns, so that it may be placed in any situation. The rubbers Y, Y, are separately insulated upon the glass pillars W, W, and are applied to the glass plate nearly in the direction of the horizontal diameter of the plate.

The superiority of this machine over other plate machines of the usual construction, principally consists in the contrivance of altering the position of the semi-circular branch E E; for by this means, the collecting terminations of E, E, may be placed in contact with the rubbers, and thus the prime conductor will instantly exhibit negative electricity; whereas in the position represented in the figure, the prime conductor H will exhibit positive electricity. But in this case, when the conductor is positively electrified, the rubbers must be made to communicate with the ground, therefore the semi-circular arch I I has been added, which must be turned so as to touch the rubbers, and form that communication. And when the negative power is wanted, then the arch E E is turned so as to touch the rubbers, and the arch I I is turned against the naked surface of the plate to receive and carry off the positive electricity. Mr. Nicholson, some years ago, discovered a method of rendering the prime conductor of a cylinder machine either positive or negative, at pleasure. Phil. Trans. for 1789. See EXCITATION.

After the description of those various machines, it may be naturally asked, which of them might be recommended in preference to the others. The answer to which is, that not every machine is adapted to all purposes; therefore, an electrical machine must be chosen according to the object in view, *viz.* whether it be wanted for all kinds of experiments in the large way, or for delicate experiments in a private study, or for medical purposes, &c. We may nevertheless point out certain peculiarities and certain observations, which may help to direct the choice of an electrical machine.

Upon the whole it appears, that the cylinder, or the circular plate, is the best shape for the electric of a machine; for they are easily procured, especially the cylinders, and admit of a vast variety of sizes; but it must be observed, that there is a considerable difference between the mounting and the working of a cylinder machine and a glass plate machine. With equal powers, the mounting of a plate machine

machine is confiderably more expenfive, and requires a much greater accuracy of workmanfhip than the mounting of a cylinder machine. With refpect to the ufe, the plate machine is not fo eafily managed as the cylinder machine. It has, in the firft place, more rubbers than one to take care of, or to keep in order, and on account of the great friction, it is rather hard to work. On the other hand, the plate machine furnifhes a more abundant quantity of electric fluid than that with a cylinder; and it is to be remarked, that if the two machines furnifh fparks of the fame length, the fpark from the conductor of the plate machine is much more active and more pungent than the fpark from the cylinder machine; hence the former will charge a battery quicker than the latter. This fuperior denfity of the fpark from a plate machine, feems to be owing to this; namely, that the plate is rubbed on both furfaces, and the electricity is taken away by the collector from one only of thofe furfaces; whereas in the other kind of machines the outer furface only of the cylinder is rubbed, and the electricity is received immediately by the collector; but the farther confideration of this phenomenon belongs to another part of this work. See the article EXCITATION.

In the preceding account of the various electrical machines, we have omitted to notice one fpecies of thefe machines, viz. thofe whofe electric confifts of filk ftuff, fuch as is called fatin, or luteftring, or the like; and our reafons for this omiffion are, that all thofe which have been occafionally defcribed in journals, and other works, are very cumberfome and defective; befides which, they have little power in comparifon to the glafs machines, and foon wear out, or are put out of order. Were we not furnifhed with more fubftantial electrics, fuch as glafs, fulphur, fhell-lac, &c. we might then turn our thoughts towards conftructing a machine with filk; but being furnifhed as we are with the above-mentioned electrics, the filk machines are far from deferving our attention.

We fhall now conclude this article with a few directions neceffary for the prefervation and for the proper management of an electrical machine.

It is hardly neceffary to obferve, that every fpecies of electrical machine will naturally require fome particular precaution; but the following directions are more or lefs applicable to all kinds of machines furnifhed with a glafs electric.

Moifture, and duft; but particularly the former, being detrimental to the power of an electrical machine, it becomes neceffary to guard from both as much as may be practicable; hence when not actually in ufe, the electrical machine fhould be kept in a dry and clean place, and at leaft the glafs part of it fhould not be fuffered to remain dirty and foiled. If the machine has been long neglected, the operator, in order to render it ready for ufe, muft in the firft place remove the rubber; he muft then place the machine at a moderate diftance from the fire; fo as to render every part of it very dry, but not too warm. This done, and the duft removed, the glafs part of the machine muft be repeatedly rubbed with a clean and warm handkerchief or towel; the rubber likewife muft be cleaned, removing all the old amalgam that may have adhered to it. The glafs cylinder, or plate, in its rotation, frequently contracts fome dark fpots or concretions upon its furface, which tend to diminifh its power. Thefe fpots, which adhere pretty faft to the glafs, may be removed by applying a finger's nail to each fpot, or by rubbing them off with a piece of coarfe canvas. Previoufly to the replacing of the rubber, the following operation generally contributes to increafe the excitation. It confifts in touching the cylinder with the bottom of a tallow candle in ftreaks parallel to the axis of the cylinder, then rub the cylinder again with a dry and warm linen cloth; taking care that this cloth be not very old, for in that cafe it is apt to leave filaments about the glafs, and about the reft of the machine. This done the rubber is fixed in its place, and its fupport is adjufted, fo that the rubber may bear upon the glafs with a proper degree of preffure. Formerly the amalgam, which greatly increafes the power of excitation, was fpread upon the rubber, before the rubber was put in its place; but experience has fhewn, that it is much better to fix the rubber clean in its place, and then to apply the amalgam upon a piece of leather to the furface of the cylinder whilft this is revolving in its ufual directions; for by this means the revolution of the cylinder, or plate, will carry away from the leather a fufficient quantity of amalgam, and will depofit it upon the rubber. The leather with the amalgam needs not be kept in contact with the glafs longer than while the cylinder makes eight or ten revolutions; moving, at the fame time, the piece of leather with the amalgam from one end of the cylinder to the other. Now if the cylinder be turned, and a hand or the ends of the fingers be prefented to it, a crackling noife, which is accompanied with luminous brufhes in a dark room, indicates that the cylinder is in good action; then the prime conductor being fituated in its proper place, you may proceed to perform the experiments. During the performance, the electrified part of the machine is apt to attract duft from all quarters, to obviate which the room ought to be previonfly fwept and dufted, and likewife the operator ought to have a clean cloth at hand to wipe off all particles of duft and filaments, which in fpite of all his precautions will frequently run to the cylinder, to the conductor, &c.

The amalgam remains to be defcribed. Mr. Canton, as far as we are informed, firft applied the amalgam of tin and mercury to the rubber of an electrical machine, which was undoubtedly a capital improvement; for by this means an electrical machine will have its power more than quadrupled. The tin amalgam is eafily made, for if you triturate tin-foil and mercury, (in the proportion of one of tin to two parts of mercury,) in a mortar, or even in the palm of your hand, the amalgam will be formed in a minute or two.

The amalgam of mercury and any metallic fubftance that may be amalgamed by it, contributes to increafe the electric power of glafs, but fome are more efficacious than others. *Mofaic gold* has alfo been found efficacious for the purpofe of excitation. The zinc amalgam, however, which was firft recommended by Dr. Higgins, has upon the whole been found the moft efficacious. This amalgam, which confifts of one part of zinc with four or five parts of mercury, is, according to Mr. Cavallo, prepared in the following manner. "Let the quickfilver," he fays, "be heated to about the degree of boiling water, and let the zinc be melted in a crucible or iron ladle. Pour the heated quickfilver into a wooden box, and immediately after pour the melted zinc in it. Then fhut up the box, and fhake it for about half a minute.. After this you muft wait until the amalgam is quite cold, or nearly fo, and then you may mix fome greafe with it by trituration. If the melted zinc be poured into the quickfilver when cold, a very fmall portion of the former will be amalgamed, the reft remaining in lumps of different fizes."

Mr. Cuthbertfon gives the following preparation of the amalgam in his Practical Electricity. "Take," he fays, "one part of tin and zinc, melt them in a crucible, and pour them on two parts of mercury, which is put into a wooden box made for the purpofe; fhake the box till the metals are cold. The amalgam is then to be pulverized in a metal mortar to a very fine powder, and afterwards mixed with a fufficient quantity of hog's lard, to make into a pafte."

ELECTRICAL *Phial*. See LEYDEN PHIAL.
ELECTRICAL *Repulsion*. See ELECTRICAL *Attraction*.
ELECTRICAL *Rubber*. See RUBBER.
ELECTRICAL *Shock*. See LEYDEN PHIAL, and SHOCK.
ELECTRICAL *Star* and *Pencil*. See STAR, and POINT.
ELECTRICAL *Varnish*. See COATING *of Electrics*.
ELECTRICAL *Well*. See WELL.

ELECTRICITY, (from the Greek ἤλεκτρον, *amber*,) is the name of an unknown natural power, which produces a great variety of peculiar and surprising phenomena, the first of which are supposed to have been observed in a mineral substance, called *amber*, whence they have been denominated *electrical phenomena*. These phenomena have been particularly examined, and are classed under distinct and comprehensive denominations, such as the attraction, the repulsion, the light, the shock, &c. of electricity: and several rules, or natural laws, have been derived from the concurring results of a great many experiments. These phenomena, these laws, the hypotheses that have been offered in explanation of their cause, and, in short, whatever belongs to them, is collectively called the *subject*, or the *science* of *electricity*. The minute and peculiar descriptions of all these particulars belong to diverse parts of this Cyclopædia; but a concise view of the whole subject will be found in the present article, whence a comprehensive idea of it may be derived, which may afterwards be enlarged by recurring to the separate articles, under their peculiar denominations.

If a clean and dry piece of glass, or of amber, be rubbed, by stroking it four or five times with a clean and dry hand, and be afterwards presented to small and light bodies of any kind; these will be alternately attracted and repelled, and attracted and repelled again, and so on, by the glass or the amber, until the power entirely ceases. If this experiment be performed in a dark room, various luminous sparks will be perceived between the small bodies and the glass or the amber. Now in this experiment the glass or the amber is said to be the *electric*, *viz.* a body capable of acquiring the above-mentioned power of attracting, &c. and when actually possessed of that power, is said to be excited; friction in this case being the cause of that excitation. The attraction and the repulsion, which are of a peculiar nature, (that is, different from all other known kinds of attraction and repulsion,) together with the light, &c. are called *electrical phenomena*; the hand, which has excited the electric by its friction, is called the *rubber*; and when a machine is formed, which contains the electric and the rubber, so disposed, that, by an easy motion, the former may be commodiously excited by the friction of the latter, this is called the *electrical machine*.

If to the amber, or to the glass, a piece of metallic wire be affixed, having a metallic ball at its end, and after having excited the amber or the glass, this be so suspended as that the above-mentioned metallic ball be presented to the light bodies, an alternate attraction and repulsion will take place between the light bodies and the ball, exactly as in the former experiment it took place between the light bodies and the amber, or the glass, itself; therefore the electric virtue will pass through the metallic wire; hence the metallic wire is called *a conductor of electricity*.

If the last experiment be repeated with this difference, *viz.* that, instead of the wire, a silk string be interposed between the ball and the electric; the light bodies will not be attracted and repelled by the ball, which shews that the electric virtue will not go through silk; hence silk is said to be a *non-conductor of electricity*.

All the bodies we are acquainted with are either conductors or non-conductors of electricity; but in various degrees. And it has been observed that all those bodies, which are non-conductors, may be excited like the above-mentioned glass, or amber, also that all those bodies, which are conductors, cannot be excited: in consequence of which *electrics*, and *non-conductors*, mean the same kind of bodies; and likewise *non-electrics* and *conductors* denote the same bodies, but of the other class. A body, surrounded entirely by non-conductors, is said to be *insulated*; thus a piece of metal, suspended in the air by means of a silk string, is insulated, because the only bodies that touch it, *viz.* the silk and the air, are non-conductors.

Rubbing or friction is one of the means of exciting an electric; but there are several other sources of that power independent of friction.

Some bodies are rendered electrical by heating and cooling, like the tourmalin; others are rendered electrical by coagulation and cooling after fusion, or by pouring them when melted into another electric, like sulphur. Certain effervescences, and evaporation, or the conversion of water into steam, and *vice versâ* the conversion of steam into water, do also produce electricity. The ambient air, the clouds, with the rain, snow, and hail, which fall from them, and fogs, are generally, or always, electrified in various degrees. The thunder and the lightning are electrical phenomena arising from the electricity of the clouds; and this electricity of the clouds seems principally to arise from the evaporation and condensation of vapour.

A remarkable electrical power is likewise possessed by four aquatic animals, all inhabitants of the sea; and these are, the *torpedo*, the *gymnotus electricus*, the *silurus electricus*, and another fish, which has not as yet been sufficiently examined, nor has it received a name.

Lastly, electricity is likewise produced by the disposition of certain metallic substances in a particular order, and especially when other substances are interposed among these metallic ones; and it is to be remarked, that the power of this source of electricity may (by increasing the number of the above-mentioned orderly dispositions) be augmented to an unlimited degree. This mode of producing electricity is of modern discovery, and is commonly known under the name of *Galvanism*, which see.

We have hitherto spoken of electricity as if it were a single power. It is now necessary to shew, that there are two electrical powers analogous, yet contrary, to each other, and they are, (in all cases of the production of electricity, as well as in the effects,) to be found closely connected with each other. In order to shew the nature and the difference of these two powers, we must recur to the above-described experiment, with the glass or with the amber; for though either of these bodies, when excited by the friction of the human hand, will produce similar electrical appearances; yet their powers are different and opposite to each other. Their difference consists in the following particulars.

1. If any light pendulous bodies, such as bits of cork suspended by threads, and insulated, be electrified by touching them with the excited piece of glass; then, on removing the glass, those light bodies will stand at some distance from each other, shewing a mutual repulsion. The same effect will take place, if another parcel of such pendulous light bodies be electrified by touching them with the excited piece of amber, or with an excited piece of rosin, which produces the same effect. Now if the above-mentioned two parcels of pendulous and electrified bodies be brought sufficiently near to each other, they will instantly attract each other, and after this attraction, these bodies will no longer exhibit any sign of being electrified. It follows, from this, that the electricity of the excited glass is different from that of the

excited rosin or amber; and accordingly the former has been called the *vitreous*, and the latter the *resinous electricity*. The first particular then in which the two electricities differ from each other is, that bodies electrified with either kind of electricity repel each other, but bodies electrified with the vitreous electricity, will attract bodies electrified with the resinous electricity.

The peculiar circumstance, which takes place in the last-mentioned case; (*viz.* that when bodies possessed of one kind of electricity, attract bodies that are in an equal degree possessed of the other kind of electricity, all signs of electricity are thereby annihilated,) suggested a supposition, that probably one of these powers is an excess, and the other a defect of something which bodies naturally possess; and upon the probability of this supposition, the vitreous electricity was also called the *plus* or the *positive electricity*, and the resinous was also called the *minus* or the *negative electricity*. This supposition or hypothesis explains the above-mentioned circumstance of the attraction; for an excess on one side is compensated by a defect on the other, and the bodies are left in a natural state.

2. If a pointed conducting body, such as a needle, be presented to the excited glass in a dark room, that point will appear illuminated with a bright globule, or star-like appearance; but if the pointed body be presented to an excited piece of amber or of rosin, that point will be illuminated with a pencil, or brush-like appearance of rays of light.

3. And lastly, in various cases, in which the vitreous electricity passes from a body overcharged with it, to another body overcharged with resinous electricity; an evident current is observed from the former to the latter; but not *vice versâ*; which tends to corroborate the above-mentioned hypothesis of positive and negative electricity, and likewise indicates that the vitreous is the positive, whilst the resinous is the negative electricity.

The method of ascertaining whether a given electrified body is possessed of the vitreous or of the resinous electricity, is easily derived from the above-mentioned distinctions. For instance, let A be the given electrified body. Take any other insulated and easily moveable body B, such a light piece of cork suspend by a thread, and electrify it by touching it with an excited piece of glass, which of course communicates to it the vitreous electricity. Let now the body B be brought close to the body A, and if a repulsion takes place, the two bodies must be possessed of the same kind of electricity, and since B is electrified with the vitreous electricity, A must likewise be possessed of the vitreous electricity. If when B is brought close to A, an attraction takes place, then A must be possessed of the resinous electricity. The instruments properly constructed for ascertaining the particular kind of electricity in an electrified body, are called *electrometers*.

That the two kinds of electricity do always accompany each other is proved by a variety of facts, the principal of which are as follows.

1. If the person who rubs a piece of glass, or amber, &c. be insulated, after the excitation of the glass, the person as well as the glass or other electric will be found electrified; but with this difference, that if the electric acquires the vitreous electricity, the person will be found electrified with the resinous electricity, and *vice versâ*. In short, whenever two bodies are rubbed against each other, and any electricity is thereby excited, both bodies are necessarily electrified, but with contrary electricities.

2. Whenever a body is electrified, the contiguous air, or any other body situated within a certain distance of the former, will also appear electrified, but with the contrary electricity. Thus, suppose that a piece of glass G be excited by friction with the human hand, let two small pendulous bodies be brought pretty near it, and these, by their mutual repulsion, or divergency, will shew that they are electrified, and if their state of electricity be examined in the manner already mentioned, they will be found possessed of the resinous electricity; *viz.* contrary to that of the excited glass. This contrary electricity is stronger or weaker, according as a body is placed nearer to, or farther from, an electrified body; and the limit, within which this contrary electricity may be perceived, is called the *sphere of action* of the electrified body.

3. The same individual body will not, when rubbed, acquire always the same kind of electricity; for certain rubbers will excite in it the resinous, and others will excite in it the vitreous electricity. Thus, if a stick of sealing-wax be rubbed with leather, the sealing-wax will acquire the resinous, and the leather will acquire the vitreous electricity; but if it be rubbed with a piece of tin-foil, then the sealing-wax will acquire the vitreous, and the tin-foil will acquire the resinous electricity.

Here it is necessary to observe, that whenever the rubber is said to acquire electricity, (as the leather, or the tin-foil, or any other conducting body,) it is always understood, that this rubber is insulated; otherwise the electricity which it acquires will be carried away as soon as it is generated.

We must now state the principal laws of communicated electricity; and here it must be observed, that most of the phenomena of electricity, and its grandest effects, belong to its transition, or to its being communicated from one body to another; thus the transition of electricity from one body to another occasions the light, the hissing, the cracking noise, and even the tremendous atmospherical thunder; by its quick passage it melts metallic bodies, sets fire to inflammables, destroys animal and vegetable life, and so forth.

Whenever a body is electrified, either by excitation or by the contact of another electrified body, that power is confined upon it only by electrics, and it remains upon that body a longer or a shorter time, according as the electrics which confine it are more or less perfect. If a finger, or any other conductor, be presented to an excited electric body, it will receive a spark from that body, which spark consists of a certain portion of the electricity of that electric. In this case, the electricity of the latter will not all be conveyed to the finger or other conductor, because as that body is a non-conductor, it cannot convey the electricity of all its surface to that side to which the conductor has been presented. Hence, if a conducting substance be successively presented to different parts of an excited electric, it will receive a spark at every approach, and that without repeating the excitation, until all the power of that electric is exhausted, and then a new excitation is necessary for the purpose of reviving it.

If a conducting body, not insulated, be exposed to an excited electric at a moderate distance, it acquires on that side the electricity contrary to that of the electric. This electricity becomes stronger the nearer that body is brought to the electric, and at last the conductor receives a spark from the electric (on account of the attraction existing between the two electricities), and thus the balance is restored. If the conductor, which is presented to the electric, be insulated, it will appear electrified at both extremities; but with this difference, that the side contiguous to the electric will appear possessed of the electricity contrary to that of the electric, and the opposite side will appear possessed of the same kind of electricity. There is a point not quite

quite in the middle of that body, which does not appear to be electrified at all. These two different electricities of the conductor become stronger the nearer that body is brought to the electric, and at last the former receives a spark from the latter, and becomes entirely possessed of the same kind of electricity with the electric. All these effects will take place also when some other non-conducting substance, besides air, is interposed between the excited electric and the conducting body; such as a thin plate of glass, of rosin, of sealing-wax, of sulphur, &c. but in this case no spark can pass from the excited electric to the conductor, unless it forces its way by bursting the interposed non-conductor. In fact, the noise of a spark arises from its bursting or displacing the air which is interposed between the excited electric and the conductor which is presented to it.

Now, since in the last mentioned case the spark cannot pass from the excited electric to the other body, unless it bursts the interposed electric or non-conductor, it follows, that if the interposed electric be pretty strong, so as to resist the effort of the two electricities, a great quantity of electricity may be accumulated on both sides of it; and this is what constitutes a charged electric; or, as it is more commonly called, from the place of its discovery, a *Leyden phial*. The following illustration will render this subject of charged electrics more intelligible. Let a large pane of glass be covered on both sides with some metallic body or other conductor, for instance, with tin-foil, but so that the tin-foil may on either side be about two inches short of the edge of the glass. Let one of these coverings or coatings be made to communicate with an electric powerfully excited, and a quantity of electricity will be communicated to that coating, at the same time that the action of that electricity will induce the contrary electricity on the opposite coating, provided that this communicates with the ground. Now it is evident, that a spark cannot pass from one coating to the other, so as to compensate or to annihilate the two contrary electricities, unless it breaks a hole through the pane of glass, or passes over its uncoated edge; which indeed will actually take place if the electricities be accumulated upon the coatings beyond the resisting power of the glass. But before this bursting takes place, let the pane of glass be removed from the vicinity of the electric, and it will remain charged; that is, a great quantity of vitreous or positive electricity will remain adhering to one side of it, and an equal quantity of the resinous or negative electricity will remain adhering to the other side. These two electricities seem to be kept close to the glass by their mutual attraction, and yet cannot come together because that attraction is not powerful enough to break the glass. And it is in consequence of that attraction that if one coating of the glass be touched whilst the other remains insulated, the electricity cannot be removed; but if a conducting communication be made from one coating to the other, an explosion, attended with a vivid spark, will take place between that communication or circuit, and that coating which has been touched last, which arises from the passage of the electricity from one side of the pane of glass to the other, in consequence of which the two contrary electricities are annihilated, and the glass is said to be *discharged*. It will be easily comprehended, that whether the coated glass for this experiment be in the form of a flat plate, or of a bottle, or of a jar, or of any other kind, the effect must be always the same, provided the coatings of the two sides, or of the inside and outside of a bottle, do not come too near the edge or opening of the bottle; for in that case the electricity would go from one coating to the other by passing over the surface of the glass, in which case the glass is said to have discharged itself. It is not known where the charge does actually reside. It certainly does not reside in the coating, for the coating may be removed and replaced again without discharging the glass; the coating only serving to form a communication between the various points of the surface of the glass. Nor do we know by what mechanism the electricity which is communicated to one side induces the contrary electricity on the other side of the glass, or of any other electric; for any other substantial electric may be coated and charged like glass. We are only acquainted with the effects, and with these we must for the present remain satisfied.

The thinner a plate of glass or of other electric is, the higher charge it may acquire; but it is at the same time more liable to be broken by a spontaneous discharge; therefore, for this experiment of charging, &c. the glass must be chosen of a moderate thickness. By increasing the quantity of coated electric surface, an immense force of electricity may be accumulated, which, when it is afterwards discharged, produces astonishing effects. For this purpose several coated jars are connected together, so as to be charged and discharged like a single jar, and this combination is called an *electrical battery*.

If the above-mentioned circuit of communication between the two coatings of a charged phial or jar, or plate, &c. be formed by the parts of a human being, a shock attended with a disagreeable sensation will be felt through the interposed parts; as for instance, if he touches one coating with one hand, and then touches the opposite coating with the other hand, he will feel an unpleasant shock, which is more or less painful according as the charge is higher or lower.

If various persons join hands, and while the person at one end of the file touches one coating of the charged jar, the person at the other end touches the opposite coating, all the file of persons will feel the shock at the very same perceivable instant of time. The charge of a Leyden phial has been found to pass through a circuit of several miles in an unappreciable small portion of time; but a small quantity of electricity has been observed to employ a very short portion of time in passing through a pretty long conductor, but not of the best kind.

From the above-mentioned sensation which an animal body receives from the discharge of a charged electric, that discharge is often called simply *the shock*; thus it is said that the shock is passed through a wire, or through any thing else. The effects of this shock or discharge are various according to the height of the charge; and when it is proportionate to the object in view, surprising effects are produced by it. Metallic bodies are fused, electric substances are broken with violence, animals are killed, inflammable substances are set on fire; and, in short, all the effects usually produced by the lightning may be imitated by it. If the circuit of communication be formed by means of a wire and a separate conductor, or the hand of a human being be situated very near the wire which forms the circuit, but so as itself to form no part of the circuit; on making the discharge through the wire, a small spark will be seen between the wire which forms the circuit and the conductor or hand that stands close to it; so that the conductor, or hand, &c. though actually out of the circuit, will feel some effect of the discharge. This effect is called the *lateral shock*, or *lateral explosion*. A coated glass is capable of receiving and of holding a greater charge in condensed, than in rarefied, air, or even than when standing under the usual atmospherical pressure. If the communication between the two sides of a charged phial be made by the interposition of imperfect conductors, as a slender piece of wood, a wet packthread, &c. the discharge will be made silently, or without explosion,

and its force is thereby weakened considerably. The force of the discharge is also weakened by the length of the circuit, though that circuit may consist of the very best conductors; which shews that the electricity finds some obstruction in passing even through the best conductors known. We must now return to the phenomena of the electricity which is communicated to conductors.

An insulated conductor, having received some electricity from an excited electric, or from another electrified conductor, (in which case it is said to be *electrified by communication*,) will act in every respect like an excited electric; excepting that when it is touched by another conductor communicating with the earth, the former gives one spark to the latter, and by that means all its electricity is discharged, because the electricity belonging to all its parts is easily conducted through its own substance to that side of it, to which the other conductor has been presented. Hence it appears that, in general, the electricity, which is discharged from an electrified and insulated conductor, is much more powerful than when discharged from an excited electric; for the conductor, especially when very extensive, may acquire a vast quantity of electricity, by receiving spark after spark from an excited electric, and may afterwards, when touched, discharge it all at once. When an insulated conductor is touched by another insulated and electrified conductor, the electricity will be divided between the two conductors, but not equally; excepting when the two conductors are equal, similar, and similarly situated.

If their surfaces are equal and dissimilar, that which is more extended will acquire a greater share of electricity than the other. Whether the conductors are hollow or solid, it makes no difference.

If the two conductors are equal and similar; but one of them is situated very near another conductor, but without touching it, then that conductor which is so situated will acquire a greater share of electricity than the other, which is supposed to remain only exposed to the ambient air.

When electricity is communicated to a capillary stream of water or other fluid, issuing out of a vessel, the stream is accelerated by it, but if, instead of being capillary, this stream be of a considerable size; then electrization will not accelerate it.

Electrization promotes the evaporation of bodies which are actually evaporating; but not in a great degree. If the face or any other part of the body be exposed, within a small distance, to an excited electric, or to a conductor strongly electrified, it will feel a peculiar sensation, as if a spider's web were drawn over it. The nostrils thus presented will perceive a peculiar smell, much resembling that of phosphorus, and if a body be kept some time within those effluvia, it will afterwards retain that smell during some minutes. If the tongue be exposed to a stream of electricity issuing out of an electrified body, it will be affected with a slight but peculiar kind of subacid taste.

It was for a long time believed that electricity communicated to animal and vegetable bodies, accelerated the pulsation of the former, and promoted the growth of the latter; but it is at present much doubted whether it really produces any of these effects. Nevertheless electrization, in medical cases, has been found useful at least as a safe and active stimulant.

An electric spark, (that is, a separate quantity of electricity,) will go a greater or lesser distance through the air, in order to reach a conductor, according as its quantity is more or less considerable, as the parts from which it flies, and those upon which it strikes, are more or less acute, and as the conductor is more or less perfect. The noise, and the light with which the spark is attended, is greater or less, according to the quantity of electricity; according as the parts from which it flies, and those upon which it strikes, are more blunt or more sharp; and according as the conductors are more or less perfect. Thus, for instance, a sharp pointed body will throw off electricity to, and will receive it from, a greater distance, than a body of any other shape; but that passage then occasions no noise, and is attended with very little light; because, in this case, the electricity does not come in a separate large body, but in a continued stream. If a pointed wire be concealed in a glass tube, which projects a short way beyond it, or if it be covered with tallow, bees'-wax, sulphur, &c. then it will take a strong spark from an electrified conductor. When a point, proceeding from an electrified body, projects into the ambient air, a remarkable current of air, or wind, proceeds always from it, whether the point and the conductor be electrified with the vitreous or with the resinous electricity, which arises from the particles of air being repelled by the point as soon as they become possessed of the same kind of electricity.

With respect to the electricity of the atmosphere, the particulars which have been ascertained are, that the air, at a small distance from the ground, from houses, trees, &c. is always electrified generally with positive electricity, but not always in an equal degree. The thunder and the lightning have also been ascertained to be electrical phenomena; but other meteors, such as the northern lights, water spouts, shooting stars, &c. have only been conjectured to be produced by electricity.

Thus we have drawn a general and comprehensive sketch of the subject of electricity. But for a minute and extended description of all the particulars which belong to it, the reader is referred to the articles of each peculiar denomination; such as CONDUCTORS, ELECTRICS, EXCITATION, LEYDEN PHIAL, LIGHTNING, &c.

ELECTRICITY, *Medical*. See MEDICAL *Electricity*.

ELECTROMETER, (from the Greek words ηλεκτρον, *amber*, and μετρον, *measure*,) an instrument useful for measuring the quantity, and determining the quality, of electricity in an electrified body; *viz.* the quantity and quality of that natural power, the effects of which were first observed in a mineral substance, called *amber*. The invention of electrometers is not much older than about the middle of the last, (*viz.* the 18th) century; but the greatest variety of them, adapted to different purposes, has been invented within the last 40 years; and according to the various purposes, as also on account of their shapes, these instruments have obtained a variety of names, such as *pith*, or *cork-ball electrometers*, *quadrant electrometers*, *bottle electrometers*, *atmospherical electrometers*, *electro-micrometers*, *electrical balances*, *discharging electrometers*, &c. A description of all these electrometers, together with their gradual improvements, and their uses, is as follows:

A simple thread held by one extremity, and presented to an electrified body, seems to have been the first instrument of the kind. It only shewed the presence of the electricity, by its being attracted by the electrified body. Dr. Desaguliers called it the *thread of trial*. The Abbé Nollet used two threads, which shewed the intensity of the electricity by the angle of their divergency, formed by their shadows upon a board placed behind them.

Mr. Canton added a cork ball, or a ball of pith of elder, to the extremity of each thread, which formed a considerable improvement; the threads acquiring thereby a greater degree of steadiness, and becoming less apt to lose their electricity, by having their extremities covered with the abovementioned balls. *Fig.* 1. *Plate* XII. represents this, Mr. Canton's, electrometer,

trometer, in its most usual state. A B represents the side of an oblong box about six inches long, but less than an inch broad. It is formed out of a single piece of wood, and has a sliding dove-tail cover over its whole length. When the cover is removed, and the box is inverted, the cork or pith-balls C, D, with their threads, come out of it, and remain suspended, as in the figure. The balls are nicely turned in a lathe, and should not be larger than an eighth of an inch in diameter. The linen threads are fastened to the balls by passing them through with a needle, and making a knot at the end of each. These threads are little short of the length of the box A B, and are fastened to a little ring at the extremity of the box, so that when not in use, they, with their balls, are placed in the cavity of the box, and the cover is slipped over them. Previous to their being passed through the balls, the threads have been sometimes wetted in a weak solution of common salt, in order to render them better conductors.

A cork, or pith-ball electrometer, is also frequently used without the box A B. In that case, it being nothing more than a thread with a ball at each end, it may be suspended by its middle to a wire at the end of the prime conductor of an electrical machine, or elsewhere. If this instrument be held by the end A of the box, and be thus presented to an electrified body, the balls C, D, will recede from each other, the threads forming an angle larger or smaller according to the intensity of the electricity. If, while the electrometer is thus diverging, an excited stick of sealing-wax or of glass be brought sideways of the balls, these will come close to the wax or to the glass, when they are possessed of the opposite kind of electricity; but will recede from the glass, or sealing-wax, or other electrified body, when they are possessed of the same kind of electricity.

If the operator, holding the box by the end A, and extending his arm as high as he can, exposes the electrometer to the ambient air in an open place, or on the top of a house, he may easily ascertain the presence and the quality of the electricity of the air, or of a fog, by the above described method.

When, for the conveniency of certain experiments, this electrometer must be insulated, then the box A B is placed upon an insulating stand, as in *fig.* 2.

This useful instrument was rendered much more commodious, and was adapted to the purposes of atmospherical electricity in a manner more certain and more efficacious by Mr. Cavallo, who first described it in the Phil. Transf. These improvements, under the denominations of a *pocket electrometer*, the *atmospherical electrometer*, and the *electrometer for rain;* are as follow:

Figs. 4. and 5. represent the "pocket electrometer." The handle or case of this instrument consists of a glass tube, about three inches long, and three or four tenths of an inch in diameter. Half of this tube is covered with sealing-wax, as is easily perceived in the figure. From that extremity of this tube, which is not covered with sealing-wax, a small loop of silk proceeds, which serves occasionally to hang the electrometer on a pin, or nail. A cork is adapted to the other extremity of this tube, which being cut tapering at both extremities, can fit the opening of the tube with either extremity. Two linen threads proceed from one end of this cork, which are a little shorter than the length of the tube, and two little *cones* of cork or of the pith of elder are fastened to their extremities. When this electrometer is to be used, that end of the cork which is opposite to the threads is pushed into the mouth of the tube; then the tube forms the insulating handle of the cork or pith-ball electrometer, as represented in *fig.* 5. But when the electrometer is to be carried in the pocket, then the threads are put into the tube, and the cork stops the aperture of the tube with its other extremity, as represented in *fig.* 4.—*Fig.* 3. represents a case to contain the above-described electrometer. It is like a common tooth-pick case, excepting that it has a piece of amber fixed on one end A, which may occasionally serve to electrify the electrometer negatively: and on the other extremity it has a piece of ivory fixed upon a piece of amber B C. This amber B C serves only to insulate the ivory, which being thus insulated, if it be rubbed against woollen cloths, will acquire the positive electricity; and is of course useful for electrifying the electrometer positively.

Fig. 6. represents an instrument peculiarly adapted to the purposes of exploring the electricity of the atmosphere. A B represents a common jointed fishing-rod, without the last or smallest joint. From the extremity of this rod proceeds a slender glass tube, or solid glass stick C, which is covered with sealing-wax, and carries a cork, D, at its extremity, to which cork a pith-ball electrometer E is suspended. H G I is a piece of twine fastened to the other extremity A of the rod, and supported at G, by a short string F G. At the end I of the twine, a pin is fastened, which, when pushed into the cork D, renders the electrometer E uninsulated.

"When I would observe," Mr. Cavallo says, "the electricity of the atmosphere with this instrument, I thrust the pin I into the cork D, and holding the rod by its lower end A, project it out of a window on the upper part of a house, into the air; raising the end of the rod with the electrometer, so as to make an angle of about 50 or 60 degrees with the horizon. In this situation I keep the instrument for a few seconds, and pulling the twine at H, I disengage the pin from the cork D, which operation causes the string to drop in the dotted situation K L, and leaves the electrometer insulated, and electrified with the electricity contrary to that of the atmosphere. This done, I draw the instrument into the room, and examine the quality of the electricity, without obstruction, either from wind or darkness.

"With this instrument I have made observations on the electricity of the atmosphere, several times in the course of each day during several months, and from them I have deduced the following general observations, which seem to coincide with those which I have made with the electrical kites.

"1. That there is in the atmosphere, at all times, a quantity of electricity; for whenever I use the above-described instrument, it always acquires some electricity.

"2. That the electricity of the atmosphere, or fogs, is always of the same kind, namely, positive; for the electrometer is always negative, except when it is evidently influenced by heavy clouds near the zenith.

"3. That in general the strongest electricity is observable in thick fogs, and also in frosty weather; and the weakest, when it is cloudy, warm, and very near raining; but it does not seem to be less by night than in the day time.

"4. That in a more elevated place, the electricity is stronger than in a lower one; for, having tried the atmospherical electrometer, both in the stone and in the iron gallery on the cupola of St. Paul's cathedral, I found that the balls diverged much more in the latter, than in the former less elevated place; hence it appears, that if this rule takes place at any distance from the earth, the electricity in the upper regions of the atmosphere must be exceedingly strong."

Fig. 7. represents the electrometer for the rain. A B C I is a strong glass tube about two feet and a half long, having a tin funnel, D E, cemented to its extremity, which funnel defends part of the tube from the rain. The outside surface of the tube from A to B is covered with sealing-wax; so also

alſo is that part of it which is ſheltered by the funnel. F D is a piece of cane, round which ſeveral braſs wires are twiſted in different directions, ſo as to catch the rain eaſily, and at the ſame time to offer little or no reſiſtance to the wind. This piece of cane is fixed into the tube, and a ſlender wire, proceeding from it, goes through the bore of the tube, and communicates with the ſtrong wire A G, which is thruſt into a piece of cork faſtened into the end A of the tube. The extremity G of the wire A G, is formed into a ring, from which is ſuſpended a more or leſs ſenſible pith-ball electrometer, as occaſion requires. This inſtrument is faſtened to the ſide of the window-frame, where it is ſupported by ſtrong braſs hooks, at C B; and this part of the tube is covered with ſeveral folds of ſilk ſtuff, in order to adapt it more ſafely and commodiouſly to the hooks. The part F G projects out of the window, with the end F elevated a little above the horizon. The remaining part of the inſtrument comes through a hole in one of the lights of the faſh, within the room, and no more of it touches the ſide of the window than the part C B. This inſtrument ſhould be placed ſo as to be eaſily taken off, and replaced; for it will be neceſſary to clean it now and then; particularly on the approach of a ſhower of rain.

"When it rains," ſays Mr. Cavallo, "eſpecially in paſſing ſhowers, this inſtrument, ſtanding in the ſituation above deſcribed, is frequently electrified; and, by the divergency of the electrometer, the quantity and quality of the electricity of the rain may be obſerved. With this inſtrument I have obſerved, that the rain is generally, though not always, electrified negatively, and ſometimes ſo ſtrongly, that I have been able to charge a ſmall coated phial at the wire A G."

A commodious way of uſing electrometers in a variety of delicate experiments, ſuch as in examining tourmalins, precious ſtones, &c. is to have a ſtand made on purpoſe, and holding both ſingle and double-thread electrometers, as in *fig.* 8. B is the baſe, made of common wood: A is a pillar of ſealing-wax, or of glaſs, to the top of which a wooden head is fixed. From this circular piece of wood, or head, four glaſs arms proceed, ſuſpending four electrometers, two of which, D, D, are nothing more than ſilk threads, about four or five inches long, each of which carries a very ſmall downy feather at its extremity. The other two electrometers, C, C, are cork or pith-ball electrometers, the conſtruction of which is a variety of thoſe which have been already deſcribed: *a b* repreſents a ſtick of glaſs, about four inches long, covered with ſealing-wax, and ſhaped at top in the form of a ring. To the lower extremity of this glaſs ſtick two fine linen threads are faſtened, with pith or cork balls at their lower extremities. In the figure theſe electrometers are repreſented as being actually electrified. The glaſs ſtick *a b* ſerves as an inſulating handle, by which the electrometer may be ſupported, when it is uſed without the ſtand. Thoſe with the downy feather D D, when electrified, one with the poſitive, and the other with the negative electricity, will continue in that ſtate for a very conſiderable time, during which, if a ſmall body ſlightly electrified be gently approached to one or the other of the feathers, the fine filaments of the latter will be attracted or repelled, according as that body is poſſeſſed of the ſame, or of the contrary electricity.

Fig. 9. repreſents Mr. Henly's quadrant electrometer upon a little ſtand; and *fig.* 10. repreſents it upon the prime conductor of an electrical machine. It conſiſts of a perpendicular ſtem or pillar A B, formed at top like a ball, and furniſhed at its lower end with a braſs ferrule, by which it may be fixed in one of the holes of the prime conductor, or upon a perpendicular wire, fixed on purpoſe to the inſide coating of an electrical battery, or upon the knob of a Leyden phial, or laſtly, upon its own ſtand, when it is not actually in uſe. To the upper part of the ſtem a graduated ivory ſemi-circle E is fixed, and about the middle of this ſemi-circle there is a braſs arm, which contains a pin, or the ſmall axis of the index. The index C conſiſts of a very ſlender ſtick, which reaches from the centre of the ſemi-circle E to the braſs ferrule, and a cork ball D nicely turned in a lathe is glued faſt to its lower extremity. The wood proper for this electrometer is box wood, and both the pillar and the index ſhould be well rounded and poliſhed. When the electrometer is not electrified, the index hangs parallel to the ſtem A B, and the ball D touches the braſs ferrule, as in *fig.* 9. But when electrified, the index recedes more or leſs from the ſtem according to the intenſity of the electricity, as in *fig.* 10. This inſtrument is peculiarly uſeful for obſerving the progreſs of the charge of a Leyden phial, or of a battery.

Beccaria recommended to incloſe the upper part of the index of this electrometer between two ſemi-circles; other electricians have alſo made other alterations, which we ſhall now deſcribe; though, upon the whole, Mr. Henly's original conſtruction ſeems to anſwer as well as any other.

Mr. Cuthbertſon's conſtruction is repreſented in *fig.* 11.; *a* is a ſmall cork-ball fixed to the extremity of a very ſlender ſtick of ivory *b c d*, which, when electrified, is repelled by the braſs tube *e e*, and as this ſtick of ivory, *b c d*, moves upon an axis at *c*, the angle of divergency is indicated by its extremity *d*, upon the graduated arch *f g*. This electrometer being very ſenſible, is peculiarly uſeful for indicating the ſmall charge of a Leyden phial, or the charge of a battery in its commencement.

Fig. 12. repreſents Mr. Brook's electrometer (Phil. Tranſ. for the year 1782.) It is a complicated and expenſive inſtrument. "B is the foot or baſe, conſiſting of a ſquare board $9\frac{3}{4}$ each way, having three ſcrews for the purpoſe of ſetting the inſtrument upright: D is a ſolid piece of glaſs, which ſupports and inſulates the inſtrument. The arms G 1, and *g*, with the ball F, turn round on the wire H, (which is of ſolid braſs, as may be alſo the arm *g*,) and when in uſe are put nearly at right angles with G 2 and H, being turned to the off ſide ſo as to be as much as poſſible out of each others' atmoſpheres, or the atmoſphere of a jar, battery, prime conductor, &c. The arms G 1 and G 2 are hollow tubes of copper, not ſo heavy as wires. The balls I 1, I 2, are made of copper, and hollow, ſo as to be as light as poſſible: K repreſents a kind of face or dial-plate to the inſtrument with its index, which (by means of multiplying motion under the dial-plate) is carried once round, whilſt the arm G 2, with its ball I 2, moves through a quarter of a circle, or 90 degrees. This motion is given to it by the repulſive power of the charge, &c. of electricity between the two balls I 2 and L. The ends of the index from its centre are of different lengths. The longeſt end reaches to a graduated circle divided into 90 equal parts, anſwering to 90°, which the arm G 2 moves through. The ſhorteſt end reaches to a ſmaller circle, divided into 60 equal parts, anſwering to 60 grains weight, or 60 diviſions on the arm G 1, with its ſliding weight *m*, each of which is equal to one grain, and the whole face is covered with a watch glaſs, to prevent the electricity from flying off at the points.

"The top of the glaſs ſtick D is cemented into a braſs cap M. This cap enters the ball L at the lower part, and ſcrews into the upper part of the ball L at *a*. The top part of this cap M is tapered off to a cone about an inch and a half long or high. The lower end of the wire H has a hole made

made conically into it, so as to receive the upper part or conical end of the cap M, which permits all the upper part of the electrometer to turn round any way that may be necessary. The kind of ferrule O, with its base, is perforated for the lower end of the wire H to go through. The bent arm *b*, which supports the cup N, is screwed into the base of the ferrule O, and turns freely round upon the wire H. The cup N is to receive the ball P of the arm H. This arm shortens or lengthens, as may be wanted, by a wire sliding into a tube. The end of the wire is slit, forming a spring in the tube to be steady. In this arm is a kind of rule joint at *d*, that the arm may give way entirely if wanted. The semi-circular end of the arm is a spring, and slips on to a ball from the prime conductor, jar, or battery; and serves to connect that prime conductor, or jar, or battery, with the electrometer.

"The arm G screws not to the ball F, but to a solid piece within the said ball, and the whole, like the arms of an unequal balance, move round an axis close to the surface of the ball F, so that the arm G 1 moves angularly round that axis, and the ball I 1 rises above the ball *r*, in virtue of the electrical repulsion.

"In order to make the divisions of G 1 exactly a grain each, first slide the weight *m* toward the ball F, till it is an exact counter balance to the weight in F. At one end of the weight *m* let the divisions begin; then suspend any tolerable pair of scales, so that the bottom of one of them may rest on the top of the ball *r*; then lay the ball I 1 into the scale, and slide the weight *m* near to I 1, and put as many grains into the other scale as will just raise the ball I 1 in the scale; then mark the arm G 1 at the same end of the weight *m*, and divide the space between the two marks into as many parts as there are grains in the scale, which may be divided and sub-divided into halves and quarters.

"The arm G 2 being repelled, shews when the charge is increasing, &c. and I 1 tells what such a repulsive power is between two balls of the size of these in grains, according to the number the weight *m* rests at when lifted up by the repulsive power of a charge. The longest end of the index K shews how many degrees of a circle G 2 is repelled, and by many trials, according to the number of grains, the arm G 1 shews, when it is lifted up, and the weight *m* put at different places, such respective number of grains may be marked on the least circle on the dial-plate where the shortest end of the index points; so that when all the grains are thus marked on the dial plate, thus ascertained by the arm G 1, all these parts of the instrument, that is, the ball F with the arms G 1 and *g*, may be taken off, and the instrument is then graduated to be used without them; "but I do not know," Mr. Brook says, "how the grains can be so exactly marked and ascertained as by these parts being on the instrument: nor do I mean to confine the number of grains or divisions on G 1; but, I think, my experience seems to tell me, that no glass to be *charged*, as we call it, with electricity, will bear a greater charge than that whose repulsive force between two balls of this size equals 60 grains weight, before it will be perforated or struck through. Nay, I have not found many instances where it would stand 50 grains; and I think it is very hazardous to go more than 45 grains."

"Thus, by knowing the quantity of coated surface, and the diameters of the balls, as I 1 and *r*, I would say, so much or so much coated surface charged to so many or so many grains repulsion between two balls of such or such a size would melt a wire of this or that size, or do such a thing, kill such an animal, &c. and if balls, wires, or arms of this size are found too small, larger may be made on the same plan."

By this means electrometers may be made to speak a common and an intelligible language.

The lower part of Mr. Brook's electrometers may likewise be called an *electrical balance*.

Notwithstanding the intricacy of the construction of Mr. Brook's electrometer, it must be acknowledged, that if not exactly upon that, at least upon some such plan, these instruments should be constructed; for an equal division of the arc, or semi-circle, into equal parts will not indicate equal increments of the repulsive force: to estimate which truly, Mr. Achard says, that the arc of the electrometer should be divided according to a scale of arcs, the tangents of which are in arithmetical progression.

The pith or cork-ball electrometers, above described, though very useful within doors, are, when used for atmospherical electricity, much disturbed, and even rendered perfectly useless by wind, rain, and the moisture of fogs. To avoid these defects, Mr. Cavallo, in the year 1777, made a most useful contrivance; which, in fact, opened the way to farther improvements, and rendered this kind of instruments both sensible and useful far beyond that of any former construction. The contrivance consisted in enclosing the electrometer in a glass vessel, and furnishing it with other parts; which rendered it capable of being exposed to the wind and to the rain, without the least obstruction. The construction of this instrument (a description of which Mr. Cavallo presented to the Royal Society, and is published in the Philosophical Transactions) is represented by the *figs.* 13, 14, and 15, *Plate* XIII. in its real size.

The principal part of this instrument is a glass tube, C D M N, cemented at the bottom into the wooden piece, A B, by which part the instrument is to be held, when used for the atmosphere; and it also serves to screw the instrument into the wooden case, A B O, *fig.* 1, when it is not actually in use. Both the foot, A B, and the case may also be made of brass or other metal. The upper part of the tube, C D M N, is shaped tapering to a smaller extremity, which is entirely covered with sealing-wax, melted by heat, and not dissolved in spirit of wine. Into this tapering part a small tube is cemented, the lower extremity, G, of which (being also covered with sealing-wax) projects a short way within the tube, C D M N. Into this smaller tube a wire is cemented, which, with its lower extremity, touches the flat piece of ivory, H, which is fastened to the tube by means of cork, and with its upper extremity, which projects about a quarter of an inch above the tube, screws into the brass cap, E F; which cap is open at the bottom, and serves to defend the waxed part of the instrument from the rain, &c. *Fig.* 3. represents a section of this brass cap, shewing its internal form; together with the manner in which it is screwed to the wire that projects above the small tube, L. The small tube, L, and the upper extremity of the large tube, C D M N, appear like one continuate piece, on account of the sealing-wax, which covers them both. The conical corks, P, of this electrometer, which by their repulsion shew the electricity, &c. are as small as can conveniently be made; and they are suspended by exceedingly fine silver wires. These wires are shaped in a ring at the top, by which they hang very loosely on the flat piece of ivory, H, which has two holes for that purpose. By this method of suspension, which is applicable to other electrometers, the friction is diminished greatly, whence the instrument is rendered extremely sensible. I M and K N are two narrow slips of tin-foil, stuck to the inside of the glass,

C D M N, and communicating with the wooden bottom, A B. These serve to carry away the electricity, which, when the corks, P, touch the glass, is communicated to it, and which, being accumulated, would disturb the free motion of the corks.

With respect to practical utility, this instrument may be used for observing the artificial as well as the atmospherical electricity. When it is to be used for artificial electricity, this electrometer is set upon a table, or other convenient support: then it is electrified, by touching the brass cap, E F, with an electrified body; and this electricity will sometimes remain upon the electrometer longer than an hour. In this state, if any electrified substance be brought near the cap, E F, the corks, P, of the electrometer, by their convergiag or by increasing their divergency, will shew the species of that body's electricity.

"It is necessary to observe," Mr. Cavallo says, "that to communicate any electricity to this electrometer, by means of an excited electric; *e. g.* a piece of sealing-wax (which we suppose as being always electrified negatively) is not very readily done in the usual manner, on account of the cap, E F, being well rounded, and free from points or sharp edges. By the approach of the wax, the electrometer will be caused to diverge; but as soon as the wax is removed, the wires immediately collapse. The best method to electrify it is to bring the excited wax so near the cap, that one or both the corks may touch the side of the bottle C D M N; after which, they will soon collapse and appear unelectrified. If now the wax be removed, they will again diverge, and will remain electrified *positively*.

"In this operation, the wax does not impart any of its electricity to the electrometer, but only acts by means of its atmosphere; *viz.* when the excited wax is first brought near the brass cap, E F, (agreeable to the well-known law of electricity, and according to Dr. Franklin's hypothesis,) it determines the electric fluid naturally belonging to the corks towards the cap: hence the corks repel each other. Now, if in this state they touch the tin-foil on the sides of the glass, C D M N, they acquire from it a quantity of electric fluid, equal to that which, by the action of the excited wax, was driven towards the cap: consequently they collapse, and appear unelectrified. Notwithstanding this appearance, the cap is actually overcharged; so that when the wax is removed, the overplus of electric fluid which the corks had acquired from the glass and tin-foil, and which was crowded upon the cap, on account of the negative atmosphere of the wax, now diffuses itself equally through the cap, the wires, the corks, &c.; and therefore the corks repel each other with positive electricity.

"If, instead of the sealing-wax excited negatively, an electric possessed of positive electricity be used, the electrometer acquires the negative electricity, and the explanation, *mutatis mutandis*, is the same as above.

"By considering this remark, it will appear that when this electrometer is electrified either positively or negatively, and an electrified body is brought towards the brass cap, the electricity of that body will be of the same kind with that of the electrometer, if the corks increase their divergency; but it will be of the contrary kind, if the corks come nearer to each other."

When this instrument is to be used for observing the electricity of the fogs, the air, the clouds, &c. the observer must unscrew it from its case, and holding it by the bottom, A B, must present it to the air in an open, free, and, if possible, an elevated, place; raising it a little above his head, so that he may conveniently observe the corks, P, which will immediately diverge, if there be any sufficient quantity of electricity; and it may be easily ascertained whether this electricity is positive or negative, by bringing an excited piece of sealing-wax, or other excited electric, towards the brass cap, E F. Upon the whole, the peculiar advantages of this electrometer, as enumerated by its inventor, are 1st, The smallness of its size; 2d, Its being always ready for experiments, without the fear of entangling the threads, or of having an equivocal result by the sluggishness of its motion; 3d, Its being not disturbed by wind or rain; 4th, Its superior sensibility; and, 5th, Its retaining its electricity longer than any other electrometer.

Mr. Saussure took great pains to point out some supposed imperfections of the above-described electrometer, and to improve it by making several specious alterations and additions, which, if not actually detrimental, evidently are of no real advantage. In the first place, he says, that the fine wires, by which the balls are suspended, should not be so long as to reach the tin-foil which is pasted on the inside of the glass; yet he directs to put four pieces of tin-foil within the glass. Secondly, Mr. Saussure has altered the shape of the glass, making it broader, and with a neck very short, which prevents the electrometer's retaining the electricity for any considerable time. Thirdly, he has made the bottom of the electrometer of brass, for the purpose of using it like a condenser. For example, he says, if it be placed on an imperfect conductor, as dry wood or marble, and if the instrument be electrified strongly, and afterwards the top is touched, the electricity will appear to be destroyed; but on lifting up the instrument by the top, the balls will again open, because the imperfect conductor formed with the base a kind of electrophorus, by which the electric fluid was condensed and lost its tension, till the perfect conductor was separated from the imperfect one; whereas, if the conductor had been more perfect, it would have been deprived of its electricity immediately, on the application of the hand. We cannot see of what practical use this equivocal and uncertain operation can be. Fourthly, Mr. Saussure has added a very long pointed wire to the top of its electrometer, for the purpose of imbibing the electricity of the atmosphere. This may in some cases be of advantage, but in others it must be very disadvantageous; for, as it appears from the above-mentioned observations of Mr. Cavallo, this electrometer is electrified with the electricity contrary to that of the atmosphere, whereas, when the electricity of the atmosphere is very strong, the pointed wire, by imbibing some of it, may render the action of the electrometer equivocal. Lastly, Mr. Saussure has placed a divided scale within the electrometer, for the purpose of measuring the angle of divergency; but to any person who is in the least conversant with the use of such instruments, it will easily appear that, by the eye, the angle of divergency may be estimated sufficiently for the purpose; whereas, with a scale, a considerable time is required to steady the electrometer, and to place the eye in a proper point of view; and during this time, the electricity of the corks, &c. will be considerably diminished.

A capital improvement to the bottle electrometer was made by the Rev. Abraham Bennet, and is described in the Philosophical Transactions for the year 1787, p. 26. Instead of the wires with the corks, Mr. Bennet used two slips of gold-leaf, which are sensible to an astonishing degree, manifesting the electricity in a ready and unequivocal manner, free from an inconvenience which frequently takes place with the cork or pith-ball electrometers. The inconvenience is, that in these electrometers, when they are electrified, the balls

balls ſometimes adhere to each other for a conſiderable time before they will ſeparate, and then they ſeparate with a kind of jerk all at once.

The *figures* 16, 17, and 18, repreſent Mr. Bennet's gold-leaf electrometer; the 16th and 17th being ſections of the inſtrument. The 18th repreſents the inſtrument joined together, and ready for uſe. "It conſiſts," ſays Mr. Bennet, "of two ſlips of gold-leaf, *a*, *a*, ſuſpended in a glaſs, *b*. The foot, *c*, may be made of wood or metal; the cap, *d*, of metal. The cap is made flat on the top, that plates, books, evaporating water, or other things to be electrified, may be conveniently placed upon it. The cap is about an inch wider in diameter than the glaſs, and its rim about three quarters of an inch broad, which hangs parallel to the glaſs, to turn off the rain, and keep it ſufficiently inſulated. Within this is another circular rim, about half as broad as the other, which is lined with ſilk or velvet, and fits cloſe upon the outſide of the glaſs: thus the cap fits well, and may be eaſily taken off, to repair any accident happening to the gold-leaf. Within this rim is a tin tube, *e*, hanging from the centre of the cap, ſomewhat longer than the depth of the inner rim. In the tube a ſmall peg, *f*, is placed, and may be occaſionally taken out. To the peg, which is made round at one end and flat at the other, two ſlips of leaf gold are faſtened with paſte, gum-water, or varniſh. Theſe ſlips ſuſpended by the peg, and that in the tube faſt to the centre of the cap, hang in the middle of the glaſs, about three inches long, and a quarter of an inch broad. In one ſide of the cap there is a ſmall tube, *g*, to place wires in. It is evident, that without the glaſs the leaf-gold would be ſo agitated by the leaſt motion of the air, that it would be uſeleſs; and if the electricity ſhould be communicated to the ſurface of the glaſs, it would interfere with the repulſion of the leaf-gold; therefore two long pieces, *h*, *h*, of tin-foil are faſtened with varniſh on oppoſite ſides of the internal ſurface of the glaſs, where the leaf-gold may be expected to ſtrike, and in connection with the foot. The upper end of the glaſs is covered and lined with ſealing-wax as low as the outermoſt rim, to make its inſulation more perfect."

Mr. Cavallo, in deſcribing this electrometer of Mr. Bennet, in his Treatiſe on Electricity, 4th edition, ſays, "As it is rather difficult to faſten the ſlips of gold-leaf to this electrometer, and to cauſe them to hang parallel, I have contrived a method which remedies that defect. When the ſlips are cut and are lying upon paper, or on the leather cuſhion upon which they are cut, I make them equal in length, by meaſuring with a pair of compaſſes, and cutting off a ſuitable portion from the longeſt. I then cut two bits of very fine gilt paper, each about half an inch long, and a quarter of an inch broad; and by means of a little wax, ſtick one of them to one extremity of each ſlip of gold-leaf, ſo as to form a kind of letter T. This done, I hold up in the fingers of one hand one of thoſe pieces of paper with the gold leaf ſuſpended to it, and hold the other with the fingers of the other hand; then bringing them near to each other, and having adjuſted them properly, *viz.* ſo as to let them hang parallel and ſmooth, I force the pieces of paper, which now touch each other, between the two ſides of a ſort of pincers made of braſs wire, or of very thin and hammered braſs plate; which pincers are faſtened to the under-part of that piece which forms the top or cover of the glaſs veſſel."

Mr. Bennet, immediately after the deſcription of his excellent electrometer, ſays, "The following experiments will ſhew the ſenſibility of this inſtrument: 1ſt, Powdered chalk was put into a pair of bellows, and blown upon the cap, which electrified it poſitively when the cap was about the diſtance of ſix inches from the nozzle of the bellows; but the ſame ſtream of powdered chalk electrified it negatively at the diſtance of three feet. In this experiment there is a change of electricity from poſitive to negative, by the diſperſion or wider diffuſion of the powder in the air. It is alſo changed by placing a bunch of fine wire, ſilk, or feathers, in the nozzle of the bellows; and is wholly negative, when blown from a pair of bellows without their iron pipe, ſo as to come out in a larger ſtream. This laſt experiment did not anſwer in dry weather ſo well as in wet. The poſitive electricity of the chalk, thus blown, is communicated, becauſe part of the powder ſticks to the cap; but the negative is not communicated, the leaf-gold collapſing as ſoon as the cloud of chalk is diſperſed.

"2dly, A piece of chalk drawn over a bruſh, or powdered chalk put into the bruſh, and projected upon the cap, electrifies it negatively; but its electricity is not communicated.

"3dly, Powdered chalk blown with the mouth or bellows, from a metal plate placed upon the cap, electrifies it permanently poſitive; or if the chalk is blown from the plate, either inſulated or not, ſo that the powder may paſs over the cap, if not too far off, it is alſo poſitive; or if a bruſh is placed upon the cap, and a piece of chalk drawn over it, when the hand is withdrawn, the leaf-gold gradually opens with poſitive electricity, as the cloud of chalk diſperſes.

"4thly, Powdered chalk, falling from one plate to another placed upon the inſtrument, electrifies it negatively."

Several other experiments were alſo made with Mr. Bennet's electrometer, out of which we ſhall collect the principal. "The inſtrument being placed in a dusty road, and the duſt ſtruck up with a ſtick near it, electrified it poſitively. Wheat flour and red lead are ſtrongly negative in all caſes where the chalk is poſitive. The following powders were like chalk: red ochre and yellow, roſin, coal aſhes, powdered crocus metallorum, aurum moſaicum, black-lead, lamp-black, (which was only ſenſible in the two firſt methods,) powdered quick-lime, umber, lapis calaminaris, Spaniſh brown, powdered ſulphur, flowers of ſulphur, iron filings, ruſt of iron, and ſand. Roſin and chalk, ſeparately alike, were changed by mixture: this was often tried in dry weather, but did not ſucceed in damp. White lead alſo ſometimes produced poſitive, and ſometimes negative electricity, when blown from a plate.

"If a metal cup be placed upon the cap, with a red-hot coal in it, a ſpoonful of water thrown in electrifies the cup negatively; and if a bent wire be placed in the cap, with a piece of paper faſtened to it, to increaſe its ſurface, the poſitive electricity of the aſcending vapour may be tried by introducing the paper into it."

The ſenſibility of this electrometer may be conſiderably increaſed by placing a candle upon the cap. By this means, the electricity of an electrical machine in one room may be perceived in the next room. Powders, in this caſe, will alſo electrify it at a much greater diſtance, &c.

When this electrometer was placed at the diſtance of ſix feet from the ſtring of a kite, having a wire through the ſtring, and raiſed in cloudy weather, the gold-leaf continued to ſtrike the ſides of the electrometer, for more than an hour together, with a velocity increaſing and decreaſing with the denſity or diſtance of the unequal clouds which paſſed over.

"No ſenſible electricity is produced by blowing pure air, projecting water, by ſmoke, flame, or exploſions of gunpowder."

The only defect of the above-described most useful gold-leaf electrometer is its not being portable, unless it be carried always upright; and with this imperfection the instrument has remained for about 20 years; until very lately, when Mr. Cavallo contrived to render it perfectly portable: and this contrivance he has permitted to be published, for the first time, in the present article.

The *figures* 19 and 20 are two sections of this instrument, *Fig.* 21 represents it in perspective. The letters of reference indicate the same parts in all the three figures. A B is a glass tube, cemented into the perforated brass bottom, or ferrule, G. D C is a short and narrower glass tube, which fits the upper part of the tube A B, by means of a piece of leather, which is cemented to that part of it which is intended to enter into A B. A third smaller glass tube, F E, is cemented into D C, and projects a little way above and below D C. The surfaces of these three tubes, from F to H, are all covered with sealing-wax. A brass wire, I, is cemented into the smallest tube, F E, and communicates with an oblong slip of brass plate, E *a*, which is a little thicker than common writing paper, and about a quarter of an inch broad, well polished and rounded off at the edges. In the *figures* 19 and 20, this slip of brass is seen edge-ways: *o c* is a slip of gold-leaf, stuck at *o* to the brass plate E *a*; and when electrified, making an angle *c o a* with it, which is larger or smaller according to the intensity of the electricity. E *a* remains always stiff and immoveable: *b e* is a piece of cork, fitted tight to the lower aperture of the glass tube, A B. There is a slit in this cork, through which the lever, or brass arm. *h i g*, moves round the axis or pin, *r*, which passes through the cork at right angles to *h g*. From *h* to *s* this brass arm is as broad as E *a*; but from *s* to *g* it spreads the other way, *viz.* from *i* to *g*. Now it is easy to comprehend, that if a finger's nail be applied at *g*, through the aperture of the brass foot, G, and be pressed against that end of the arm, this arm, *h g*, may be placed in the situation represented in *fig.* 20; in which case, the gold-leaf will be enclosed between the arm, *h s*, and the slip, E *a*, and in that state the instrument may be turned in any direction; for the elasticity of the cork, *b c*, is fully sufficient to retain *h g* in that position. The instrument then is slipped into a paper, or brass tube, which covers the whole, and fits the outside of the brass foot at G. When the instrument is to be used, the nail of a finger applied to the brass arm at *i*, and pushed against it, will place it in the situation of *figs.* 19 and 20; and then the slip of gold-leaf, being disengaged, is ready to act; moving, as already mentioned, between E *a* and *h s*. To the wire, I, which projects above the small tube, F E, a bail, or another longer and pointed wire, may be affixed; or, in short, this wire, I, may be made to communicate with any thing, like any other bottle electrometer.

If by any accident the gold-leaf, *o c*, happens to be damaged, the tube, D C, is taken out of the tube, A B, and a new slip of gold-leaf is fastened at *o*, upon the brass plate, E *a*. But on replacing D C into A B, the former must be turned, so as to place the surface of the brass slip, E *a*, quite parallel to the surface of the arm, *h s*. Thus the gold-leaf electrometer is rendered perfectly portable; and the experience of some months has shewn that the gold-leaf, *o c*, suffers not the least derangement by being enclosed between the two brass surfaces of E *a* and *h s*.

Fig. 22. represents an instrument, invented by Mr. Coulomb, for measuring the force of electric repulsion by the torsion of a wire. Its inventor calls it an *electrical balance*. The instrument is of glass, and its shape is sufficiently shewn in the figure; excepting the upper part of E, which is a brass flat plate, and a ferrule, which is cemented to the upper part of the glass tube. D is a piece of thick wire, laid upon the horizontal plate E, and holding a very fine wire which passes through a hole in E, and proceeds all the way down through the middle of the long tube, and until it reaches about the middle of the lower or larger tube, where it holds, suspended in an horizontal situation, the needle A B, which is made of silk covered with sealing-wax, and carries at its extremity, B, a ball of the pith of elder. A graduated circle is fixed in the inside of the large glass tube in the same plane with the needle A B, and within this circle another pith ball C is fixed, similar to the ball B. When these balls are electrified they repel each other; and this repulsion, which occasions the torsion of the wire that supports the needle A B, is measured by the divisions of the graduated circle.

Mr. Cuthbertson's electrometer, or combination of electrometers, is represented in *fig.* 23. "A B is a long square piece of wood about 18 inches by 6, in which are fixed two glass supports D, E, mounted with brass balls. Under the brass ball E is a long brass hook; the ball *b* is made of two hemispheres, the lower one being fixed to the brass mounting, and the upper turned with a groove to shut upon it, so that it may be taken off at pleasure; it is screwed to a brass tube about 4 inches long, fitted on the top of D; from its lower end proceeds an arm carrying the piece F C, consisting of two hollow balls and a tube, which together make nearly the same length as that fitted on D: G H is a straight brass wire, with a knife-edge centre in the middle, placed a little below the centre of gravity, and equally balanced with a hollow brass ball at each end, the centre or axis resting upon a proper shaped piece of brass fixed in the inside of the ball *b*; that part of the hemisphere towards H is cut open, to permit that end of the balance to descend till it touches E; and the upper hemisphere *b* is also cut open. To the under side of *a* is hooked a brass wire about 4 inches long, hanging freely in a hole at the top of F. The arm G is divided into sixty grains, and is furnished with a slider to be set at the number of grains the experiment requires: *k* is a common Henly's electrometer, screwed upon the top of *b*.

"It is evident from the construction, that if the foot stand horizontally, and the ball G be made to touch F, and the slider set at *o*, it will remain in that position, but if it should by any means receive a very low charge of electric fluid, the two balls F, G, will repel each other; G will begin to ascend, and on account of its centre of gravity being above the centre of motion, and the slider so loose as to slide forward towards *b*, as soon as G H is out of its horizontal situation, the ascending will continue with an accelerated motion till H strikes upon F. If the balance be set again horizontal, and the slider set at 10 grains, it will cause G to rest upon F with a pressure equal to that weight, so that more electric fluid must be communicated than the above low charge, before the balls will separate; and as the weight towards G is increased or diminished, a greater or less quantity of electric fluid will be required to effect a separation.

"When this instrument is to be applied to a jar or battery, for which purpose it was invented, one end of a wire must be inserted into a hole in the ball F, and the other into a hole of any ball proceeding from the inside of a battery or jar; *k* must be screwed upon *b*, with its index pointing towards H; the reason of this instrument being added, is to shew, while the index continues to rise, that the charge of the battery is increasing, because the other part of the instrument does not act till the battery has received its required charge.

"If this instrument be examined with attention, it will be found to consist of three electrometers, and answers three different purposes; namely, a Henly's electrometer, Lane's discharging

charging electrometer, and Brook's ſteelyard electrometer; the firſt is not improved, but the two laſt, which were very defective when firſt invented, I flatter myſelf, are here brought to perfection: as the only uſe of Henly's electrometer to this inſtrument is, as I have ſaid before, to ſhew that the battery continues to receive a ſtill ſtronger charge, it required no improvement; but Lane's electrometer, in its primitive ſtate, could by no means anſwer the required purpoſe for batteries, becauſe the ball intended to diſcharge the battery was neceſſarily placed ſo near to the ball of the battery, that duſt, and many conducting particles, always floating in the air, were attracted, and repelled between the two balls, ſo as to render a regular intended high charge impoſſible; whereas in this, they are placed at four inches diſtance, and when the deſired height of charge is obtained, and not before, the ball of the electrometer moves of itſelf nearer to the ball, which is connected with the outſide of the battery, and cauſes a diſcharge. The defects in Brook's ſteelyard electrometer were, 1ſt, that it could not cauſe a diſcharge; and, 2dly, the difficulty of obſerving the firſt ſeparation of the balls cauſed great error; if it were not placed in an advantageous light (which the nature of the experiments does not always permit) it could not be ſeen without the attention of an aſſiſtant, which cannot always be commanded. But this inſtrument, which I have deſcribed, requires no attention or aſſiſtance; for, as ſoon as the ſeparation takes place between G and F, the ball H deſcends, and diſcharges the battery of itſelf.

"By this combination and improvement, we poſſeſs, in the preſent inſtrument, all that can ever be required of an electrometer; namely, by *k* we ſee the progreſs of the charge; by the ſeparation of G F we have the repulſive power in weight; and, by the ball H, the diſcharge is cauſed when the charge has acquired the ſtrength propoſed." Cuthbertſon's Pract. Elect.

We might now add to this article the deſcriptions of ſeveral other electrometers; but as their uſe is inferior to thoſe which have been already deſcribed, we think it uſeleſs to detain the reader with any ſuch accounts, many of which are only imperfect varieties of the above deſcribed inſtruments; ſhould, however, the reader wiſh to examine thoſe electrometers ſuch as they are, we refer him to the following works.

Darcy's electrometer. Act. Par. for 1749. Richman's electrometer. N. A. Petr. vol. iv. p. 301. Comus's electric platometer. Roz. Journ. vol. vii. p. 520. Townſend's electrometer. Adams's Eſſay on Electr. Terry's electrometer. Roz. Journ. xxiv. p. 315. Boyer Brun's electroſcope for a conductor. Roz. Journ. xxviii. p. 183. De Luc's fundamental electrometer. Idees ſur la met. Chappe's electrometer. Roz. Journ. xxxiv. p. 370. Cadet's electrometer. Annales de Chim. xxxvii. and Nich. Jour. v. p. 31. Marechaux's delicate electrometer. Gilb. xv. p. 98.

The uſe of the electrometers, which we have deſcribed, is undoubtedly very extenſive; ſome of them being capable of meaſuring the higheſt charges of electricity known, and they may be extended farther ſtill, ſhould future experimenters endeavour to adapt them to the prodigious force of lightning or to ſome other natural or artificial power of electricity; whilſt others are capable of indicating very ſmall quantities of electricity; yet there are ſeveral caſes where the electricity is ſo very feeble, as to be incapable of affecting any electrometer whatever: nevertheleſs electricians have deviſed means of diſcovering even this feeble electricity, which may be conſidered as diſtinguiſhable into two ſtates; *viz.* either the quantity of electricity is really very ſmall, and in that caſe Mr. Cavallo's multiplier will render it ſenſible; or the electricity is diffuſed over a large ſpace, ſo as to have its intenſity too weak to affect an electrometer, and in that caſe the condenſer will collect it into a narrower compaſs, &c. See MULTIPLIER, and CONDENSER.

ELECTROPHORUS, (from the Greek words ἤλεκτρον, *amber*, and φέρω, *I bear*,) is a machine conſiſting of two plates, one of which is a reſinous electric, and the other a metallic plate. When the former is once excited, by a peculiar application of the latter, (which will be deſcribed preſently,) this machine will furniſh electricity for a very conſiderable time; ſo much ſo, that many perſons, imagining that it would never loſe its power, called it *the machine for exhibiting perpetual electricity*. It was invented by a much diſtinguiſhed Italian philoſopher, (Mr. Volta of Como,) about the year 1774, or rather earlier. *Fig.* 1. *Plate* XIV. repreſents this machine, whoſe two plates are A, and B. The lower one, B, is a circular glaſs plate, covered on the upper ſide with ſulphur, or ſhell-lac, or other reſinous electric. The upper plate, A, is of braſs, or of wood covered with tin-foil, and has a glaſs handle, which ſcrews (by means of a braſs or wooden ferrule) perpendicularly into the centre of it. This metallic plate muſt have a pretty thick edge, well rounded off.

In the firſt place, the plate B is excited by rubbing its coated ſide with a piece of new white flannel, or with a dry hand, and when powerfully excited is ſet upon a table with its coated ſide uppermoſt. Secondly, the metal plate is laid upon the excited electric, as repreſented in the figure. Thirdly, the metal plate is touched with the finger, or with any other conductor, and this contact is attended with a ſpark. Laſtly, the metal plate A being held by the extremity of its glaſs handle I, is ſeparated from the electric plate; and being elevated above that plate, will be found ſtrongly electrified with an electricity contrary to that of the electric plate; and it will give a ſtrong ſpark to any conductor that is brought near it. By ſetting the metal plate upon the electric one, touching it with the finger, and ſeparating it ſucceſſively, a great number of ſparks may be obtained apparently of the ſame ſtrength, and that without exciting the electric plate anew. If theſe ſparks be repeatedly given to the knob of a Leyden phial, this will preſently become charged. Having thus given a general idea of the conſtruction, the management, and the effects of this machine, we muſt now examine all theſe particulars, and whatever belongs to them, ſeparately, and in a more extenſive manner.

It can hardly be doubted, that an excited plate of glaſs will form an electrophorus plate capable of producing the uſual phenomena; but the reaſon why reſinous electrics are generally uſed for this purpoſe in preference to glaſs, is, that the glaſs plate, owing to its readily attracting moiſture, and partly to the ſmoothneſs of its ſurface, loſes its electricity much ſooner than an excited piece of ſealing-wax, or ſulphur, or of many other reſinous electrics. Various experiments have been inſtituted for the purpoſe of determining the ſubſtance which would anſwer beſt for an electrophorus. A compoſition of roſin and ſulphur, or ſulphur alone, anſwers very well; but the firſt is attended with an unpleaſant ſmell in melting and making it, and both, if long uſed, impart an unpleaſant effluvium to the hand that rubs, or uſes it. Sulphur alone is alſo apt to crack, ſo as frequently to require renovation.

Mr. Adams uſed a compoſition conſiſting of two parts of ſhell-lac and one of Venice turpentine. The cake of theſe two ingredients had no glaſs plate. Roſin, with bees'-wax, in the proportion of four or five parts of the former to one of the latter, is the cheapeſt compoſition, and anſwers tolerably well; but is inferior to Mr. Adams's compoſition. Mr. Cavallo

Cavallo fays, in his treatife on Electricity, " I tried feveral fubftances either fimple or mixed, and at laft I obferved that the ftrongeft in power, as well as the eafieft I could conftruct, were thofe made with the fecond fort of fealing-wax, fpread upon a thick plate of glafs. A plate that I made after this manner, and not more than fix inches in diameter, when once excited, could charge a coated phial feveral times fucceffively, fo ftrong as to pierce a hole through a card with the difcharge. Sometimes the metal plate, when feparated from it, was fo ftrongly electrified, that it darted ftrong flaffies to the table upon which the electric plate was laid, and even into the air, befides caufing the fenfation of the fpider's web upon the face when brought near to it, like an electric ftrongly excited. The power of fome of my plates is fo ftrong, that fometimes the electric plate adheres to the metal, when this is lifted up; nor will they feparate, even when the metal plate is touched with a finger, or other conductor.

" It is to be remarked, thefe plates fometimes will not act well at firft; but they may be rendered very active by fcraping with the edge of a knife the fhining or glofly furface of the wax. This feems analogous to a well known property of glafs, namely, that new cylinders, or globes, made for electrical purpofes, are often very bad electrics at firft, but that they improve by being worked, *i. e.* by having their furface a little worn. Paper alfo has nearly the fame property."

The fecond fort of fealing-wax mentioned by Mr. Cavallo, is a harder fort than the beft, which, perhaps, owing to its greater foftnefs and pliability, cannot be excited fo powerfully, nor does it retain the electricity fo long as the harder fort.

The refinous coat was at firft generally fpread upon a glafs plate, but foon began to be laid upon a metal plate; and as this was found more ufeful on various accounts, the glafs plate has for feveral years been laid afide. When the electrophorus is of a moderate fize, *viz.* lefs than nine or ten inches in diameter, the refinous cake may be made to adhere to a brafs plate; but when larger (and fome of thefe electrophorus cakes have been made as large as a yard in diameter) then they are made without any ftiff metallic plate in Mr. Adams's manner, or have only a piece of tin-foil ftuck to their lower furface.

The excitation of an electrophorus plate may be performed various ways. The fmall plates may be excited by friction with a dry hand, or by rubbing againft the woollen garments of the operator. When large, they may be excited by rubbing with a piece of clean and dry flannel, or with a hair fkin, or cat fkin; meaning the fkin with the hair on. Even a clean and hard hair brufh will anfwer that purpofe. But when the excitation has once commenced, or when the electricity of an electrophorus is decreafing, its force may be augmented in the following manner, and without friction. Place the metallic plate upon the refinous cake, touch it in the ufual manner; then take up the metallic plate, and difcharge it on the knob of a Leyden phial: repeat the operation feveral times, which will charge the phial. Now lay the bottle upon the refinous cake; hold the bottle by the knob, and move it fo as to touch the various parts of the furface of the cake with its outfide coating, which operation will augment the force of the electrophorus. This done, the whole operation may be repeated; that is, the metal plate is again laid upon the refinous plate, the phial is charged, &c., by which means the refinous cake may be rendered as powerfully electrical as poffible. The rationale of this operation is fo obvious, as to require no particular explanation.

The activity of thefe plates, though not continuing for ever, as fome perfons were at firft inclined to believe, does, however, laft a very great length of time, but always in a decreafing ftate. Sometimes thefe plates have been found capable of charging a phial, and of giving fparks a week after they had been excited, and even longer; but they have been obferved to affect an electrometer full a twelvemonth after excitation, provided they are properly preferved.

The experiments which fhew how both the furfaces of the refinous plate are affected by the fuper-impofition of the metal plate, &c. as made by Mr. Cavallo, are as follow: " If," he fays, " after having excited the fealing-wax, I lay the plate with the wax upon the table, and the glafs uppermoft, *i.e.* contrary to the common method, then, on making the ufual experiment of putting the metal plate on it, and taking the fpark, &c. I obferve it to be attended with the contrary electricity; that is, if I lay the metal plate upon the electric one, and while in that fituation, touch it with an infulated body, that body acquires the pofitive electricity, and the metallic, removed from the electric plate, appears to be negative; whereas it would become pofitive if laid upon the excited wax. This experiment, I find, anfwers in the fame manner, when an electric plate is ufed which has the fealing-wax coating on both fides, or one of Mr. Adams's, which has no glafs plate.

" If the brafs plate, after being feparated from the wax, be prefented with the edge towards it, lightly touching it, and thus be drawn over its furface, I find that the electricity of the metal is abforbed by the fealing-wax, and thus the electric plate lofes part of its power; and if this operation be repeated five or fix times, the electric plate lofes its power entirely, fo that a new excitation is neceffary in order to revive it.

" If inftead of laying the electric plate upon the table, it be placed upon an electric ftand, fo as to be accurately infulated, then the metal plate fet on it acquires fo little electricity, that it can only be difcovered with an electrometer, which fhews that the electricity of this plate will not be confpicuous on one fide of it, if the oppofite fide is not at liberty either to part with, or acquire more of the electric fluid. In confequence of this experiment, and in order to afcertain how the oppofite fides of the electric plate would be affected in different circumftances, I made the following experiments.

" Upon an electric ftand E, *fig.* 2, I placed a circular tin plate, nearly fix inches in diameter, which, by a flender wire H, communicated with an electrometer of pith-balls G, which was alfo infulated upon the electric ftand F. I then placed the excited electric plate D, of fix inches and a quarter in diameter, upon the tin plate, with the wax uppermoft; and on removing my hand from it, the electrometer G, which communicated with the tin plate; *i. e.* with the under fide of the electric plate, immediately opened with negative electricity. If, by touching the electrometer, I took off that electricity, the electrometer did not afterwards diverge. But if now, or when the electrometer diverged, I prefented my hand open, or any other uninfulated conductor, at the diftance of about one or two inches over the electric plate, without touching it, then the pith-balls diverged; or if they diverged before, came together, and immediately diverged again with pofitive electricity:—I removed the hand, and the balls came together;—approached the hand, and they diverged; and fo on.

" If, while the pith-balls diverged with negative electricity, I laid the metal plate (holding it by the extremity K of its glafs handle) upon the wax, the balls came, for a fhort time, towards

towards one another, but ſoon opened again with the ſame; *i. e.* negative electricity.

"If, while the metallic reſted upon the electric plate, I touched the former, the electrometer immediately diverged with poſitive electricity, which if, by touching it I took off, the electrometer continued without divergence. I touched the metal plate again, and the electrometer opened again; and ſo on for a conſiderable number of times, until the metal plate had acquired its full charge. On taking now the metal plate up, the electrometer G inſtantly diverged with ſtrong negative electricity.

"I repeated the above-deſcribed experiments with this only difference in the diſpoſition of the apparatus; *i. e.* I laid the electric plate D, with the excited ſealing-wax, upon the circular tin plate, and the glaſs uppermoſt; and the difference in their reſult was, that where the electricity had been poſitive in the former diſpoſition of the apparatus, it now became negative, and *vice verſâ;* except that when I firſt laid the electric plate upon the tin, the electrometer G diverged with negative electricity, as well in this as in the other diſpoſition of the apparatus.

"I repeated all the above-mentioned experiments with an electric plate, which, beſides the ſealing-wax coating on one ſide, had a ſtrong coat of varniſh on the other ſide; and their reſult was ſimilar to that of thoſe made with the above-deſcribed plate.

"As to the explanation of theſe experiments, they ſeem to depend upon theſe two well-known principles; *viz.* that a body brought within the ſphere of action of an electrified body, does actually acquire the contrary electricity; and that the exiſtence of one kind of electricity upon the ſurface of any ſubſtance whatever, cauſes the exiſtence of the contrary electricity upon ſome other ſubſtance near it."

The writers of the Encyclopædia Britannica, in noticing the above-mentioned experiments of Mr. Cavallo, ſay, "He tells us, that, *if inſtead of laying the electric plate upon the table, it is ſet upon an electric ſtand, ſo as to be accurately inſulated, then the metal plate ſet on it acquires ſo little electricity, that it can only be diſcovered by an electrometer.* In what manner theſe gentlemen came to miſtake a plain fact ſo egregiouſly, is not eaſy to determine."

Finding ſuch a formal contradiction made to a matter of fact which may be eaſily tried, we had the curioſity to try the experiment, and found, from the reſult of it, that Mr. Cavallo's account was perfectly correct, and the above-mentioned writers were perfectly miſtaken.

What we have already mentioned with reſpect to the action of the electrophorus plate may be eaſily applied to each particular phenomenon ſeparately conſidered. Should the reader wiſh to examine farther obſervations and conjectures concerning them, he may conſult the Phil. Tranſ. vol. 66. p. 513. vol. 67. p. 116. and p. 389. and vol. 68. p. 1027, and 1049. See VINDICATING *Electricity*.

About the year 1777 an account was received in London of certain experiments made by profeſſor Lichtenberg of Gottingen, with the electrophorus. The experiments are performed in the following manner. The reſinous plate of an electrophorus is firſt excited; then a piece of metal of any ſhape, (as a pair of ſciſſars, a piece of braſs tube, &c.) is laid upon the electrophorus plate; and to this piece of metal a ſpark is communicated of the electricity contrary to that of the plate; this done, the piece of metal is removed by means of a ſtick of glaſs, or ſealing-wax, or other electric; and the powder of roſin, kept in a linen bag, is ſhaken over the electrophorus. This powder will be found to fall about thoſe points upon the plate which were touched by the above-mentioned piece of metal, and to form ſeveral beautiful radiated configurations about thoſe points. The reſt of the plate remains almoſt entirely free from the powdered roſin. This is the caſe when the plate is excited negatively, and a ſpark of the poſitive electricity is communicated to the piece of metal laid upon it. But if the plate be excited poſitively, and a ſpark of negative electricity is given to the piece of metal; then the powdered roſin will fall upon thoſe parts of the plate which in the preceding caſe were left uncovered by it, and will leave a radiated configuration round each of the points which were touched by the piece of metal. In ſhort, the electricity of the ſpark which is communicated to the piece of metal ſeems to ſpread itſelf in a ramified manner over the plate, and round the points of contact, &c; and the powdered roſin which is ſhaken over it is attracted only by thoſe parts of the ſurface of the electrophorus which are electrified poſitively. Prof. Lichtenberg in his work, "De nova methodo naturam ac motum fluidi electrici inveſtigandi commentatio prior," wherein theſe experiments were firſt deſcribed, did not attempt to give any explanation of the phenomena; in conſequence of which, Mr. Cavallo inſtituted a ſeries of experiments with a view of inveſtigating the cauſe of the above deſcribed phenomena; and he diſcovered that powdered roſin, by its being ſhaken out of the linen bag, was actually excited, and acquired the negative electricity; therefore, in the experiments with the electrophorus, it was not wonderful that the roſin thus excited negatively, ſhould be attracted by thoſe parts of the plate which were electrified poſitively. Mr. Cavallo likewiſe tried various other powders in a ſimilar manner, as well as otherwiſe; and found that ſome of them acquired the poſitive, whilſt others acquired the negative electricity. See his Treat. on Elect. p. iv. ch. vii. Alſo EXCITATION.

Mr. Bennet repeated and diverſified Prof. Lichtenberg's experiments. He took a glaſs plate, 15 inches ſquare, covered on one ſide with a thin reſinous black coating, with tinfoil paſted on the other ſide; and ſuſpended it by a loop againſt the wall, that the groſſer particles of the powder that was ſhaken near it might fall to the ground, and no more of it might adhere to the plate than was attracted by the electricity diffuſed thereon. A ſmall Leyden phial was weakly charged, and after its knob had been drawn over the plate, a cloud of chalk was projected by rubbing the lump upon a bruſh near the electrified ſurface of the plate. This produced a plain white line without any ramifications. When the experiment was performed with the Leyden phial charged a little higher, ramifications appeared about the plate at a conſiderable diſtance from each other. When the phial was charged as highly as it could bear, the ramifications were cloſe and broad, reſembling white feathers with a very broad ſhade.

A circular braſs plate, with an inſulating handle, was placed upon the reſinous plate which ſtood upon the table, and a ſpark from the charged phial was communicated to the braſs plate, which was then removed by its inſulating handle; and chalk was projected, which produced a very regular circle of ramifications, proceeding from the circumference of the ſpace covered by the braſs plate, and within the circle there were various irregular figures, ſomewhat like ſtars. A ſhock made to paſs through the above-mentioned plate generally produced more diſtinct ramifications, and ſometimes without any ſtars within the circle.

By varying the powders as well as the bodies, which are laid upon the plate, the configurations may be varied without limit. If powders of different colours are mixed and projected as above, or out of a pair of bellows, ſome of the colours will prevail in ſome places, and other colours in other places; and eſpecially if two figures of contrary electricities

tricities are made upon the same plate; and most of all when both the electrical states of the figures and of the powders are contrary to each other. For example, if minium, whose electricity is strongly positive, and sulphur, which is strongly negative, be powdered together, and the mixed powder be projected out of a pair of bellows upon the figures contrarily electrified; the powders will be separated, and the sulphur will fall upon the positive figures, whilst the minium falls upon the negative figures; producing several curious configurations, agreeably to the well known electrical law, *viz.* that bodies, possessed of different electricities, attract each other, whilst bodies possessed of the same kind of electricity repel each other. See ELECTRICAL *Experiments.*

ELECTRUM, Ἤλεκτρον. This term has been applied by the Greek and Roman writers to various substances; from which circumstance much confusion has arisen, and the knowledge of the ancient naturalists has been on several occasions very unjustly called in question: at the same time, however, many of the classical writers, especially among the Romans, have fallen into mistakes on the subject, for the purpose of explaining which, it is worth while to enter somewhat minutely into an investigation of the question, "What is the electrum of the ancients?"

The answer given by Pliny to this question is, that the word electrum denotes two substances, the one the fossil, now called amber, and the other a certain metallic alloy, at present no longer in use, composed of four parts of gold and one part silver. Bearing this general explanation in mind, we shall proceed to consider the principal passages among the ancient writers in which it occurs.

The word itself is probably derived from Ἠλεκτωρ, a name applied by Homer and other early Greek writers to the sun. Thus Achilles prepared for battle is represented as,

Τευχεσι παμφαινων ὥς Ἠλεκτωρ υπερμον.

Radiant in arms as the sun Hyperion.

Homer, the most ancient Greek writer, whose works are extant, is also the first who mentions electrum: the word is not to be found in the Iliad, but occurs thrice in the Odyssey. A Phœnician merchant is described as possessing χρυσεον ὅρμον, μετα δ' ηλεκτροισιν εερτο, *a golden necklace set with beads of amber.* Eurymachus presents Penelope with ὅρμον πολυδαιδαλον, ηλεκτροισιν εεμενον, *a curiously-wrought necklace, set with beads of amber.* Lastly, Telemachus, on visiting the palace of Menelaus, admires the splendour of the echoing halls, radiant

Χρυσεῳ τ' ηλεκτῳ τε, και αργυρῳ ηδ' ελεφαντος.

With gold and amber, with silver and ivory.

Pliny indeed quotes this passage as a proof that Homer was acquainted with the metallic electrum; but, in my opinion injudiciously, for not to mention that the former passages clearly relate to amber, it is not evident that the electrum and ivory here bear the same relation to each other as the gold and silver do: the one is yellow, and therefore mentioned with the gold, as the other is white, and therefore mentioned with the silver, but it does not by any means follow that either is metallic.

The next writer, in chronological order, is Hesiod; in whose poem, called *the Shield of Hercules*, the word ηλεκτρον occurs. In the passage alluded to it is immediately associated with ivory, and, therefore, probably, as in Homer, means amber.

It may, perhaps, be objected, that as amber is not to be procured in quantity any where except on the coast of Ducal Prussia, it is very unlikely that in such early times it should have been so well known among the Greeks, and so common an article of ornament. But this objection will vanish, when we recollect that at the period now referred to, the commerce of the Phœnicians was in full activity; and that enterprising people, who, after establishing colonies in Spain, opened a trade with Britain for the tin of Cornwall, might very possibly extend their researches even into the Baltic. What serves as a striking confirmation of this is, that the oldest Greek writers who mention the country of amber, are much nearer the truth in this respect, than those who wrote after the decline of Phœnicia, and acquired their knowledge of the Western countries of Europe only from the timid coasting voyages of their countrymen, to whom the pillars of Hercules were the extremity of the world in that direction. On this subject the testimony of Herodotus is of great importance; and the more so, as the account which he gives is not to serve any theory of his own, since he expressly says, that he himself does not believe it. After describing the Scythians and other Northern tribes, he proceeds thus: (Lib. iii. § 115.) "Of the western extremities of Europe, I can report nothing with certainty, for, that a river flowing into the North sea, and from which, as I am informed, amber is procured, should be called by the Barbarians Eridanos, I can by no means allow; nor am I acquainted with the islands called Cassiterides, from which tin is procured. Indeed the very name of the river shews that there is some mistake, for Eridanos is not a Barbarous but a Greek word, and invented by some poet. It is certain, however, that both tin and amber come from that extremity of the world."

From this important document we learn, that in the time of this historian both tin and amber were procured from the north-western part of Europe (with respect to Greece); that the latter was said to be obtained from a river called Eridanos, flowing into the North sea, and that the only, or at least the principal, reason why Herodotus doubted the truth of this, was because the name Eridanos was Greek and not Barbarian. Unquestionably the word, in its present form, is Greek; but the root of it is as certainly (to use the phraseology of Herodotus) Barbarian, being the same as the English river Rodon, and the French river Rhone, *Rhodanus;* and, in fact, there is a river at this very day called Rhodaun, which flows into the Vistula, near Dantzic, traversing the country in which the present amber mines of Prussia are situated; which striking coincidence will surely justify us in considering this as the true Eridanus of the earliest Greeks.

Carthage appears about this time to have succeeded to the establishments in the West, formerly possessed by the mother-country Phœnicia; and, induced by commercial jealousy, suppressed as much as possible all information respecting the countries lying west of Italy; hence these regions again became the seat of Greek fiction and fable, almost as much as in the time of Homer. The true Eridanus of the Baltic was brought within the pillars of Hercules, and represented by Æschylus as a river of Iberia, and the same as the Rhodanus; on its banks were stationed by the same poet the sisters of Phaethon, who, lamenting his death, were turned into poplar trees, from which exuded tears of amber. The romance was adopted by Euripides, but the scene was transferred from the Rhone to the Po, as being probably the remotest great river of the West with which he was acquainted. The later poets, both of Greece and Rome, acquiesced in the authority of Euripides, and Eridanus continued ever after to be the poetical name of the Padus, while Strabo and the geographers denied its very existence; τον Ηριδανον, τον μηδαμῳ γης οντα being the very words of the above-mentioned writer.

The obscurity which thus involved, and by degrees entirely concealed, the knowledge that had been possessed by the ancient Greeks of the native country of amber, was not satisfactorily

fectorily removed till the Romans extended their conquests to Britain and the north of Germany. In the reign of Tiberius, a regular commerce in Roman ships appears to have been carried on between the northern ports of Gaul and the district lying between the Elbe and Vistula; and Nero procured thence such an abundance of amber, that it was largely employed in ornamenting the amphitheatre.

But during the period in which this ignorance of the real country of amber prevailed, the substance itself appears to have been very common, so that it was used as a frequent term of comparison, just as glass is with us. We say water as clear as glass. Callimachus says, το δ', ως ηλεκτριον, ὑδωρ, *water as clear as if it were made of amber;* and Virgil, "purior electro, amnis," *a river purer than amber;* and Lucian, ηλεκτρη, η Σιδωνια· υελω διαφανεστερα, *more transparent than amber or Sidonian glass.*

It appears, that both the Greeks and Romans were persuaded that amber was a concrete vegetable juice, (whence indeed the latter people called this very substance succinum, *a succo,*), and this circumstance would induce them to receive with less suspicion any of the harder resins of India, such as copal and lac, as real varieties of amber: and in this way is probably to be explained the assertion of Pliny, that amber was procured from Africa, India, and Egypt, which countries yield little, if any, of the real amber, but abundance of the hard resins. At present we possess a very satisfactory method of distinguishing amber from the resins, by its insolubility in alcohol; but prior to the discovery of this fluid, the distinction between these two substances was not very likely to be perceived. The Egyptian name of amber, according to Pliny, was sacal; but sachol is an Arabian word still in use, and is rendered in the Lexicon Copto-Arab, by the words *gummi vel resina*, which is no small confirmation of the above hypothesis. It would be foreign to the purpose of the present article, to pass from the consideration of the term electrum to that of amber, which being originally appropriated to the substance now called ambergris, came through ignorance to be confounded in process of time with the amber of the Baltic. I shall therefore proceed to state some of the principal passages in which electrum is considered as a metal or metallic alloy.

In the Antigone of Sophocles, v. 1049, occurs the following passage:

> Κερδαινετ', εμπολατε τον προ Σαρδεων
> Ηλεκτρον, ει βαλεσθε, και τον Ινδικον
> Χρυσον· ταφω δ'εκεινον ουχι κρυψετε.

Dispose of my Sardian electrum and Indian gold as you please, but on no account commit his body (of Polynices) *to the tomb.*—Eustathius and all the scholiasts consider electrum as here meaning gold, especially as it is said to come from Sardis, in the vicinity of which was the river Pactolus, so celebrated for its golden sands; but if this interpretation be admitted, it is surely a strange tautology in the poet to make mention afterwards of Indian gold. Is it not possible that Sophocles may have mistaken Sardis for Sardinia? Apollonius, in his Argonautics, represents the Eridanus as flowing into the Σαρδονιον πελαγος, the *Sardinian sea.*

Of less dubious import, is a passage occurring in Strabo's description of the gold-mines of Spain, εκ δε τε χρυσε ἑ ψομενε και καθαιρομενε συντηκομενε τινα γη, το καθαρμα ηλεκτρον ειναι, &c. *Moreover the gold being cemented and purged by a certain aluminous earth, that which remains is called electrum, and this being a mixture of gold and silver, the latter is separated by cementation, and the gold is left.*

A still more particular account is given by Pliny, (Hist. Nat. xxxiii. § 23.) of the metallic electrum. All gold, says he, is naturally alloyed by silver in various proportions; some containing a tenth, some a ninth, and some an eighth part. Wherever the silver amounts to a fifth of the mass, the compound is called electrum; this alloy may also be prepared artificially, by adding to gold the requisite proportion of silver. But if this latter exceeds a fifth of the whole, the mass ceases to be malleable. The nature of electrum is to reflect a richer lustre by lamp light than pure silver does. That which is native has also the additional property of detecting poisons, iridescent rings passing rapidly over the surface of the cup, accompanied by a noise like that of hot metal plunged in water.

Electrum was not only used for ornamental plate, but was occasionally employed for coin, at least for medals. Thus Lampridius, in his life of Alexander Severus, says, that that prince caused medals to be struck in honour of Alexander the Great, both of electrum and gold. (Electreos aliquantos, sed plurimos tamen aureos.)

From what has been said, it appears to be at least very dubious, whether the alloy of gold and silver, known to the Romans by the name electrum, was at all in use among the Greeks. The Romans themselves appear to have preferred the white lustre of silver to the yellow radiance of gold, &c. probably this taste, together with the imperfection of the art of assaying, as practised by them, aided also by an idle superstitious notion of the efficacy of electrum in detecting poison, contributed to give to this alloy a temporary celebrity. Modern taste, however, prefers the native lustre of the noble metals in all their purity to any alloy of them with each other, nor is it probable, that the Roman electrum will ever again be met with at the mint or on the sideboard.

ELECTUARY, or ELECTARY, ELECTUARIUM, in *Pharmacy.* Vossius observes, that all the remedies prescribed for the sick, as well as the confections taken by way of regale, were called by the Greeks εκλειγματα, and εκλικτα, of the verb λειχω, *I lick;* whence, says he, was formed the Latin electarium, and afterwards electuarium. This conjecture he supports from the laws of Sicily, where it is ordained, that electuaries, syrups, and other remedies, be prepared after the legal manner. The Bollandists, who relate this etymology, seem to confirm it. Act. Sanct. Mart. tom. ii. p. 131.

Electaries are medicines chiefly composed of powders of various kinds, mixed up with syrup or honey into such a consistence, that the powders may not separate by keeping, and that a dose may be taken upon the end of a knife, and prove not too stiff to swallow.

The ingredients of electaries are chiefly the milder drugs, those which may be taken a good deal *ad libitum,* such as the milder aperients, or aromatics and alteratives, in which a certain latitude may be allowed in the dosing without material risk.

The ancient physicians bestowed prodigious pains on the composition of particular electaries, and multiplied the ingredients to a most prepposterous degree; heaping together gums, resins, aromatics, animal substances, inert mucilaginous vegetables, salts, &c. &c. with the most indiscriminating profusion. They also made the distinction between electuaries and *opiates,* meaning by the latter term electaries, of which opium formed a part. This distinction has long been dropped, and indeed a very great reform has been made in all the more modern pharmacopœias, by suppressing a great part of the electaries, and rendering the rest much more simple, and of course their modus operandi more intelligible.

The great defect of all electaries is their liability to mould by keeping, and thus to acquire both unpleasant sensible properties, and also to have the virtues of some of their ingredients

gredients much impaired. This disposition to mould is particularly found in those electaries which are composed of succulent vegetables, pulps of fruits, and the like; and though the moulding is somewhat checked by the quantity of sugar added, it cannot always be done effectually unless these preparations are kept very dry, whereby they harden and lose that kind of consistence which is essential to their use.

The electaries that are the best for keeping, are those which are composed principally of aromatic powders, or gum-resins; and these, if properly prepared, may be preserved for years unaltered.

Though electaries, in the present mode of practice, are generally made from extemporaneous prescription, a few are retained in the Pharmacopœia, together with some *confections*, which differ from the electaries only by name.

ELECTUARY *of Cassia*, is composed of the fresh extracted pulp of cassia, half a pound; manna, two ounces by weight, tamarind, one ounce by weight, and rose-syrup, half a pound. It is prepared by beating the manna, and dissolving it, in a water-bath saturated with sea-salt, in the rose-syrup; then adding the pulps, and, with the same degree of heat, evaporating the whole to an electuary of proper consistence. The dose for an adult is from ʒ j to ℥ iss.

ELECTUARY *of Scammony* consists of scammony, in powder, 1½ ounce by weight, cloves and ginger, of each six drams by weight, oil of caraway, half a dram by weight, and rose-syrup, as much as is sufficient. The spices, being powdered together, are mixed with the syrup; and then the scammony is added, and lastly the oil of caraway. The dose for an adult is from ℈ j to ʒ j.

ELECTUARY *of Senna* is composed of senna, eight ounces by weight, figs, 1lb. tamarind, cassia, and prunes, of each ½lb. coriander four ounces by weight, liquorice three ounces by weight, and double-refined sugar, 2½ lbs. The senna is powdered with the coriander pods, and 10 ounces of the powder is sifted out. The remainder is boiled with the figs and the liquorice, in four pints of distilled water, to one-half; then the liquor is pressed out and strained. It is then evaporated to the weight of about 1½lb., and the sugar added to make a syrup: then this is added by degrees to the pulps, and lastly the powder is mixed in it. The dose for an adult is from ʒ ss. to ℥ ss.

ELEEMOSYNA CARUCARUM, or *pro Aratris*, or *Aratri*, in our *Ancient Customs*, a penny which king Ethelred ordered to be paid for every plough in England, towards the support of the poor. Sometimes it is also called eleemosyna regis, because first appointed by the king.

ELEEMOSYNÆ is also used for the possessions belonging to churches. See ALMS, and FRANK *Almoign*.

ELEEMOSYNARIA. See AMBRY.

ELEEMOSYNARIUS, in our *Old Writers*, is used for the almoner, or peculiar officer who received the eleemosynary rents and gifts, and distributed them to pious and charitable uses. There was such an officer in all religious houses. The bishops also used to have their almoners, as now the king has. Linn. Provinc. lib. i. tit. 12. See also Du-Cange, Gloss. Lat.

ELEEMOSYNARY CORPORATIONS. See CORPORATIONS.

ELEGANCE, ELEGANCY, from *eligo*, I chuse, denotes a manner of doing, or saying things politely, agreeably, and with choice.

With choice, so as to rise above the common manners; politely, so as to strike people of delicate taste; and agreeably, so as to diffuse a relish which gratifies every body.

ELEGANCE, in *Painting*, is a quality which embellishes and heightens the beauty of objects in a picture, of whatever nature they may be, and that either in form, in colour, or both, without destroying the general air of truth. It is a diminutive of grace which may unite with the grand, whilst elegance seems to militate against it. Many attempts have been made to discover and define wherein elegance consists, but none are satisfactory; and what particular combinations of lines or colours will best produce its effect, remain hitherto undescribed.

Sir Joshua Reynolds, who possessed more of it, and has more exemplified it in his works than any artist that ever lived before him, or since, has observed, in his Discourses, that correctness is its basis. In saying this, he must not be understood to mean literally a correctness of imitation of particular forms in nature; but that general character of form in man and other objects, round which all of the same species vary. He observes also, "that to suppose it to proceed from incorrectness or deformity is poison to the mind of a young artist, and may lead him to neglect essential studies to pursue a phantom that has no existence but in the vain imagination of affected speculators."

This argument, however just it may appear, will be found extremely difficult to reconcile with the fact, that elegance in design does exist without correctness; indeed, in works where extreme incorrectness is evident to the commonest observer, and even in better works, in too many of this great man's own productions, this union is too visible; and elegance is rarely to be found in the works of those who have made correctness their principal study. It seems, therefore, that it may most justly be said to proceed from a refinement upon the general form, and therefore a variation from it; but which ought not to have been termed a deformity, since we see it in nature constantly exemplified; and no one is inclined to regard an elegant woman as a piece of deformity. Sir Joshua in this appears to have followed too closely the accustomed inclination of a systematizer, and having laid down a rule that nature, in a general sense, is the only guide, attaches particular circumstances to it that have no relation, in fact, not willing to give up, for a moment, his general principle.

It is to be lamented, in contradiction to his sentiment, that the productions of his elegant mind and pencil are too often convincing proofs, that elegance may exist with certain deviations from correct imitation of general Nature; nay, almost, that it scarce can exist without some encroachment on that form, and substituting something ideal for something real, which, nevertheless, has sufficient truth not to destroy the fabric, and to give more pleasure than a representation of the absolute forms ever can to a cultivated mind.

We therefore are no nearer the definition of its nature than before he wrote; and if he who possessed so much larger a portion of this agreeable quality than any one else, and was so well able to define and illustrate his conceptions by language; if he has failed in an attempt to explain, in some degree, the nature of elegance, it becomes almost a hopeless case that we may ever see it performed with success.

We are better able to inform our readers what does not, rather than what does, assist in producing its effect; though, indeed, we may also speak of some of those characteristics of it which are apparent in the works of those who have most excelled in their attempts to obtain it, without pretending clearly to guide the judgment of others who may seek to embellish their works with so pleasing an ornament.

Heaviness of line or form, grossness and violence of colours, are each a strong antipathy to elegance, it cannot reside with them. On the contrary, lightness of form and execution, a gentle flow of line, not too violent or too tame in its varieties, are useful in obtaining its character; the figure

figure that aſpires to it ſhould not be over-cloathed; parts of the figure ſhould appear, in ſome meaſure, acting under the drapery. Too violent an oppoſition of colours militates againſt it; though brilliancy of hue may well accompany it, poſitive colours are not admiſſible; where it is required, a broken hue of a ſofter ſhade better correſponds with its nature. Altogether it depends upon, or rather it is, a pleaſing arrangement of forms and colours; but what particular unions of lines will beſt give thoſe forms, or what ordering of colours it requires, we will not attempt to define.

That there is ſuch a quality we are all ſenſible, and are ſenſibly affected by it. Yet as in nature ſo we believe it to be in art. If not felt inherently and uninſtructedly, we fear it will never be acquired to any ſufficient degree to make it valuable.

How few in number are the young perſons with whom ſo long continued and ſuch zealous pains are taken to render them in their manners elegant and graceful, out of the immenſe maſs who are daily coming forward in the faſhionable world, who poſſeſs it? And how ſoon do the affected airs, which education has unhappily taught many (miſtaking them for elegant) to aſſume, become apparent and diſguſting, where what we are accuſtomed to term natural elegance is not inherent!

Sir Joſhua Reynolds poſſeſſed it by nature; his earlieſt works participate of it. Not finding any difficulty himſelf in entering into its principles, he naturally enough ſuppoſed that thoſe who took the ſame pains to inform themſelves that he did, would alſo acquire it, (for he has ſaid it may be acquired,) yet numberleſs are the artiſts who acknowledge and feel the full value of it in the work of others, and who, labouring with all their might to obtain it, never preſent a glimpſe of it in their own works. That late excellent artiſt, Opie, has often, in converſation with the writer of this article, dwelt with rapture on the elegance of works from Reynolds' pencil, and ardently expreſſed his wiſh to obtain poſſeſſion of the faculty himſelf. All who are acquainted with his works, know how far he was from blending elegance with the other great qualities they contain. It ſeems, therefore, that though thoſe who have a ſhare of it by nature may improve their ſtock; thoſe who are not ſo fortunate, will rarely, perhaps never acquire it.

The ancient works poſſeſs it largely, as ſtatues, bas reliefs, and paintings, particularly the ornamental. Among the moderns, Reynolds, Correggio, Parmigiano, and Guido Rheni, beſt exemplify it: Raphael is ſometimes elegant, but expreſſion was his object, and he who aims at that principally muſt not too often ſacrifice to elegance.

ELEGANCY, in *Oratory*, is one of the three parts of general Elocution, and reſpects the purity and perſpicuity of the language. By the former a diſcourſe is rendered correct, and by the latter intelligible; and both extend to the ſelection of ſingle words, as well as to their conſtruction in ſentences. See Purity, and Perspicuity.

Poetical elegancies, *elegantiæ poeticæ*, are of ſervice to ſcholars in making their verſes; by being too regular in the grammatical conſtruction, we loſe certain licences, wherein the elegance of language conſiſts. Elegance, though irregular, is better than regularity without elegance.

ELEGARDA, in *Ancient Geography*, a town of Aſia, in Armenia Major. Ptolemy.

ELEGIA, in *Botany*, from ἔλεγος, *lamentation*, perhaps in alluſion to the ſad or mourning colour of the whole plant. Linn. Mant. 2. 162. Thunb. Reſtio 4. Prod. 14. Schreb. 675. Mart. Mill. Dict. v. 2. Claſs and order, *Dioecia Triandria*. Nat. Ord. *Calamariæ*, Linn. *Junci*, Juſſ.

Gen. Ch. Male, *Cal.* Spathes within ſpathes, remote, ſingle-valved, coriaceous, lanceolate, deciduous; ſpadix thread-ſhaped, jointed, with a catkin at each joint; catkin lax, with one ſtalked floret to each ſcale; ſcales ſetaceous, membranous, flat, longer than the florets; proper perianth of ſix ſetaceous, clearly, unequal, lax leaves. *Cor.* none, *Stam.* Filaments three, very ſhort; anthers incumbent, oval, larger than the perianth.—Female in a ſeparate plant, *Cal.* Spathes as in the male, but ſhorter; ſpadix as in the male; catkin racemoſe, compound; proper perianth of ſix leaves, the three outermoſt lanceolate, channelled, petal-like, equal. *Cor.* none. *Piſt.* Germen ſuperior, rather oblong; ſtyles three, thread-ſhaped, the length of the perianth; ſtigmas ſimple. *Peric.*, according to Thunberg, a capſule of three cells. *Seeds* ſeveral, oblong.

Eſſ. Ch. Male, Catkin compound; florets ſtalked; perianth of ſix unequal leaves. Corolla none. Female, Catkin compound; perianth of ſix leaves. Capſule of three cells.

E. *juncea*. Linn. Mant. 2. 297. Thunb. Prod. 14. (Reſtio Elegia; Linn. Syſt. Veg. ed. 14. 882. R. thyrſifer; Rottb. Deſcr. 8. t. 3. f. 4.) the only ſpecies, a native of the Cape of Good Hope. A hard ruſhy plant, with exactly the habit of a *Reſtio*, to which genus Linnæus finally referred it, but Thunberg inſiſts on its remaining diſtinct. The *roots* are perennial. *Stems* ſeveral, four feet high, ſimple or branched, rigid, a little waved, round, ſmooth, not ſo thick as a goofe-quill, brownifh green, with ſeveral remote joints. *Leaves* none, except a few ſmooth, brown, imbricated, pointed ſcales towards the root, and a ſimilar one at each joint of the ſtem; theſe laſt fall off, and leave their black annular baſe at the joint. *Catkins* in a terminal ovate head, with broad, tumid, ovate, brown ſpathes, enveloping the catkins. The *anthers* are large and conſpicuous, brown bordered with white. *Female catkins* of a darker brown hue, eſpecially when in fruit.

Elegia, in *Ancient Geography*, *Ilija*, a place of Aſia, in Melitenè, ſeated on the left bank of the Euphrates, at the entrance of this river in mount Taurus.

ELEGIAC, in the *Latin Poetry*, ſomething that belongs to *elegy*, which ſee.

Elegiac verſes, Ελεγοι, are alternately hexameter, and pentameter.

Quintilian eſteems Tibullus the chief of the elegiac poets; but the younger Pliny gives the preference to Propertius. They have each of them reaſon on their ſide; and one might make a third choice, as juſt as either of them. See Elegy.

ELEGIT, in *Law*, a judicial writ given by the ſtatute Weſtm. 2. 13 Edw. I. c. 18, either upon a judgment for a debt, or damages; or upon the forfeiture of a recognizance taken in the king's court. By the common law a man could only have ſatisfaction of goods, chattels, and the preſent profits of lands, by the two writs of "fieri facias" or "levari facias;" but not the poſſeſſion of the lands themſelves; which was a natural conſequence of the feodal principles, that prohibited the alienation, and of courſe the incumbering of the fief with the debts of the owner. And when the reſtriction of alienation began to wear away, the conſequence ſtill continued; and no creditor could take the poſſeſſion of lands, but only levy the growing profits, ſo that if the defendant alened his lands, the plaintiff was ouſted of his remedy. The ſtatute therefore granted this writ (called an *elegit*, becauſe it is in the choice or election of the plaintiff whether he will ſue out this writ or one of the former) by which the defendant's goods and chattels are not ſold, but only appraiſed, and all of them (except oxen and beaſts of the plough) are delivered to the plaintiff, at ſuch reaſonable appraiſement and price in part of ſatisfaction of his debt. If the goods are not ſufficient, then the moiety, or

one half of his freehold lands, which he had at the time of the judgment given (2 Inst. 395.), whether held in his own name, or by any other truſt for him (ſtat. 29 Car. II. c. 3.), are alſo to be delivered to the plaintiff; to hold, till out of the rents and profits thereof the debt be levied, or till the defendant's intereſt be expired; as, till the death of the defendant, if he be tenant for life, or in tail. During this period, the plaintiff is called tenant by *elegit* (ſee TENANT). This is evidently a mere conditional eſtate, defeaſible as ſoon as the debt is levied. Till the ſtatute above-mentioned, lands were not, by the ancient common law, liable to be charged with, or ſeiſed for, debts; becauſe by theſe means the connection between lord and tenant might be deſtroyed, fraudulent alienations might be made, and the ſervices be transferred to be performed by a ſtranger; provided the tenant incurred a large debt, ſufficient to cover the land. And therefore, even by this ſtatute, only one half was, and now is, ſubject to execution; that out of the remainder ſufficient might be left for the lord to diſtrain upon for his ſervices. And upon the ſame feodal principle, copyhold lands are at this day not liable to be taken in execution upon a judgment. (1 Roll. Abr. 888.) But in caſe of a debt to the king, it appears by magna carta, c. 8, that it was allowed by the common law for him to take poſſeſſion of the lands till the debt was paid. Moreover, by the ſtatute "de Mercatoribus," paſſed in the ſame year with the former, the whole of a man's lands were liable to be pledged in a ſtatute merchant, for a debt contracted in trade; though only half of them was liable to be taken in execution for any other debt of the owner.

This execution, or ſeiſing of lands by *elegit*, is of ſo high a nature, that after it the body of the tenant cannot be taken; but if execution can only be had of the goods, becauſe there are no lands, and ſuch goods are not ſufficient to pay the debt, a "capias ad ſatisfaciendum" may then be had, after the *elegit*; for ſuch *elegit* is in this caſe no more in effect than a "fieri facias." (Hob. 58.) So that body and goods may be taken in execution, or land and goods: but not body and land too, upon any judgment between ſubject and ſubject in the courſe of the common law. Blackſt. Comm. book iii.

ELEGY, Ελεγεια, a mournful, and plaintive kind of poem. Voſſius, after Didymus, derives the term from ἔ, ἔ, λεγειν, *to ſay alas!*

The firſt inventor of the elegy is not known: ſome ſay it was one Theocles of Naxus, or according to others, of Eretria, who, in the heat of his phrenſy, firſt produced this kind of compoſition. But there is no wonder that we are at this time in the dark as to the matter. Horace aſſures us it was a point not ſettled among the grammarians even in his time, who the author was.

> "Quis tamen exiguos elegos emiſerit auctor,
> Grammatici certant, & adhuc ſub judice lis eſt."

The chief writers of elegy among the Greeks are, Callimachus, Parthenius, and Euphorion; and among the Latins, Ovid, Catullus, Tibullus, and Propertius.

The Flemiſh have diſtinguiſhed themſelves among the moderns for this kind of Latin verſe. The elegies of Bidermann, Grotius, and eſpecially Sedronius and Vallius, ſeem worthy of the pureſt antiquity. The counteſs de la Suze has diſtinguiſhed herſelf for elegies in the French tongue.

In the Engliſh, we have nothing conſiderable of the elegiac kind, but what we have of Milton, except Hammond's love elegies, and Grey's elegy, written in a country churchyard. The elegies of Hammond have had admirers among men of great eminence in literature and criticiſm; and perhaps if we did not make an exception in favour of Grey, we ſhould offend two-thirds of the lovers of poetry in this kingdom. The Engliſh and French elegies are chiefly in Alexandrine verſes.

In proceſs of time, elegy degenerated from its original intention; and not only matters of grief, but alſo joy, wiſhes, prayers, expoſtulations, reproaches, and almoſt every ſubject, were admitted into elegy.

The office of elegy is well delivered by M. Boileau:

> "La plaintive elegie en long habits de deuil,
> Sçait, les cheveux epars, gemir ſur un cercueil:
> Elle peint des aimans la joye, & la triſteſſe;
> Flate, menace, irrite, appaiſe une maitreſſe."

> "In mourning weeds ſad elegy appears,
> Her hair diſhevell'd, and her eyes in tears:
> Her theme, the lover's joys, but more his pains;
> By turns ſhe ſings, ſooths, threatens, and complains."

The diction of elegy ought to be clean, eaſy, perſpicuous, expreſſive of the manners, tender, and pathetic; not oppreſſed with ſentences, points, &c. No apoſtrophes are allowed; and the ſenſe ought to be generally cloſed in every diſtich, or two lines; at leaſt, in Latin compoſitions.

ELEGY, a kind of *nome*, or air, for flutes, in high favour with the ancients, invented by Sacadas the Argian. Rouſſeau.

ELEMENTARY, ſomething that relates to the principles or elements of bodies.

The elements of a body are alſo called the elementary principles thereof. See PRINCIPLE.

The whole ſpace, included within the concave, or orbit of the moon, is called the elementary region, as being the ſeat, or ſphere, of the four vulgar elements, and the bodies compounded thereof.

ELEMENTARY *Air, Fire, Geometry, Muſic.* See the ſubſtantives.

ELEMENTS *of the Planets*, in *Aſtronomy*, certain quantities which are neceſſary to be known, for the purpoſe of determining the theory of their elliptic motion. (See ELLIPTIC *Motion.*) Aſtronomers reckon ſeven of theſe quantities. The five which relate to the motion of the ellipſe are, firſt, the duration of the ſidereal revolution; ſecond, half the greater axis of the orbit; third, the excentricity, from which is derived the greateſt equation of the centre; fourth, the mean longitude of the planet at any given epoch; and, fifth, the longitude of the perihelion at the ſame epoch. The two other elements relate to the poſition of the orbit; and are, firſt, the longitude (at a given epoch) of the nodes of the orbit with the ecliptic; ſecond, the inclination of the orbit to this plane. There are thus forty-nine elements to determine for the entire ſyſtem, as will be ſeen by the table at the end of this article.

To determine the elements of the orbit of a planet by three obſervations.

The time of the revolution of the planet muſt in the firſt place be ſuppoſed known, ſo that the mean motion of the planet may be given in the intervals of the obſervations. If theſe intervals are conſiderable, the motion of the aphelion ſhould likewiſe be known, as the obſervations are ſuppoſed to relate to an ellipſe fixed and immoveable; but as in general the intervals employed are not very long, the error ariſing from the motion of the aphelion is inconſiderable.

The three obſervations ſhould be diſtant from each other about a quarter of a revolution, that is, two near the apſides, and

and the other nearly in the mean diſtance, or two in the mean diſtances, and the other in the apſides. The aphelion is determined with the greateſt accuracy when two longitudes are taken in the apſides, but the equation of the centre is obtained with moſt advantage by taking two obſervations in the mean diſtances, for then it is determined by the double of its value. Theſe obſervations may be taken after ſeveral entire revolutions of the planet, provided its motion, and that of its aphelion, are pretty well known. We ſuppoſe likewiſe that the excentricity is nearly known, and the place of the aphelion. (For the method of finding the former when entirely unknown, ſee EXCENTRICITY.)

The three obſervations ſhould be reduced to the plane of the orbit and not to the ecliptic: it ſhould be remarked that aſtronomers always publiſh their obſerved longitudes reduced to the ecliptic; in this caſe, therefore, a reduction is neceſſary, to have the place of the planet in its own orbit.

Theſe three longitudes, which are deſtined to determine the three principal elements of the orbit, ſhould be connected by all the known inequalities ariſing from the attractions of the other planets, and likewiſe for aberration, which always augments the longitudes of the planets in their oppoſitions.

This method may be divided into three parts. In the firſt we will ſuppoſe the excentricity known, and that we wiſh to find the place of the aphelion; in the ſecond, we change the excentricity, and deduce a new place of the aphelion; and in the third we inveſtigate, by means of a third obſervation, which of the two excentricities ought to be preferred.

The time of the revolution of the planet being ſuppoſed known, we have exactly the number of degrees of mean anomaly between the obſervations, for the mean anomaly is always exactly proportionate to the time.

But though we may always know the ſum or the difference of two mean anomalies, or two mean diſtances from the apſide, one taken on one ſide and the other on the other, it is not ſo with theſe anomalies taken ſeparately, for to determine theſe two, we ſhould know both the place of the aphelion, which is the point from which they are reckoned, and the mean place of the planet: but the obſervation gives only the true place; the excentricity muſt therefore be known, which ſerves to find the mean anomaly, the true anomaly being given.

This conſideration affords a method of diſcovering by two obſervations if the place of the aphelion of a planet, as found in the tables, is exact, ſuppoſing the excentricity known, for having two obſerved longitudes, we have (by ſubtracting the place of the aphelion) two ſuppoſed true anomalies, and muſt then compute the mean anomaly with the excentricity ſuppoſed known, by the two following proportions.

1. The ſquare root of the diſtance from the perihelion is to the ſquare root of the diſtance from the aphelion, as the tangent of half the true anomaly to the tangent of half the excentric anomaly.

2. The difference between the excentric anomaly and the mean anomaly is equal to the product of the excentricity by the ſine of the excentric anomaly.

If theſe two mean anomalies differ from each other as much as the interval requires, they are exact, and conſequently the ſuppoſed place of the aphelion correct.

If the two ſuppoſed true anomalies do not give the ſame mean anomaly as they ought to do, that is, if they do not give the ſame interval of time which is derived from obſervation, it is a proof that they are not correct, and this trial will indicate that the place of the aphelion, taken from the tables, or by conjecture, is not exact. In this caſe we muſt make another ſuppoſition, giving to the place of the aphelion a few minutes more or leſs, and recommencing the ſame calculation, and we ſhall find by the reſult of the ſecond ſuppoſition what quantity ſhould really be adopted, and what the place of the aphelion is, which muſt be adopted to repreſent the interval of the two firſt obſervations (with the known excentricity or that employed in the firſt hypotheſis.)

By *firſt hypotheſis* we mean, a ſuppoſed excentricity, with ſuch a correſponding place of the aphelion as accords with the interval between the two obſervations. To arrive at this hypotheſis it was neceſſary to take ſeveral ſuppoſitions for the place of the aphelion.

If the place of the aphelion, found by the firſt hypotheſis, was exactly determined, it is a proof that the excentricity was rightly aſſumed; for to convert true anomaly into mean anomaly the excentricity is employed as in the rules given above.

If we ſuppoſe another excentricity, and repeat the ſame computation, we ſhall have for the ſecond hypotheſis a different reſult for the place of the aphelion, employing always the ſame obſervations; in this manner we may make a table of different excentricities, and on the ſide of every one write the place of the aphelion, which correſponds to each hypotheſis of excentricity.

To determine now, which is the true excentricity that ſhould be choſen, we employ the third obſervation, which is diſtant about 90° from the other two; on which the following remark ſhould previouſly be made. The interval of time between the aphelion obſervation, and that 90° on either ſide being known, the difference between the two mean anomalies is known; but if a miſtake has been committed in the excentricity, or what is the ſame thing, in the equation of the centre, all the error will fall upon the anomaly, which is 90° from the aphelion, becauſe the equation there is the greateſt; and this error will be nothing in the aphelion obſervation, where the equation of the centre is nothing, or at leaſt very ſmall. Thus, the difference between the mean anomaly near the aphelion and the mean anomaly at 90° diſtance, will be affected by the whole of the error committed in the equation of the centre. It may be ſeen, therefore, by this difference of anomaly, what equation ſhould be employed to make the difference of anomaly equal to that computed from the elapſed time between the two obſervations, and thus the equation will be determined.

We are to take, then, the excentricity of the firſt hypotheſis with the known place of the aphelion, as determined for this firſt excentricity; we then form two true anomalies, and two true longitudes of which, one is ſufficiently diſtant from the other for the equation to be as different as poſſible. Theſe are to be converted into mean anomalies, and if the difference of theſe mean anomalies is exactly that which it ſhould be, the hypotheſis is exact, and no farther calculation is required; but it is hardly poſſible to ſucceed the firſt time in aſſuming the true excentricity. We chooſe then another excentricity, with the place of the aphelion anſwering to it, that is to ſay, the *ſecond hypotheſis*; we then examine which agrees beſt with the given interval, and by the rule of proportion, we find a third, which will exactly anſwer to the interval, or to the known difference of mean anomaly between the two obſervations. By another proportion we find, what is the longitude of the correſponding aphelion. This excentricity and aphelion will correſpond to the three obſervations, and thus the problem will be ſolved.

Example.—Suppoſe three oppoſitions of Mars obſerved in 1743, 1751, and 1753, which give the longitudes of Mars upon his orbit as ſeen from the ſun, for mean time as follows,

applying to the three longitudes on the ecliptic the reductions $-17''$, $-50''$, $+13''$.

Mean time of observation.	Long. in orbit.	Diff. of mean Anom.
1743, 15th Feb. $19^h\ 17'\ 40''$	$4^s\ 27^\circ\ 16'\ 15''$	
1751, 14th Sep. 8 28 0	11 21 34 10	$6^s\ 21^\circ\ 30'\ 44''.4$
1753, 16th Nov. 10 28 33	1 24 47 37 1 26	6 50.6

The places of the aphelion, taken from Halley's tables, are $5^s\ 1^\circ\ 23'\ 37''$, $5^s\ 1^\circ\ 33'\ 37''$, $5^s\ 1^\circ\ 36'\ 9''$; from which are derived three true anomalies, $11^s\ 25^\circ\ 52'\ 38''$, $6^s\ 20^\circ\ 0'\ 33''$, $8^s\ 23^\circ\ 11'\ 28''$. Convert the two first into mean anomalies, assuming the two following hypotheses for the excentricity, supposing it first 1417 parts, and next 1427, the mean distance of the sun from the earth being always supposed equal to 10,000 parts.

First Hypothesis.—Take the excentricity 1417 according to the tables of Halley; the mean distance of Mars to the sun being 15236.9 reduced to that, which it would be if the mean distance of Mars was unity, and take likewise the aphelion such as it is in the tables; this forms the first supposition, the two true anomalies give these two mean anomalies, $11^s\ 25^\circ\ 3'\ 15''.1$, $6^s\ 16^\circ\ 35'\ 21''.6$, the difference is too great by $2'\ 22''.2$, for, according to the time elapsed between the two observations, it should only be $6^s\ 21^\circ\ 30'\ 44''.4$ according to the tables of Halley.

In continuing the same hypothesis of excentricity, make another supposition for the aphelion, by increasing by $10'$ the place of the aphelion employed in the first supposition. This gives two true anomalies less by $10'$ than the former ones. These converted into mean anomalies, are $11^s\ 24^\circ\ 51'\ 15''.5$, and $6^s\ 16^\circ\ 27'\ 0''.8$, the difference is $6^s\ 21^\circ\ 35'\ 45''.3$, that is, too great by $5'\ 1''$.

Thus by changing the aphelion $10'$, the error, which was $1'\ 22''.2$, becomes $5'\ 1''$, that is, has augmented $3'\ 38''.8$. Make this proportion,

$$3'\ 38''.8 : 10' :: 1'\ 22''.2 : 3'\ 45''.$$

To render therefore this error nothing, we must diminish the place of the aphelion $3'\ 45''$, instead of augmenting it $10'$.

By this calculation, we are assured that the excentricity, taken from the tables and employed in this first hypothesis with the aphelion diminished $3'\ 45''$, will satisfy the interval of the two observations.

We have now to repeat the same operation with another excentricity.

Second Hypothesis.—Take the excentricity 1427 greater than that of Halley by 10 parts, supposing the greater axis to remain the same, and the aphelion as it is found in the same tables. Convert the two true anomalies into mean anomalies, which give $11^s\ 25^\circ\ 2'\ 52''.6$, and $6^s\ 16^\circ\ 34'\ 0''.2$; whose difference, $6^s\ 21^\circ\ 31'\ 7''.6$, is greater by $23''.2$ than the truth. Make a second supposition, by augmenting the place of the aphelion $10'$, and there will result two other true anomalies, $11^s\ 24^\circ\ 50'\ 52''.2$, and $6^s\ 16^\circ\ 25'\ 40''.1$, whose difference is too great by $4'\ 3''.5$.

Thus by augmenting the place of the aphelion $10'$ in this second hypothesis of excentricity, the error, which was $23''.2$, becomes $4'\ 3''.5$, that is, has increased $3'\ 40''.3$. To diminish it, therefore, $23''.2$, or to reduce it to nothing, make this proportion $3'\ 40''.3 : 10' :: 23''.2 : 1'\ 3''.2$, which quantity, taken from the place of the aphelion of the tables, will reconcile this second hypothesis with the interval between the two observations.

The aphelion, therefore, of the tables diminished by $3'\ 45''$ for 1417 excentricity, or diminished by $1'\ 3''.2$ with 1427, satisfies the two first observations. It remains now, by means of the third observation, to determine which of these two hypotheses is nearest the truth, and to determine such an excentricity and place of aphelion as shall represent the three observations.

The interval of time between the second and third observation gives for the difference of mean anomaly $56^\circ\ 6'\ 50''.6$ according to the tables. Convert the true anomalies into mean anomalies in the second and third observation, with 1417 excentricity, the aphelion of the tables being diminished $3'\ 45''$, and next with 1427 of excentricity, the aphelion being diminished $1'\ 3''.2$. The mean anomaly for the third observation will be, in the first hypothesis, $8^s\ 12^\circ\ 46'\ 17''.8$, and in the second $8^s\ 12^\circ\ 39'\ 17''.8$. Thus between the mean anomalies of the second and third observations in the first hypothesis, the difference is greater by $57''.7$ than $56^\circ\ 6'\ 50''.6$; and in the second hypothesis the difference is too little by $2'\ 25''.8$. Adding together these two differences, which are in contrary directions, it will appear that a change of $10'$ in the excentricity produces $3'\ 23''.5$ of variation in the motion of the mean anomaly for this interval of time, and by the same proportion it will be found, that $57''.7$, which is the error of the first hypothesis, gives $2''.84$. We must, therefore, add $2'\ 84''$ to 1417, the excentricity of the first hypothesis, which will give 1419.84 for the excentricity, which will represent equally the third observation, provided it is combined with a suitable aphelion.

To correct the place of the aphelion,

$$3'\ 23''.5 : 2'\ 41''.8 :: 57''.7 : 45''.5.$$

For since the first hypothesis of excentricity 1417, with the place of the aphelion, diminished by $3'\ 45''$, gave $57''.7$ too much, and the second hypothesis of 1427, with the place of the aphelion, diminished by $1'\ 3''.2$ (that is, by $2'\ 41''.8$ less than in the first case,) gave $2'\ 25''.8$ too small, so as to change the error $3'\ 23''.5$, it follows, that to correct the $57''.7$ of the first hypothesis, it will be requisite to diminish the aphelion by a quantity less by $45''.5$ than in the first hypothesis, in which the correction was taken $3'\ 45''$, the difference is $2'\ 59''.5$, and it is this quantity which must be taken from the aphelion of the tables.

It may now be shewn, in the first place, that this excentricity, 1419.84, with the place of the aphelion diminished by $2'\ 59''.5$, will represent the first interval. For we have found that 1417 of excentricity with $3'\ 45''$ of diminution in the place of the aphelion, or 1427 of excentricity, with $1'\ 3''$ of diminution in the aphelion, represented equally the given interval or the difference of mean anomaly of the two first observations. Hence any other excentricity with a proportionate diminution of the aphelion, will represent this given interval, therefore 1419.84 of excentricity, with $2'\ 59''.5$ of diminution of the place of the aphelion, will agree with the two first observations.

In the second place, it may be proved, that this supposition will satisfy the second interval, or the mean anomaly between the second and third observations; for in the first hypothesis, 1417, we found $57''.7$ too much for this difference, and in the second $2'\ 25''.8$ too little, according to which proportion, 1419.84 should give the true difference, which answers to the greatest equation of $10^\circ\ 41'\ 19''$. It is not necessary in practice to carry the calculation to tenths of seconds; as the observed longitudes cannot be obtained nearer than $5''$.

The excentricity and place of the aphelion being found, nothing remains but to determine one mean longitude of the planet;

planet; to have the three elements required, for this purpose, one of the three mean anomalies may be taken as found above, for example, $11^s\ 25^\circ\ 6'\ 43''.6$, and add the place of the aphelion of the tables, diminished by $2'\ 59''.5$, according to the last result, and the mean heliocentric longitude of Mars in his orbit will be $4^s\ 26^\circ\ 27'\ 21''$ for the moment of the first observation, which exceeds the tables of Halley $9''$.

The following table of the elements of the planets is taken from the last edition of La Place's "Systeme du Monde."

Table of the Elements of the planetary Orbits from La Place.

Duration of their several revolutions.

Mercury	$87^d.969255$	$87^d\ 23^h\ 15'\ 44''$
Venus	224.700817	224 16 49 11
The Earth	365.256384	1^y 0 6 9 8
Mars	686.979579	1 321 23 30 35.6
Jupiter	4332.602208	11 317 14 27 10.7
Saturn	10759.077213	29 174 1 51 11.2
Uranus	30689.000000	84 29 0 0 0 0

Semi-major axes of their orbits, or their mean distances.

Mercury	0.387100
Venus	0.723332
The Earth	1.000000
Mars	1.523693
Jupiter	5.202792
Saturn	9.540724
Uranus	19.183620

Proportion of the excentricity of the semi-major axes, for the beginning of the year 1750.

Mercury	0.205513
Venus	0.006885
The Earth	0.016814
Mars	0.093088
Jupiter	0.048077
Saturn	0.056223
Uranus	0.046683

The secular variations of this proportion, (the sign — indicates a diminution.)

Mercury	0.000003369
Venus	—0.000062905
The Earth	—0.000045572
Mars	0.000090685
Jupiter	0.000134245
Saturn	—0.000261553
Uranus	—0.000026228

The mean longitudes at the commencement of 1750. These longitudes are reckoned from the mean vernal equinox at the epoch of the 31st of December, 1749, at noon, mean time at Paris:

Mercury	$281^\circ.3194$	$253^\circ\ 11'\ 14''.8$
Venus	31.4963	46 20 48.0
The Earth	311.1218	280 0 34.5
Mars	24.4219	21 58 46.9
Jupiter	4.1201	3 42 29.0
Saturn	257.0438	231 20 21.9
Uranus	353.9010	228 33 53.6

Longitudes of the perihelion at the beginning of 1750.

Mercury	$81^\circ.7401$	$73^\circ\ 33'\ 57''.9$
Venus	141.9759	127 46 41.9
The Earth	309.5750	278 37 15.9
Mars	$368^\circ.3005$	$331^\circ\ 28'\ 13''.6$
Jupiter	11.5012	10 21 3.8
Saturn	97.9466	88 9 6.9
Uranus	185.1262	166 36 48.8

The sidereal and secular motion of the perihelion. (The sign — indicates a retrograde motion.)

Mercury	$1735''.50$	$9'\ 22''\ 3$
Venus	—699.07	3 46.4
The Earth	3671.63	19 49 6
Mars	4834.57	26 6.4
Jupiter	2030.25	10 57.8
Saturn	4967.64	26 49.5
Uranus	759.85	4 6.1

The inclination of the orbit to the ecliptic at the beginning of 1750.

Mercury	$7^\circ.7778$	$7^\circ\ 00'\ 00''$
Venus	3.7701	3 23 35
The Earth	0.0000	0 00 00
Mars	2.0556	1 51 00
Jupiter	1.4636	1 19 2
Saturn	2.7762	2 29 54
Uranus	0.8599	0 46 26

The secular variation of the inclination to the true ecliptic.

Mercury	$55''.09$	$17''.50$
Venus	13.80	4.47
The Earth	0.00	0.00
Mars	—4.45	—1.4
Jupiter	—67.40	—21.8
Saturn	—47.87	—15.5
Uranus	9.38	3.0

The sidereal and secular motion of the node upon the true ecliptic.

Mercury	$-2332.''90$	$12'\ 35''.8$
Venus	—5673.60	30 38.2
The Earth	0000.00	0 00.0
Mars	—7027.41	37 38.0
Jupiter	—4509.50	24 21.0
Saturn	—5781.54	31 13.2
Uranus	—10608.00	57 16.9

Longitude of the ascending node upon the ecliptic at the beginning of 1750.

Mercury	$50^\circ.3836$	$45^\circ\ 20'\ 42''.8$
Venus	82.7093	74 26 18.0
The Earth	0.0000	00 00 00 0
Mars	52.9377	47 38 38.0
Jupiter	108.8062	97 55 32.0
Saturn	123.9327	111 32 21.9
Uranus	80.7015	72 37 52.8

In the history of astronomy, published in the Connoissance des Temps for 1809, we find the following short abstract relating to the elements of the planet Vesta.

On the 25th of April, 1807, M. Burckhardt read in the class of sciences a note, in which he gave the first sketch of the orbit of Vesta. According to the first calculations the semi-major axis, or the mean distance, would be 2.6, that is to say, rather more than twice and a half the distance of the earth from the sun; the excentricity 0.16; the place of the perihelion 248°; that of the node 107°; finally, the inclination 7°.

More

More recent investigations gave him 2.36 for the semi-major axis; 250° 20′ for the place of the perihelion; 103° 19′ 40″ for the place of the node; 7° 7½′ for the inclination; and finally, 0 093 for the excentricity.

While M. Burckhardt was calculating the elements, which we have just given at Paris, and to bring them to perfection, was occupied in determining the perturbations, without which only approximation for a short interval can be obtained, M Gauss lost no time in sketching the orbit of a planet to which he had given a name, and which appears to be universally adopted.

He then found for the mean longitude on the 29th of March, at midnight, mean time on the meridian of Bremen 193° 8′ 5″; the perihelion 249° 7′ 41″; the node 103° 8′ 36″; the inclination 7° 5′ 50″; the excentricity 0.097505; and finally, the mean distance 2.359604.

A second trial gave him 192° 9′ 54″; 249° 57′ 52″; 103° 18′ 54″; 7° 8′ 7″; 0.087223; and the mean diurnal tropical motion 98″.707.

These elements, compared with sixty-eight observations, have only shewn very slight errors. We find, from the journal of M. de Zach, September 1807, that according to the new investigations of M. Gauss, these elements have undergone some slight modifications, as follow:

192° 23′ 30″; 249° 50′ 32″; 103° 18′ 28″; 7° 8′ 11″; 0.085505; and 2.355135, with a diurnal motion of 981″.8459.

At the end of these elements we find, in the same work, a comparison made by M. Gauss of its second orbit, with twenty-two observations by M. Bouvard; the errors do not amount to 17″ in right ascension; they are generally smaller in declination, except on the 21st of April, where it is evident that an error of 1′ has crept into the Paris observations.

The following are the elements of the other new planets, Ceres, Palias, and Juno, for the 1st of January, 1805.

	Inclination of the orbit.	Place of the ascending node.	Mean distance	Excentricity.	Mean distance in millions of miles.	Place of the aphelion.	Mean place of the planet.
Ceres	10° 38′	2° 21° 7′	27670	2170	263	10° 20° 2′	1° 0° 12′
Pallas	34 38	5 22 31	27650	6800	263	10 1 3	0 18 13
Juno	13 4	5 21 4	26640	6770	253	7 23 11	1 12 33

ELEMENTS, in *Chemistry*. It necessarily happens in every department of human science that the spirit of philosophizing or generalizing outruns the careful investigation of facts. A few prominent circumstances are first noticed, the imagination is struck with their resemblance to each other; their characteristic differences are neglected, and, as it is natural to attribute similar effects to the same operating cause, a general principle or theory is invented, and thus originates the first germ of science. The advantage of thus classifying a number of otherwise independent facts is great; the memory is assisted, the imagination is engaged, and in the attack or defence of a brilliant hypothesis the mind is more interested, and more easily induced to persevere than it would be by the gradual and laborious investigation of simple truth.

The science of chemistry, on account of its vast extent, and the number of striking analogies and resemblances that it presents, has been peculiarly fruitful in hypotheses, some of which have been partial and others general. Of the latter kind are those speculations concerning the elementary principles of substances, which occupied so much of the attention of the ancient chemists. The universe itself (and therefore all chemical substances) was supposed to be formed of the four elements; but, without carrying the hypothetical analysis of bodies to their utmost extent, there appeared to be a number of intermediate principles to which all chemical phenomena were referred by the early investigators of this science. Thus, all inflammable substances were supposed to be compounded of a common inflammable element, called at first sulphur, and afterwards phlogiston, to which their generic characters were owing, united in different bodies to different substances, from which were derived their specific distinctions. Thus also, all salts were supposed to contain a common saline principle; and all metals a mercurial or metalline principle. Modern chemistry, however, does not acknowledge any particular number of elements, but freely admits into this class all substances that have not hitherto been decomposed. An element, therefore, in the present meaning of the term, is merely one of the last results of chemical analysis, and hence the number of elements must be continually fluctuating, according to the progressive advance of experimental science.

ELEMENT, in the science of *Elocution*, is the general name of any simple enunciated sound, (see ENUNCIATION.) of which a letter may be set down as the arbitrary or visible sign. Elements differ both from the letters that represent them, and from the names of those letters, in the same respect (though not in both cases, from the same necessity) as a *tree*, or a *man*, differs both from the sound of the *words*, man and tree, and the *forms of the letters*, of which the words are respectively composed.

Part of this distinction is sufficiently obvious. No one is in any danger of supposing any resemblance between the sound presented to the ear and the picture presented to the eye. It would be well if the other not less important distinction were as strongly impressed, and a consequent practice were adopted, of associating, in the first instance, with the *form of the letter*, not the *name* of that letter, but its *elemental* sound: for what connection, for example, can there possibly be between the names *double you* and *tee-aitch*, and the actual sounds usually assigned to the letters W and Th? [And the same might evidently be said of the Eupsilon Υ, Theta Θ, Sigma Σ, &c. of the Greek, and of many of the letters of every known alphabet, of ancient and modern times.] And what inconvenience must not inevitably result from the awkward and impertinent intervention of the complicated names of these letters, between the arbitrary sign and actual sound, which ought to be immediately associated in the infant mind. Some judicious private teachers have of late ventured to reform, in some degree, this abuse, by keeping their pupils unacquainted with the customary *names* of the letters, till the association between the forms and the elementary sounds became familiar; and a laudable (though perhaps imperfect) attempt has been made by Miss Edgeworth, in her "Rational Primmer," to generalize a practice so commendable. Still, however, as in all the instances that have fallen within the observation of the writer of this article, the practice of these commendable innovators has not gone so far as to give to their pupils the *naked sound* of the consonants, (which in every one of them but the three absolute mutes, it is contended, is clearly practicable,) without some portion, initial or terminative, of vowel sound. All that in reality has been effected is to give to the generality of the letters names more simple, and more approximate to the elementary sound, than those that are usually given to the alphabetic characters. It will be shewn hereafter, that something more is necessary, in order to secure all the advantages that might be derived from this innovation in the system of elementary instruction.

Elements,

Elements, like letters, (though not to the ſame extent,) differ in their number, in different languages; ſcarcely any (if any) language availing itſelf of all the modifications of elementary ſound, which the organs of enunciation, by the nice diverſities of action and poſition, are capable of producing. The Engliſh elements repreſented by V and Th, for example, being deficient in ſome languages, while certain guttural ſounds, familiar enough, not only in ſome parts of the continent, but even to the Highlander and the native of North Wales, are perfectly unknown in the ſouthern parts of England; though their ſigns are ſtill preſerved in our written language. See CONSONANT.

For anatomical definitions of the reſpective elements, ſee the reſpective titles, VOWEL, LIQUID, SEMI-LIQUID, SIBILANT, SEMI-SIBILANT, ASPIRATE, and MUTE; alſo, LINGUAL, LABIAL, GUTTURAL, and NASAL. The learned reader may conſult, among others, upon this ſubject, Dionyſius Halicarnaſſenſis ("De Comp. Verb.") and Dr. John Wallis ("Grammatica Linguæ Anglicanæ"); and the Engliſh reader will do well to read with attention the Grammar of old Ben Jonſon, and, with caution, the "Analyſis of Articulate Sounds," among the additional notes to Dr. Darwin's "Temple of Nature." Thoſe who are particularly intereſted in the ſubject may alſo conſult Dr. Holder's "Elements of Speech," Lond. 1669, a ſcarce, but valuable tract; and a neglected book, bearing the ſame title, 1773, by the late John Herries. Among theſe, and ſome other writers upon the formation or anatomy of the elements, ſome differences and contradictions will be found; partly, perhaps, accountable from provincial or other peculiarities in the pronunciation of the writers themſelves; but, ſtill more, from non-obſervance of the varieties exiſting in the conformation of the mouths and organs of different ſpeakers, and the conſequent neceſſity of correſponding differences of action and poſition for the formation of the ſame element. In the theory of the formation of ſeveral of the more difficult elements of ſpeech, as in many other reſpects, he who, from an individual inſtance, haſtily proceeds to draw general concluſions, or lay down general rules, will frequently be found to be only poſitive in error, while he thinks himſelf moſt luminous in the demonſtration of practical truth. Mr. Thelwall who, for ſeveral years, has been practically employed both in the inveſtigation of theſe topics, and in the application of his principles to the removal of every ſpecies of imperfection in human utterance, has, in his unpubliſhed lectures, introduced a claſſification and ſeries of definitions, differing in many particulars, as to the poſitions and actions of the organs, from thoſe of Dr. Darwin; and aſcribing to ſome miſtakes in the theory of that celebrated phyſiologiſt a part, at leaſt, of the impediment by which his utterance was notoriouſly obſtructed. Theſe definitions, not being elſewhere extant in any printed form, will be inſerted in this work under the titles of their reſpective claſſes above referred to. According to the doctrines of this profeſſor, (ſee a ſpecies of Elementary Horn Book prefixed to a volume of Selections, &c.) of all the letters of our alphabet, three only, t, k, and p, are to be regarded as *pure conſonants*, (according to vulgar definition,) or *mute ſtops*. "All the others are elements of quantity, and capable of duration and tune (except s = c *ſoft*, ch, ſh, th", and fh, which, though they have quantity, have no tune). They may, therefore, be partially ſounded without the addition of any vowel; and the ſtudent is recommended to habituate himſelf ſo to ſound them, in the firſt inſtance; and then to write them out, in cadences, in combination with all the reſpective vowels with which they can enter into compoſition, both as initials and as terminatives, and to exercife himſelf in thoſe combinations in the ſame way."

To the uninitiated there may be ſome difficulty in realizing this theory, with reſpect to ſome of the elements here maintained to be ſuſceptible of independent ſound: but, under proper directions, the difficulty is ſurmountable, and the experiment will be found practically important, not only in the removal of impediments, but in the improvement of the grace, force, and harmony of utterance.

ELEMENTS, in the *Higher Geometry*, are the infinitely ſmall parts, or differentials, of a right line, curve, ſurface, or ſolid. Thus, (*Plate* II. *Analyſis*, *fig.* 27.) the ſmall ſpace P M *m p*, formed by the two ordinates, P M, *p m*, infinitely near each other, and the arc M *m* of the curve, is the element of the ſpace A P M, P *p* is the element of the abſciſſe A P, M *m* that of the curve A M, &c. See DIFFERENTIAL, FLUXION, &c.

ELEMENTS, in *Phyſics*, the firſt principles or ingredients of which all bodies are compoſed.

The natural operations which commonly occur within the cognizance of our ſenſes, and in a more particular manner the analytical proceſſes of the chemiſts, ſhew that certain ingredients, preciſely of the ſame kind, are yielded by compound bodies of different kinds. Thus water is obtained from vegetables, from animal bodies, and from certain minerals; an earthy or unevaporable ſubſtance is obtained from the ſame bodies, and ſo forth. This naturally ſuggeſted the idea, that all bodies conſiſted of certain primitive and homogeneous ſubſtances, to which philoſophers and chemiſts gave the name of *elements*, or *elementary bodies*. Therefore the elements are ſuppoſed to be the ſimpleſt bodies of the univerſe; which, whilſt they themſelves are not reducible into more ſimple components, form, by their combination in different number and various proportion, all the compound bodies that belong to the globe we inhabit.

So far the idea is natural and generally received; but the determination of the number, as well as of the nature, of theſe elements, has always been, and will probably long continue to be attended with great difficulty. Various opinions have been entertained, and various hypotheſes have been advanced, concerning the elements; ſome of which have been ſuggeſted by reaſoning entirely upon ſuppoſitions, whilſt others have, in great meaſure, reſted upon a firmer baſe; namely, the reſult of experiments. Of theſe opinions, and of theſe reſults of experimental inquiries, we ſhall now ſelect the beſt.

Epicurus thought that all bodies were modifications of one homogeneous primary ſubſtance, whoſe particles were of a particular figure, ſolid, and in their nature unalterable; and that they only required to be arranged in this or that other manner, in order to compoſe the various bodies of the univerſe. But the conſtant and unalterable properties of a great number of bodies, peculiar to each and diſſimilar from others, render this hypotheſis highly improbable; for we find that gold, iron, mercury, &c. though diſſolved, reduced, hammered, mixed, ſeparated, and ſo forth, can never be converted into other bodies, but each of them may always be reduced to its original nature; that is, the iron into iron, the gold into gold, &c. which could hardly take place if the identical elementary ſubſtance formed them all.

Certain authors make a difference between elements and principles; but it is difficult to form a clear idea of their meaning. *Principle*, they ſay, as matter, is a kind of incomplete nature, but *element* is a perfect or complete one.

Another queſtion has likewiſe been much diſcuſſed among the philoſophers of antiquity; namely, whether the ele-

ments were corruptible or incorruptible; and it is difficult to conceive how the defenders of the former could possibly support a doctrine so very contradictory; for if corruptibility means a decomposition, (and it seems that no other idea can be formed of it,) a corruptible element is the same thing as a decomposible indecomposible substance. If by the word corruptibility they meant something else, we must acknowledge our ignorance of their meaning. It is farther to be remarked, that some of those philosophers admitted one corruptible element, whilst others admitted more than one. Of the former, the principal are Heraclitus, who held fire; Anaximenes, air; Thales Milesius, water; and Hesiod, earth; as the only element. Hesiod is followed by Bernardin, Telesius; and Thales, by many of the chemists.

Among those who admit several corruptible elements, the principal are the Peripatetics; who, after their master Aristotle, contend for four elements; *viz.* fire, air, water, and earth. Aristotle took the notion from Hippocrates; Hippocrates from Pythagoras; and Pythagoras from Ocellus Lucanus, who seems to be the first author of the dogma.

The Cartesians only admit three elements; which they pretend are all that could arise from the first division of matter. See CARTESIAN *Philosophy*.

Paracelsus and his followers attempted to establish four elements, which they called *salt*, *sulphur*, *earth*, and *mercury*. And some chemists, rejecting the last, retained only three, *viz. salt*, *sulphur*, and *mercury*; but their expressions are so very indefinite and perplexed, as by no means to convey any distinct and satisfactory idea.

The late discoveries relative to the aerial, or permanently elastic fluids, (which shewed that those fluids consist of certain bases, expanded and rendered elastic principally by their union with heat; also that heat renders ice fluid, water elastic, mercury volatile, &c.) produced a new and singular opinion respecting the elements, which was adopted by several philosophers, and particularly by the count de Tresson, in his Essay on the electric fluid. According to this doctrine, two primitive material substances are supposed to exist in nature; one that incessantly acts, and to which it is essential to be in motion; the other absolutely passive, and whose nature it is to be inert, and move intirely as directed by the former. The active principle has, by some, been supposed to be a certain fluid or element, which, according to its various modifications, they thought, produces *light*, or *heat*, or *electricity*. The other principle has not been attempted yet to be defined. We need not endeavour to give a formal refutation of this doctrine, which is evidently too indefinite and insufficient.

Our great sir Isaac Newton, considering the primary elements of bodies on the atomical system (see ATOMICAL *Philosophy*), says, that all things duly regarded, it seems probable, that God in the beginning formed matter in solid, massive, hard, impenetrable, moveable particles, of such sizes and figures, and with such other properties, and in such proportion to space, as most conduced to the end for which he formed them; and that these primitive particles, being solids, are incomparably harder than any porous bodies compounded of them; even so very hard as never to wear out; no ordinary power being able to divide what God made one in the first creation. While the particles remain entire, they may compose bodies of one and the same nature and texture in all ages; but should they wear away, or break in pieces, the nature of things, depending on them, would be changed; water and earth, composed of old worn particles, and fragments of particles, would not be of the same nature and texture now, with water and earth composed of entire particles in the beginning. And, therefore, that things may be lasting, the changes of corporeal things are to be placed only in the various separations, and new associations and motions, of those permanent particles; compound bodies being apt to break not in the midst of solid particles, but where those particles are laid together, and only touch in a few points. It seems to him likewise, that these particles have not only a *vis inertiæ*, with the passive laws of motion resulting therefrom, but are also moved by certain active principles; such as is gravity, and that which causes fermentation, and the cohesion of bodies. See COHESION, EARTH, FERMENTATION, GRAVITY, and PRINCIPLE.

Of all these opinions, that of the four elements, under the names of *fire*, *air*, *earth*, and *water*, has been more generally adopted, and has prevailed for a much longer time; until towards the latter end of the last century, Dr. Higgins, in his work upon Light, attempted to increase their number from four to seven; but the great improvements in chemistry which followed soon after, (having decidedly shewn that water and the atmospherical air are compound bodies,) produced a total change of opinion relative to the elements: in consequence of which the scientific persons of the present day acknowledge for elements not those which are suggested by their fanciful suppositions, but those which they are not able to decompose.

According to this new system, both philosophers and chemists in coalition, (for they are both inquirers into the works of nature;) rejecting the example of their predecessors, endeavour to express themselves in a manner more consonant with truth, and better authorized by the result of experiments. In the first place, they acknowledge that they are ignorant of the real number of elementary substances. Secondly, they consider as elements all those bodies which no known process has been able to decompound; that is, to reduce into simpler bodies; allowing, at the same time, that this want of actual or practical decomposition at present does not imply that a certain substance is absolutely an element; for by a new method of decomposition, that substance which has long been considered as an element, may be found to be a compound body; and, in fact, such discoveries are now frequently made. Also, certain bodies which have at one time been looked upon as distinct from each other, have afterwards been found to be of the very same nature. Therefore, under the denomination of elements we must now understand all those bodies which differ from each other in some essential property, and which have not as yet been reduced into simpler bodies.

The list, which follows, contains all the elementary bodies which were acknowledged as such soon after the commencement of the present century. We shall then add all the material alterations, which the discoveries made during the few years that have since elapsed, have necessarily introduced.

Elementary substances.

Light,	Radical succinic,
Caloric, or calorific,	Radical acetic,
The electric fluid,	Radical tartaric,
The magnetic fluid,	Radical pyro-tartaric,
Oxygen,	Radical oxalic,
Hydrogen,	Radical gallic,
Azote,	Radical citric,
Carbon,	Radical malic,
Sulphur,	Radical benzoic,
Phosphorus,	Radical pyro-lignic,
Radical muriatic,	Radical pyro-mucic,
Radical boracic,	Radical camphoric,
Radical fluoric,	Radical lactic,

Radical

Radical ſach-lactic,		Arſenic,	*Acidifiable.*
Radical formic,		Tungſten,	
Radical Pruſſic,		Molybdenum,	
Radical ſebacic,		Chrome,	
Radical bombic,		Columbium,	
Radical laccic,		Tantalium,	
Radical ſuberic,		Uranium,	
Radical zoonic,		Tellurium,	
Pot-aſh,	The *Alkalies.*	Titanium,	
Soda,		Oſmium,	
Ammonia,		Paladium,	
Gold,	The *Metals*	Rhodium,	
Platina,		Iridium,	
Silver,		Lime,	The *Earths.*
Mercury,		Magneſia,	*Alkaline.*
Copper,		Strontites,	
Iron,		Barytes,	
Tin,		Silex,	
Lead,		Alumine,	
Nickel,		Yttria,	
Zinc,		Glucina,	
Biſmuth,		Zirgonia, and	
Antimony,		Aguſtina.	
Cobalt,			
Manganeſe,			

The firſt four of theſe elements may with propriety be called hypothetical. Theſe are, *light*, or that fluid which renders objects perceivable by our eyes; *caloric*, or that fluid which is ſuppoſed to produce the phenomena of heat, *viz.* to affect us with the ſenſation of heat; the *electric fluid*, which is ſuppoſed to produce the phenomena called *electrical*; and the *magnetic fluid*, to which the properties of the magnet are attributed; for, in truth, the phenomena which fall under each of thoſe four denominations, are only *ſuppoſed* to be the effects of a ſingle fluid; reſpecting the nature of which, however, various opinions are entertained. See the articles under their denominations of HEAT, LIGHT, ELECTRICITY, and MAGNETISM.

Several of the above radicals appear, in conſequence of various experiments, to be of the ſame nature; but as this cannot be made to appear without the detail of the experiments, we muſt refer the reader to the articles of their particular names.

A very great alteration has been produced reſpecting the alkalies by the recent and capital diſcoveries of Mr. Davy, who has found that every one of the three alkalies is a compound body. The pot-aſh conſiſts of a metallic ſubſtance, which he has called *potaſium*, and oxygen; the ſoda conſiſts of another metallic ſubſtance, which he has called *ſodium*, and oxygen: ſo that pot-aſh and ſoda are two metallic oxyds. Therefore in conſequence of this diſcovery, the two alkalies, *viz.* pot-aſh and ſoda, muſt be ſtruck out of the liſt, and two new metallic ſubſtances, *viz. ſodium* and *potaſium*, muſt be placed amongſt the other metals. The components of *ammonia* have not been as yet exactly aſcertained, though no doubt remains of its being a compound ſubſtance.

Some of the earths, and eſpecially the alkaline earths, as they are commonly called, have given ſtrong indications of their being compound bodies, and of a metallic nature; but we muſt refer the reader to the articles of their peculiar names for farther particulars.

A new metallic ſubſtance was lately ſaid to have been diſcovered in tungſten, and as deſcribed under the name of *cerium* by Hiſinger. Dr. Wollaſton has very lately diſcovered, that the two metallic ſubſtances *columbium*, and *tantalium*, are one and the ſame thing; ſo that one of theſe names muſt now be ſtruck out of the liſt of metals.

ELEMENTS are alſo uſed, figuratively, for the grounds and principles of arts and ſciences.

Thus we ſay, letters are the elements of ſpeech: he does not know the firſt elements of grammar.

The ELEMENTS of mathematics have been delivered by ſeveral authors in their courſes, ſyſtems, &c. The firſt work of this kind is that of Peter Herigon, in Latin and French, publiſhed in 1664, in ten tomes; wherein are contained the elements of Euclid, Euclid's Data, Apollonius Pergæus, &c. with the elements of arithmetic, algebra, trigonometry, architecture, geography, navigation, optics, ſpherics, aſtronomy, muſic, perſpective, &c. The work is remarkable for this, that, throughout, a kind of real and univerſal characters is uſed; ſo that the demonſtrations may be underſtood by ſuch as only remember the characters, without any dependence on language or words at all.

Since Herigon, the elements of the ſeveral parts of mathematics have been laid down by others, particularly the Jeſuit Schottus, in his Curſus Mathematicus, in 1674; Sir Jonas Moor, in his New Syſtem of Mathematics, in 1681; De Chales, in 1674; Ozanam, in his Cours de Mathematique, in 1699; and, above all, Chriſt. Wolius, in his Elementa Matheſeos Univerſæ, in two vols. 4to. the firſt publiſhed in 1713, and the ſecond in 1715; a work held in high eſtimation. There has been another edition of this excellent work publiſhed at Geneva, in five volumes in quarto; the firſt volume in 1732, the ſecond in 1733, the third in 1735, the fourth in 1738, and the fifth in 1741.

The Elements of Euclid are the firſt and beſt ſyſtem of geometry. We have abundance of editions and commenta on the fifteen books of Euclid's Elements. Orontius Fincus firſt publiſhed the firſt ſix books in 1530, with notes, to explain Euclid's ſenſe. The like did Peletarius in 1557. Nic. Tartaglia made a comment on all the fifteen books about the ſame time, with the addition of ſome things of his own; and the like did Fran. Fluſſates Candalla, a noble Frenchman, in the year 1578, with conſiderable additions, as to the compariſon and inſcriptions of ſolid bodies; which work was afterwards republiſhed, with a proliX comment, by Clavius, whoſe edition has ſince been reprinted, at various places and times.

Dr. Gregory publiſhed an edition of all Euclid's works, including his Elements, in Greek and Latin, in 1703, fol. But as the whole fifteen books do not ſeem neceſſary, eſpecially for young mathematicians, ſome authors have choſen only the firſt ſix, with the eleventh and twelfth at moſt. It would be endleſs to relate the ſeveral editions hereof: there is a French one of De Chales, and a Latin one of And. Tacquet; the beſt edition of the former of which is that of Paris, in 1709, by Ozanam; and of the latter, that of Cambridge, in 1703, by Mr. Whiſton. Mr. T. Simpſon's Elements of Geometry is an excellent compendium of this kind; and Dr. Simpſon of Glaſgow publiſhed, in 1756, a Latin edition of the ſix firſt, and eleventh and twelfth books of Euclid, with notes.

ELEMI, or ELEMY, in *Pharmacy*, a pellucid reſin, of a whitiſh colour, intermixed with yellowiſh particles, and often much of the colour and conſiſtence of wax; of a pretty briſk bitter, though not diſagreeable taſte; and a ſmell ſomewhat like that of fennel.

It is uſually called gum elemi, though very improperly, inaſmuch as it takes fire readily enough, and diſſolves in oleaginous liquors, which are the characters of a reſin, not a gum. It totally diſſolves in rectified ſpirit of wine; and in diſtillation with water, ſixteen ounces of gum yield one ounce of eſſential oil. It flows from inciſions made in the

trunk and large branches of a large and tall tree, of the olive kind, growing in Ethiopia and Arabia Felix. It is alſo found in Apulia, a province in the kingdom of Naples. See AMYRIS.

Pomet in his Hiſtory, and Lemery in his Dictionary of Drugs, deſcribe elemi as a white reſin, bordering on green, odoriferous, and brought from Ethiopia, in cakes of two or three pounds a-piece, and uſually wrapped up in the leaves of the Indian cane.

It is excellent in diſeaſes of the head; and is proper to digeſt, reſolve, and ſuppurate. It is held a kind of natural balſam; and is ſovereign in the cure of all ſorts of wounds.

One of the beſt officinal digeſtives, commonly called the ointment or liniment of Arcæus, conſiſts of ſix parts of the elemi, five or ſix of turpentine, and twelve of lard, or a mixture of lard and ſuet melted together.

The true gum elemi is that above deſcribed; but there are ſeveral ſpurious ſorts, ſome natural, and others factitious, frequently ſold for it.

The factitious, or counterfeit, is uſually made of reſin waſhed in oil of aſpic: though the ill ſmell, and white colour of this might eaſily diſcover the fraud. The natural gums, obtruded from elemi, are,

1. A gum brought from the American iſlands, in cags of different weights, covered up with the leaves of a plant unknown in Europe.

The ſecond may be taken for common reſin, but for its ſmell, which is ſomewhat ſweeter, and more aromatic.

The third is of an aſh colour, bordering on brown, brought over in large pieces, and very dry and friable.

Pomet does not take any of theſe for different genuine gums, but rather ſuppoſes them to be originally elemi, only impure, and coarſe, ſince melted down, and made up by the fire.

ELENCHUS, in *Antiquity*, a kind of ear-rings ſet with large pearls.

ELENCHUS, Ἔλεγχος, in *Logic*, by the Latins called *argumentum*, and *inquiſitio*, is a vicious or fallacious argument, which deceives under the appearance of a truth; the ſame with what is otherwiſe called *ſophiſm*.

ELEOCARPUS, in *Botany*. See ELÆOCARPUS.

ELEOSACCHARUM. See ELÆOSACCHARUM.

ELEOSELINUM, in *Botany*, a name by which ſome authors have called the paludapium or ſmallage. Ger. Emac. Ind. 2.

ELEPHANT, in *Zoology*. See ELEPHAS.

ELEPHANT, *Elephas*, gives the denomination to an ancient and honourable military order, conferred by the kings of Denmark on none but perſons of the higheſt quality and extraordinary merit.

It is called the "order of the Elephant," from its badge, which is an elephant with a caſtle on its back, ſet with diamonds, and hung on a watery ſky-coloured ribband, like the George in England.

There are different ſentiments as to the origin and inſtitution of this order; the firſt is that of Mennenius and Hoepingius, who attribute it to Chriſtian IV. who was elected king in 1584. The ſecond, that of Selden and Imhof, who derive it from Frederic II. elected in 1542. Gregorio Leti goes back as far as Frederic I. who reigned about the year 1530. Bernard Robolledus will have king John to be the author, who began to reign about 1478. Aſchelmius, Roſſærus, and Loeſcher, hold it to have had its riſe under Chriſtian I. father of Frederic I. Laſtly, Voigtius, Beeman, and Bircherodius, maintain Canutus VI. to have been the firſt inſtitutor; and the occaſion thereof to have been the croiſades. This prince, according to the chronology of Swaining, reigned towards the cloſe of the twelfth century, from the year 1168 to 1191. This, at leaſt, we are certain of, that the order was ſubſiſting in the year 1494; there being a painting ſtill extant, done that year by count Reinden, a knight of this order. And we have even authentic evidences of the marquis of Mantua's being created knight of the ſame order by Chriſtian I. in 1474. There are bulls of pope Pius II. and Sextus IV. confirming the ſtatutes of the order, authorizing the holding of aſſemblies, or chapters, in the chapel of Roſchild, and ſettling the privileges of the knights. Edmondſon ſays, that it was inſtituted in 1478 by Chriſtian I. king of Denmark, on the marriage of his ſon John with Chriſtina, daughter of Erneſt, duke of Saxony.

The order was firſt called the "order of St. Mary," *ordo S. Mariæ*; though it ſeems to have had the appellation of the Elephant as early as Chriſtian I.: witneſs the figure of an elephant ſo often ſtruck on his coins, medals, &c.

The manner of its inſtitution is thus related: king Canutus having ſent a fleet againſt the Saracens in 1189, which took Siluma and Ptolemais, a gentleman among the Daniſh croiſees killed an elephant; in memory of which extraordinary accident the order was erected. This account is rendered the more probable by this; that it is referred to an era, when nothing was more common than to take the ſpoils of a vanquiſhed enemy for armories or cognizances; and accordingly, ſome of the principal arms of the like kind now on foot, *e. gr.* the lions of the Low-Countries, had their riſe at the time of the croiſades, as is ſhewn by Heuterius and Hoepingius; which circumſtances greatly corroborate the opinion of thoſe who aſcribe the order to king Canutus.

The collar of the order is of gold, compoſed of elephants and towers alternately, enamelled proper: to the front of the collar is pendent an elephant, with a caſtle on his back, alſo a man, all enamelled proper: and on the ſide of the elephant a croſs of Danebrog in diamonds. The knights all wear the badge pendent to a ſky-blue ribband, which paſſes ſcarfwiſe over the left ſhoulder to the right hip. See the abbot Juſtiniani, Hiſt. de tutti gl'Ord. Milit. e Caval. tom. ii. cap. 72.

The chapel of Roſchild was founded by Chriſtian I. for the aſſemblies or chapters of this order to be held in. It was firſt called the "Chapel of the Three Kings," *Capella Trium Regum*; afterwards Frederick I. gave it the name of the "Royal Chapel."

The order was reſtored by Frederic II. who created abundance of knights at the ceremony of his coronation, which is the only time when the Daniſh kings made any knights of the Elephant. Chriſtian V. augmented and enriched it very conſiderably. In the year 1694, a grand chapter of the order was held at Frederiesburg, in the chapel of the knights, wherein ſix German princes were admitted into the order.

We have a multitude of writings on the ſubject of this order, whereof that of Janus Bircherodius may ſerve for all the reſt; it is the lateſt, moſt ample, and learned. It was publiſhed at Copenhagen in 1705, under the title of "Breviarium Equeſtre, ſeu de illuſtriſſimo, & inclytiſſimo Ordine Elephantino," &c.

ELEPHANT'S *Bones*. Many teeth and bones of animals have been found in a foſſil ſtate, both in Siberia and on the banks of the Ohio, in North America. The French academicians, on comparing ſome of theſe with the bones of real elephants, determined, that they belonged to the ſame ſpecies of animal: but Dr. Hunter has diſcovered, on a more accurate

accurate examination, that they are very different from those of the elephant, and belong to another animal. The tusks of the true elephant have a slight lateral bend; but those brought from America have a larger twist, or spiral curve, towards the smaller end: the grinders of the latter are made like those of a carnivorous animal, being furnished with a double row of high and conic processes, as if designed to masticate and not to grind its food; whereas those of the elephant are flat, and ribbed transversely on their surface; besides, the thigh bone is of a very disproportionate thickness to that of the elephant, and has some other anatomical variations. And though the American tusks, when cut and polished by the workmen in ivory, did not differ in texture and appearance from the true ivory, Dr. Hunter concludes, that genuine ivory must be the production of two different animals, and not of the elephant alone; and that the animal to which these bones belonged may be the supposed elephant or mammouth of Siberia, and other parts of the world, which is yet unknown. Phil. Trans. vol. lviii. art. 5.

The ingenious Russian naturalist, M. Pallas, was led to conclude, from the circumstance that these bones are equally dispersed in all the northern regions of Europe, that the climate was probably, in the earlier ages, sufficiently warm to be the native countries of the elephant, rhinoceros, and other quadrupeds now found only in the south. But when, during his travels, he visited the spots where the fossil bones were found, and could form a judgment from his own observations, and not from the accounts of others, he renounced his former hypothesis, and, in conformity with the opinion of many modern philosophers, asserted that they must have been brought by the waters, and that nothing but a sudden and general inundation, such as the deluge, could have transported them from their native countries to the regions of the north. In proof of this assertion, he adds, that the bones are generally found separate, as if scattered by the waves, covered with a stratum of mud, evidently formed by the waters, and commonly intermixed with the remains of marine plants; instances of which he himself observed during his progress through Siberia, and which sufficiently prove that these regions of Asia were once overwhelmed with the sea.

Elephant *caterpillar*, a name given by some authors to a species of insect, commonly known in Ireland by the name of Connaught-worm, and supposed to be poisonous to cattle which feed on it. See *Connaught* Worm.

Elephant, *era of the*, in *Chronology*, an era among the ancient Arabs, which commenced A.D. 578, in the year when the Abassines were vanquished in their expedition against Mecca, and in which Mahomet was born. From this era the Arabs computed their time for 20 years. This was followed by another, called that of the unjust, or impious war; and this was finally succeeded by that of the Hegira.

Elephant *fish*. See Chimæra.

Elephant's-*foot*, in *Botany*. See Elephantopus.

Elephant's-*head*, in *Botany*, a species of the *rhinanthus*, which see.

Elephant *mountain*, in *Geography*, a mountain on the S.E. coast of the island of Ceylon; 74 miles S.E. of Candy.

Elephant's *nose*, or *elephant's snuse*, as it is called by the Dutch, is a species of the acus or needle fish, caught in the East Indies, so named from the resemblance of its snout to the trunk of an elephant. It is a very singular species, the lower jaw running out to a very long and sharp-pointed spine: it is round-bodied, and beautifully variegated with spots, and has on each side a green line running from head to tail. It is caught in salt waters. Ray's Ichthyogr. app. p. 4.

Elephant, *water*. See Hippopotamus.

ELEPHANTA, in *Geography*, a small island situated in a large sound, about $5\frac{1}{2}$ miles E. of Bombay, on the coast of Hindoostan, and acquired by the English from the Mahrattas, to whom it belonged. The circumference of the island is about five miles, and the number of its inhabitants, including women and children, about 200, who inhabit a neat village near the landing place; they are employed in cultivating rice and rearing goats for their support; they are under our protection, and pay about 56*l.* annually to the government: the surplus revenue furnishes their simple clothing. Their ancestors, as they say, being improperly treated by the Portuguese, fled hither from the opposite island of Salsette. Its proper name is "Gali Pouri," but the Europeans call it Elephanta, from the statue of an elephant formed of black stone, which stands in this island, in the open plain, near the shore. This island is famous for its subterraneous temple, formed in a hill of stone, about $\frac{3}{4}$ of a mile from the beach, of which M. Niebuhr made drawings, and which he has particularly described. It is 120 feet long, and the same in breadth, exclusively of the chapels and adjacent chambers. Its height within is nearly 15 feet, and the whole of it is situated in a hill of considerable height, cut out in the solid rock. The pillars supporting the roof are also parts of the rock, which have been left standing by the architect. The walls are ornamented with figures in bas-relief, so prominent that they are joined to the rock only by the back. Many of these figures are of a colossal size, being some 10, some 12, and some even 14 feet high. Although these bas-reliefs cannot be compared, either in design or in execution, with the works of the Grecian sculptors, they are much superior in elegance to the remains of the ancient Egyptian sculpture; and they are finer than those from the ruins of Persepolis. These figures, probably, mark events relating to the mythology and fabulous history of the Indians, for they seem to be representations of gods and heroes. The modern Indians are so ignorant, that they can give no information concerning these curious remains of antiquity. One person, who pretended to be wiser than the rest, assured M. Niebuhr, that one of the largest statues was that of Kaun, one of their ancient fabulous princes, notorious for the cruelties which he perpetrated upon his sister's children. The statue is well-formed, and has eight arms, an emblem of power, which the Indians give to their allegorical figures. None of these figures have beards, but all of them have very scanty whiskers. At present all the young Indians wear whiskers, and as they become more advanced in life, they commonly allow the whole beard to grow. The lips of these figures are thick, and their ears are lengthened out by large pendants; ornaments which almost all wear. Several of them wear a small cord in the fashion of a scarf; a mode now prevalent among the Bramins. One woman has but a single breast; from which it should seem, that the story of the Amazons was not unknown to the old Indians. Several figures, as well masculine as feminine, have one arm leaning on the head of a male or female dwarf, whence we may infer, that these monsters of the human species have been always objects of luxury and magnificence among the great. Several figures have hair on their heads, not of native growth, but resembling a wig, whence we may conclude that this covering for the head is of very ancient invention. The female bosom is perfectly round, which intimates, that the Indian fashion of wearing thin wooden cases

upon the breafts is very ancient. The head-drefs of thefe female figures is commonly an high-crowned bonnet. Several are naked; the drefs of others more nearly refembles that of the moderns. In feveral parts of thefe bas-reliefs appears the famous Cobra de Capello, a fort of ferpent, which the human figures treat with great familiarity. Thefe ferpents are ftill very common in the ifle of Elephanta, and the inhabitants fay that they are friendly to man, and do no harm unlefs provoked: their bite, however, is reckoned mortal. On each fide of the temple is a chapel nine feet high: and the walls of thefe chapels are covered with bas-relief figures, on a fmaller fcale than thofe upon the walls of the temple. The fmalleft of the chapels, having no fculptured figure but that of the god "Cannis," is ftill in a ftate of neat preferva'ion; and the inhabitants repair hither to perform their devotions. Before the entrance into this chapel is a pile of fhapelefs ftones, bedaubed with red paint, fuppofed to be reprefentations of the new objects of worfhip adored by the Indians. Such red ftones are not uncommon in other parts of India, and are held in high veneration. The reft of the temple is now become the haunt of ferpents and beafts of prey. On a hill at a fmall diftance is another temple; but it is not eafy of access. In India are other temples of a fimilar kind. (See SALSETTE.) As the Greeks, and perhaps alfo the Egyptians, drew the firft elements of their knowledge from India, thefe monuments of Indian antiquity deferve particular examination; as it might ferve to throw new light on thofe opinions and modes of worfhip, which were by degrees diffused through other parts of the Eaft, and at laft into Europe.

Mr. Goldingham, in the fourth volume of the "Afiatic Refearches," has given a particular defcription of the cave of Elephanta, and of the figures which it exhibits. He eftimates the length of the great cave at 135 feet, and its breadth at nearly the fame dimenfions. The whole information which he could obtain from the inhabitants was, that they conceived it to have been formed by the gods. Some have, without fufficient authority, deduced its origin from the Egyptians, from the Jews, or from Alexander the Great; but it is much more probable that the anceftors of the Hindu race were its fabricators; and this writer is of opinion, that it was a temple dedicated principally to Siva, the deftroyer or changer. Upon this principle he has endeavoured to defcribe the feveral figures, with their appropriate attributes and accompaniments. It is not fo eafy, fays this writer, to afcertain the era of its fabrication. He has no doubt, however, that it was poftcrior to the great fchifm in the Hindu religion, which, according to the Purana, happened at a period coeval with our date of the creation. But without tracing it to this fabulous antiquity, we have accounts of powerful princes who ruled this part of the country at a later period; particularly of one who ufurped the government in the 90th year of the Chriftian era, famed for a paffion for architecture. Poffibly he might have founded the cave; but no evidence occurs to fupport any hypothefis beyond conjecture.

ELEPHANTANA, in *Ancient Geography*, a town of the ifland of Sardinia. Anton. Itin.—Alfo, an epifcopal town of Africa, in Mauritania.

ELEPHANTIASIS, in *Medicine*, ἐλεφαντίασις, *elephantia*, a loathfome, contagious, and hitherto incurable difeafe, of the chronic kind; characterized by the appearance of tubercles, producing great deformity of the face and limbs, with a thickened, rough, and wrinkled ftate of the fkin, lofs of hair on the chin and body, infenfibility of the extremities, ulcerations in the throat, nofe, fingers, &c. and other cachectic fymptoms.

An extreme degree of confufion has prevailed in the writings of phyficians, with regard to this difeafe, in confequence of the circumftance, that the Arabians have defcribed the fame fymptoms, under the denomination of *lepra*, or *leprofy*, to which the Greek phyficians had affigned the appellation of *elephantiafis;* whence the term *leprofy* has been indifcriminately applied to both difeafes. But, in our inquiries concerning the nature of leprofy, we fhould conftantly bear in mind, that the leprofy of the Greeks *(lepra Græcorum)* and the Arabian leprofy *(lepra Arabum)* are altogether different in nature; and that the leprofy of the Arabians is the elephantiafis of the Greeks. The *leprofy*, properly fo called, as defcribed by the beft Greek writers, is a difeafe of the fkin only, and much lefs formidable than the elephantiafis; Hippocrates fpeaks of the former as an affection merely fuperficial, and to be ranked among the blemifhes, rather than among the difeafes of the body; (lib. περὶ παθῶν.) and Galen, (De tumorib. præter nat. cap. 13.) Actuarius, and Paulus Ægineta, make fimilar obfervations. The Arabians have defcribed the different varieties of the leprofy *(lepra Græcorum)* under the generic terms of morphea and albiras, with the fpecific titles *alba* and *nigra* white and black. See LEPROSY.

What has contributed ftill farther to augment the confufion, in which thefe difeafes have been involved, is, that moft of the Arabians have alfo defcribed a difeafe, under the title of *elephantiafis*, which is altogether different from both the lepra and elephantiafis of the Greeks, and which does not appear to have been known to the latter. This is a mere enlargement, or thickening of the legs, with a change of the colour and texture of the fkin, producing a refemblance, it is faid, to the leg of the elephant: it is compared, in its nature and origin, to the enlargement from varicofe veins; and was probably fimilar to the thick leg of Barbadoes, or, in fome inftances, a fymptom of fcurvy. Thus Avicenna, in his chapter "De Elephantia," obferves, that it confifts of "an intumefcence of the feet, fimilar to what occurs in the varix of the veins: fometimes, and indeed moft frequently, it arifes from a melancholic humour, and fometimes from a thick phlegm, and occafionally alfo from the fame caufes, which render the veins varicofe; it is at firft red, and afterwards black; and is relieved by the fame circumftances which relieve the varices." (Avicen. lib iii. Fen. xxii. Tract. i. cap. 16.) Thus alfo Rhafis writes refpecting the *elephantia*; "eft cum pedis craffities augeri videtur, et color obfufcari, venæ quoque quæ vites vocantur apparere cæperint." (Ad Almanfor, lib. ix. cap. 93.) And Avenzoar afferts fimply, that "a præternatural fwelling happens in the legs, which is called *elephantia*, and this on account of its refemblance in thicknefs to the legs of the elephant." (Lib. ii. cap. 26.) It ought not here to be omitted, however, that Haly Abbas ftands alone among the Arabian writers, upon this fubject, in point of correctnefs; for, under the term *elephantia*, both in his defcription of the fymptom and his obfervations on the practical treatment of the difeafe, he has in view the proper elephantiafis of the Greeks; (fee his works, Theorice, lib. viii. cap. 15. and Practice, cap. 4.) and he treats of the leprofy of the Greeks under the head lepra. But he alfo defcribes the thick leg, diftinguifhing it (or at leaft his tranflator has fo done) by the term *elephas*. "Quæ vero in cruribus et pedibus fiunt *elephas* vocatur, et quæ dicuntur varices venæ. Et elephanticus morbus apoftema eft melancholicum quod in cruribus fit et pedibus; et ejus fignum eft, quod pedis figura figuræ elephantis fimilis fit, æqualis, et non diverfa." (Theorice, lib. viii. cap. 18.) We know not the original terms here employed, but if the tranflation be correct, the intended diftinction is obvious.

For after noticing the ulcerations of the face and nose, belonging to elephantiasis, properly so called, he says, "*but* the disorder which takes place in the legs and feet is called *elephas*, (the elephant:)" and he also terms it the "elephant-like disease," (elephanticus morbus.) This distinction has been noticed by Sennertus, as a contradiction on the part of Haly Abbas; (see Sen. Opera lib. v. part 1. cap. 45.) where it is obvious that the distinction of the terms, employed by the Arabian, is overlooked. The difference between the leprosy of the Greek and Arabian writers has been so often pointed out by the learned, that it is remarkable how the confusion of the two diseases should have so often prevailed. (See Fuchsii Paradoxa Medicinæ, lib ii. cap. 16. Gregor. Horst. Obs. Med. lib. vii. obs. xviii. Epist. Hopnero. Turner, on Dis. of the Skin. chap. i. where part of the epistle of Horstius is translated. Sennertus, loc. cit. cap 40.)

The elephantiasis of the Greek writers, then, and of Haly Abbas, (as distinct from the elephas of that writer) is the subject of our consideration at present. The origin of the name is differently explained by different authors. The Arabians seem to have misapplied the term, from a supposition that it referred alone to a similarity in shape, colour, and other qualities of the skin, in the disease, to that of the elephant; but it appears to have been adopted from a more general analogy of the magnitude and severity of the disease, with the size of the animal. "Est enim visu fœdus," says Aretæus, "et in omnibus terribilis, quemadmodum et elephas bellua:" and Aëtius observes, "elephantiæ quidem ex magnitudine et diuturnitate affectionis nomen accepit." It has been stated, too, by the poet,

"Est lepræ species, elephantiasisque vocatur,
Quæ cunctis morbis major sic esse videtur,
Ut major cunctis elephas animantibus exstat."
Macer, de Virib. herbarum.

Upon the same principle, Aretæus observes, that it has been called the "Herculean disease;" since no disease is more powerful or more fatal. "Magnus quidem potentia morbus; ad mortem enim inferendam est omnium longè efficacissimus." Other peculiarities of the disease have given rise to other denominations, to which the Greek writers allude. Thus it was also called *satyriasis* and *satyriasmos*, partly on account of the change of the features, which often occurred, and rendered the countenance somewhat like that given by painters to the Satyr; and partly from the excessive libidinous disposition which accompanied the disease. (See Aëtius.) The lips, according to Galen, become thick, the nose swells laterally, and therefore appears to be depressed, the ears grow thio, the cheeks red, and tumours arise here and there upon the forehead, somewhat resembling horns. (De tumorib. cap. 14.) And Aëtius observes, that, as if by a sort of spasmodic distention of the muscles of the jaws, the face is dilated, and assumes the appearance of laughter, as in the Satyr. Another condition of the countenance, under this disease, gained it the appellation of *leontiasis*, or *leo*, the lion, or lion-face. Aëtius and Aretæus attribute this name to the laxity and wrinkles of the skin of the forehead, which resembles the flexible eye-brows of the lion. But the Arabian writers ascribe it to a different source. Haly Abbas says, the countenance was called *leonine*, because the white of the eyes becomes livid, and the eyes of a round figure: and Avicen observes, that the term *leonine* was applied to the disease, because it renders the countenance terrible to look at, and somewhat of the form of the lion's visage.

Symptoms of the Elephantiasis.—The symptoms of this incurable disease, which is said to be not only most grievous to the individual who suffers it, but intolerable to bystanders, so that even the domestics and attendants of the patient are averse to intercourse with him, are detailed by Aëtius and Aretæus in nearly similar terms. Both these writers lament, that the incipient symptoms are not observable: there is no unusual derangement of the constitution, no obvious external change, which, being seen at once, might suggest a timely application of medicine: the disease preys for a long time unobserved on the constitution, and when its first symptoms begin to shew themselves externally, the malady is not then commencing, but is completely established, and the condition of the patient is hopeless. When the disease is about to appear, the person becomes sluggish and inactive, and is sleepy after slight exertions, the bowels are costive, but the appetite remains unchanged. These symptoms, however, are not very unfrequent in ordinary health. The first external marks of the disease generally appear in the face: the cheeks and chin become thickened and red, but of a livid, not a florid hue: pustular tumours arise, sometimes with a white top, and livid base; and the veins under the tongue become varicose and black. The breathing is now slower and more difficult, the breath fœtid, the sluggishness and inability of exertion increase, the appetite is still little altered, but continual eructations occur, which are offensive even to the patient, the urine is thick, like that of cattle, the bowels extremely constipated, and the venereal appetite great. The hair begins to fall off from every part of the body, from the pubes, the eyebrows, and the chin, and the hair of the head is thinned, and the scalp becomes rough, and chopped, with deep fissures. The pulse is small, slow, feeble, "as if moving through mud." The whole skin becomes thickened and rough, and small livid tubercles appear, more particularly on the face, on the nose, and about the ears: the nose swells and dilates, the lips grow thick and prominent, and livid; the ears enlarge, and become red with a mixture of blackness, and ulcers form about their base; the eye-brows grow prominent, thick, smooth, and pendulous from their gravity, and of a livid or black colour; the eyes of a dark or brazen hue. This condition of the countenance, which somewhat resembles the visage of the lion, gave origin to the name *leontiasis*. The teeth become black; the voice hoarse, and obscure. At length similar pustules and tubercles appear in the extremities, and every other part of the body; much itching is sometimes occasioned, and scratching affords some relief; many thick and rough *rugæ* are also formed over the whole skin, with deep fissures, which extend, in the feet, from the heel to the middle of the toes. As the disease increases the tumours of the cheeks and chin, of the toes and legs, ulcerate, and the ulcers discharge a fœtid sanies, and do not heal; but new ones appear one after another, and extend, until the nose, the toes, fingers, and even the hands and feet fall off. But even this degree of disease, says Aretæus, does not liberate the sufferer from his severe calamity and miserable life, although dismembered limb by limb: for the disease, like the animal from which it derives its name, is characterized by longevity. Yet so weak and pusillanimous does the patient become, that he still clings to life, although he avoids the sight of friends, and receives no enjoyment whatever. The appetite for food is not greatly diminished, but the sense of taste is lost, and neither food nor drink afford him any gratification: an insufferable languor and an unusual sense of weight in the limbs oppress him, but the sense of feeling in every part of the body is nearly lost; rabiosa inest libido; yet every thing is without pleasure; eating and fasting, motion and rest, cleanliness and filth, are equally indifferent to him. The difficulty of breathing becomes extremely great, amounting

amounting to a ſenſe of ſuffocation, as if the patient were ſtrangled: and in this way life is frequently terminated. (See Aretæi de Cauſ. et Signis Morb. dictum. lib. ii. cap. 13. Aëtii Tetrabibl. iv. Serm. i. cap. 120.)

The ancients all agree in conſidering the elephantiaſis as a cancer of the whole body, as well as in attributing it to the generation of a melancholic humour, or black bile, of great malignity, which contaminates the whole of the blood, and is diffuſed throughout the habit. They enumerate various exciting cauſes of this morbid condition of the body. Among theſe the uſe of ſtrong, viſcid, and indigeſtible food is much inſiſted upon; eſpecially the uſe of ſalted meats, of fiſh, and of *aſſes' fleſh*, from which a thick and ſluggiſh blood was ſuppoſed to be generated. Climate is alſo ſaid, together with this ſort of diet, to influence the production of the diſeaſe: whence Galen accounts for the frequent occurrence of elephantiaſis at Alexandria, where the atmoſphere is hot, and often loaded with vapours. Hence alſo Lucretius obſerves,

"Eſt elephas morbus, qui propter flumina Nili
Gignitur Ægypto in media, neque præterea uſquam."
Lib. 6.

Though this aſſertion of the poet be not ſtrictly true, yet the diſeaſe appears to have originated chiefly in warm climates. Pliny conſidered the elephantiaſis as peculiar to Egypt, and obſerves that it was not brought into Italy until the time of Pompey. (Nat. Hiſt. lib. xxvi. cap. 1.) And Celſus remarks, that it was but little known in Italy in his time. (De Med. lib. iii. cap. 15.) In later ages it has occurred to a great extent in the ſouth of Europe; and is mentioned by travellers as ſtill exiſting there as well as in Arabia, Abyſſinia, and the adjoining regions: it alſo occurs in the Weſt-Indies, as we ſhall have occaſion to mention more at large below.

Contagion is another ſource to which elephantiaſis is attributed. It is not to be doubted that contact with the diſeaſed will excite elephantiaſis, as in other chronic diſeaſes, in which a morbid poiſon is generated; accordingly the diſorder is mentioned as being frequently communicated by cohabitation, either from an infected female to a ſound man, or the contrary, or by the common intercourſe of life. In the laſt caſe it has been ſuppoſed to be communicated by effluvia, as in acute diſeaſes, and the air, in which the patient breathes, is ſaid to be contaminated. (Avicenna, &c.) But, this ſeems queſtionable, both becauſe it is inconſiſtent with the general analogy, and becauſe the contagion does not appear to have been ſo virulent, or to have extended itſelf with the ſame activity, as is obſerved in contagious diſeaſes in general, which infect at a diſtance. The diſeaſe has been alſo obſerved to be hereditary; which has been attributed to the contamination of the ſeminal fluids, by which the fœtus was engendered in diſeaſe. (Haly Abbas, &c.) But, like other hereditary diſeaſes, or, more properly ſpeaking, like other diſeaſes, to which there is a connate predſpoſition in certain individuals, the elephantiaſis is ſaid to have lain dormant for one or more generations, and to have re-appeared in the ſucceeding ones.

Too much exerciſe, as well as too much indolence, is ſaid by Aëtius to induce elephantiaſis, by contributing, as he ſuppoſes, to thicken the blood. A thickened and arid condition of the humours, indeed, is a leading ſuppoſition in the pathology of the ancients in reſpect to this diſeaſe; and a dry and corrupt condition of the liver and ſpleen is aſſigned as the principal ſource of this humoral corruption. Hence caſtration has been ſeriouſly propoſed, as a remedy, by which the habit might be rendered more moiſt and effeminate, and its humidity retained. The author, juſt quoted, obſerves, that males are more liable to the diſeaſe than females, and thoſe eſpecially about the age of puberty.

With regard *to the cure of elephantiaſis*, it is admitted univerſally by the Greek, Latin, and Arabian writers, that the diſeaſe is incurable, except in the very commencement, when its approach can ſcarcely even be ſuſpected. Numerous expedients were practiſed, however, with a view to relieve it. For although we may ſtretch our hand to the miſerable ſufferers in vain, ſays Aëtius, to leave them unaided were an act of deſpair and cruelty. "Humanum enim et plenum benevolentiæ ſignum eſt, in extremis etiam malis uſque ad experimentum procedere, ad difficultatem affectionis compeſcendam".

Moderate blood letting from the arm is recommended to be firſt employed, and, after a few days, purging, by means of glyſters, and colocynth. The whey of milk, and aſſes' milk, with other light diet, is then to be taken; and then purging and vomiting, at intervals, by means of the black hellebore, and ſcammony, &c. (See Aëtius, loc. citat, cap. 122.) The ſame writer occupies ſeveral chapters in the enumeration of pills, and other internal medicines, proper to be adminiſtered; and of liniments and other ſubſtances for external application, among which the dung of goats, and other animals, was often recommended. Alum, ſulphur, nitre, vinegar, pepper, iris, &c. &c. were the remedies chiefly depended upon, externally. The aſhes of burnt twigs, mixed with the fat of beaſts, as of the lion, panther, &c., were alſo preſcribed, as liniments. (See Aretæi de Curat. Morb. dictum, lib. ii. cap. 13.) The fleſh of the viper was generally recommended as a remedy for the elephantiaſis. Aëtius calls it "mirabilis elephantiaſis remedium;" and it is ſaid by Aretæus to have been diſcovered to poſſeſs thoſe remedial powers by accident; an infected perſon, expoſed in a wilderneſs, having, either from hunger, or from a wiſh to get rid of life, eaten a viper alive, and afterwards recovered. Galen, and many ſucceeding writers, have recommended the uſe of vipers, prepared in various ways, as beneficial in lepra, elephantiaſis, and other diſeaſes of the ſkin. But ample experience has proved the inefficacy of this medicine. (See Palmarius de Morb. Contag.) Dr. Willan juſtly remarks, that we cannot but diſtruſt the accounts of the writers, who have more lately recommended the fleſh of vipers, "when we read in them at the ſame time, that equal advantages accrue to the patient from living on pullets fed with vipers' fleſh." (On Cutaneous Diſeaſes. Part ii. Gen. Lepra. p. 142.)

Such is the account of the loathſome and fatal diſorder, the elephantiaſis, and the means of cure uſually reſorted to, as recorded by the ancients. In the later periods of European hiſtory, eſpecially in the twelfth and thirteenth centuries, the ſame diſeaſe ſeems to have prevailed moſt extenſively throughout Chriſtendom, more particularly in the ſouth of Europe; it was not, however, altogether confined to the warmer countries, ſince it was prevalent in England. It was generally denominated *leproſy*; and from the numerous ulcerations, which were among its ſymptoms, it was alſo called *Morbus Sti. Lazari*, the diſeaſe of St. Lazarus; and many hoſpitals, or lazarettos, were erected for this diſeaſe alone. According to Matt. Paris there were 2000 of theſe lazarettos in France, and 19,000 in Europe, in the thirteenth century. (Hiſt. Engl. ad. ann. 1244.) There were ſeveral at the ſame time in England; the principal or head of theſe was in Leiceſterſhire; but it is ſaid, that the city of Norwich alone contained five. But of this ſubject we ſhall treat more at large under the head of LEPROSY. The venereal diſeaſe, for ſome time after it was firſt obſerved, in 1493, was

was considered as a variety of the elephantiasis, or of the Yaws; and it is conjectured by some writers to have sprung from that source; as the leprosy is said to have gradually disappeared, while Syphilis was disseminated. See Sprengel. Hist. of Medicine (Geschichte der Artzneykunde) vol. ii. p. 660.

The elephantiasis seems to be at present nearly extinct in Europe. In the year 1755, a hospital, called St. Lazare, which had been established from time immemorial, is mentioned as existing at Le Martigues, a small town in Provence, in which persons attacked with the *leprosy* were shut up. The disease, as it occurred at that place and period, is said to have commenced with an elastic swelling in the legs, with insensibility of the skin, gradually extending from the toes to the knee; after which the veins became varicose, the skin hard and scaly, and then tuberculated. All these symptoms then appeared on the face, where the skin grew thick, forming large wrinkles full of schirrous tubercles, "which make the poor wretches look frightful." The skin, especially about the joints, is next affected in the same way. The patients continued in this condition, with little suffering, for years; the voice then became hoarse, corroding ulcers of the palate, and throat, and internal parts of the nose, ensued, with fœtid breath, carious teeth, and a livid hue of the face. The schirrous tubercles then ulcerated, the bones beneath became carious, and in a few cases the poor creatures lost their fingers and toes. They became hectic, and fell into marasmus, when the smell of their perspiration was intolerable, and "at length after about three or four years of suffering," they died. (See a letter from Dr. Joannis of Aix, in the Med. Obs. and Inquiries, vol. i. p. 201.) The great propensity to venery was strongly exemplified in that hospital; and the hereditary nature of the disease, to the fourth generation, (when it seemed to wear out) was also observed. It was remarked too, "that the husband rarely communicates the disease to his wife, born of healthy parents, though she may bring into the world children that in time die of leprosy;" which also concurs with the statements of the ancients. There is at present a lazaretto, near Funchall, in the island of Madeira, in which there were ten patients, labouring under elephantiasis, in the year 1803, according to Dr. Adams. We shall speak of the disease, as it was observed in that hospital, presently.

In the warmer climates, the elephantiasis has been observed, and frequently described by physicians and travellers, during the last (18th) century. Niebuhr has given an imperfect description of a malignant species of leprosy, which was prevalent in Arabia and Persia, at the time of his journey into those countries, and which the natives denominate *Dijuddam*, and *Madijuddam*; but it would appear to be a less severe malady than the elephantiasis, or lepra of the Arabian writers. At Bagdat there were several barracks, in one quarter of the town, into which all the leprous persons were compelled to retire by the magistrate; but they were allowed to go out every Friday, to beg alms in the markets. It is said, he remarks, tous renfermés qu'ils sont, ils continuent leurs amours; and he mentions the circumstance of a man, shut up in the barrack, who contrived to infect a female, for whom he had a violent desire, by means of linen, and then obtained an order for her imprisonment in the same place. (See Description de l'Arabie, tom. iii. p. 119.) Bruce has also described the elephantiasis as he observed it in Abyssinia, which, however, seems to have been principally confined to the legs, and to resemble the *elephas* of Haly Abbas, rather than the true elephantiasis. (Travels, book v. chap. 2.)

The importation of this horrible malady into the West Indies, from Africa, appears to have been one of the punishments, which that abominable traffic, the slave trade, has inflicted upon the inhabitants. The symptoms of the disease, as detailed by Dr. Hillary, under the title of leprosy of the Arabians, in his account of the diseases of Barbadoes, accord so accurately with the description given by the ancients, that his history appears more like a transcript of the chapter of Aretæus, or Aëtius, than a record of the observations of a modern inquirer, in another climate. Dr. Hillary describes two forms of the disease, which were also noticed by Haly Abbas, (exclusive of the thick leg, or *elephas*,) in one of which the limbs fall off from the joints; but in the other, the ulcerations go on without this effect. The former Dr. H calls the "leprosy of the joints." (Observations on the Air and Diseases of the Island of Barbadoes, p. 322, & 335.—2d edit.)

Dr. Hillary, however, has described another disease, which is endemial in that island, under the title of elephantiasis, having confounded the distinction between the elephantiasis and elephas of Haly Abbas, and between the elephantiasis of the other Arabian writers, and that of the Greeks. The elephantiasis of Dr. Hillary appears to be the elephantiasis of the Arabians generally, and the elephas of Haly Abbas. It is a disease confined to the leg, and usually to one leg; which grows to a monstrous size, the veins becoming varicose, and the skin thick and scaly, with fissures and chops upon the surface; but which affects the functions and constitution so little, that patients often live many years, some have lived upwards of twenty, "without being sensible of any other inconvenience of life, but that of carrying along with them such a troublesome load of leg." The seat of this disease is confined to the blood-vessels, cellular substance, and skin, the muscles, tendons, and bones below, being altogether unaffected. A great effusion or collection of a fatty and gelatinous matter, in the cells of the membrane, constitutes the bulk of the diseased limb: the veins and arteries being also considerably enlarged. The disease first appears after a febrile paroxysm, in which great pain is felt in the inguinal glands of the side about to be affected. Hence Dr. Hendy gave it the appellation of the "glandular disease of Barbadoes." Dr. Rollo, in his treatise upon the same subject, has properly noticed the mistake of Dr. Hillary, in applying the term elephantiasis to this disorder. But this error is general: the principal use of the term, in this country, at present, is its application to the *thick leg* of this description, which is often seen in persons who have resided in hot climates.

The true elephantiasis (of the Greeks) appears to have first visited the island of Guadaloupe about the year 1730, having been imported with the negroes from Africa, according to Dr. Peysonel, who has given a minute detail of its progress and symptoms, which agrees in all the leading points with the descriptions of the ancients. (See Philosoph. Transactions, vol. l. part 1, for 1757, art. vii.) We shall here transcribe some observations, relative only to the contagious origin of the disease, as it would be superfluous to repeat the symptoms. "We were well assured," says M. Peysonel, "from our observations that the distemper is contagious and hereditary; and yet the contagion is not so active, nor poisonous, as that of the plague, small-pox, nor even as the ring-worm, itch, scald, and other cutaneous disorders: for, if that were the case, the American colonies would be utterly destroyed; and these persons so infected, mixed as they are in every habitation, would have already infected all the negroes whom they come near.

"We believe, that this contagion does not take place, but by long frequenting the company of the infected, or by carnal

carnal knowledge. Besides, we have observed, that even such long frequenting, or cohabiting with them, are not always sufficient to communicate the disease; because we have seen women cohabit with their husbands, and husbands with their wives, in the distemper, while one is sound, and the other infected. We see families communicate and live with leprous persons, and yet never be infected; and thus, although experience, and the information of the sick, prove the contagion, we are of opinion, that there must be a particular disposition in people to receive the poison of the leprosy.

"As to what regards the distemper's being hereditary, it is assuredly so. We have seen entire families infected; and almost every child of a leprous father or mother fall insensibly into the leprosy; and yet, in several other families, we have seen some children sound, and others tainted; the father has died of the disease, and the children grew old without any infection: so that, though it is certainly hereditary, yet we believe it is of the same nature with those in families troubled with the consumption, gravel, and other hereditary distempers; which are transmitted from father to son, without being so very regular, as to affect every one of the family." In the female children of infected parents, the disease generally first shewed itself at the commencement of menstruation, and continued slightly till they had had one or two children, when the more severe symptoms began to appear; but there was nothing regular in the period of its occurrence in males.

The latest account of the elephantiasis, occurring in Europe, is that which is given by Dr. Adams, in his "Observations on Morbid Poisons," 2d. edition, published in 1807. The disease was minutely examined by that gentleman, in the lazaretto, near Funchall, in the island of Madeira; and his description of its symptoms resembles that of his predecessors, both ancient and modern, in the general circumstances: there are several particulars, however, in which his account differs from the histories detailed by them. We have seen that the ancients and moderns concur in asserting, that the venereal appetite is exceedingly increased, when the constitution is under the influence of elephantiasis. But the observation of Dr. Adams led him to draw a conclusion directly the reverse of that just stated. For, on examining several young men, upwards of twenty years of age, in whom the disease had commenced at or before the period of puberty, he found that they had no hair on the chin and pubes, that the testes were small, and even scarcely to be felt, and that the scrotum, and all the organs very much resembled those of a boy of six or seven years old. And in those men, who had been attacked by the disease, subsequent to the period of puberty, there appeared generally a wasting of the testicles, and a diminution of the beard and hair of the pubes; and one of them, a married man, assured him that he had lost the venereal desire. Dr. Adams therefore concludes, "that all such boys as are attacked with the disease, before the age of puberty, never acquire the distinguishing marks of that change in the constitution; on the contrary, that the testicles, for the most part, diminish, and, as far as can be collected from their conversation, that they retain the simplicity of infancy in whatever relates to the sexes;" and "that such as are affected later in life, gradually lose the power of procreation, as far as can be judged by the changes which take place in the organs." P. 267. 268.

Dr. Adams is disposed to deny altogether the contagious nature of the disease; partly from the consideration, that a country must be depopulated by it, if it were contagious; and partly from the fact, that none of the nurses in the lazaretto have shewn any symptoms of the disease, and that individual lazars have remained for years at home, without infecting any part of their family. Dr. Thomas Heberden (in a paper published in the Medical Transactions of the Coll. of Physicians) has also contended for the same point. It is obvious, indeed, from all that has been written on the subject of elephantiasis, that, if there be contagion, it is not of a violent nature. It must not be omitted, however, that the wife of the married lazar, just mentioned, was also diseased, and that Dr. Adams heard of two other couple in a similar condition; and also that the porter of the house had become a lazar, since his residence in the lazaretto.

In addition to the symptoms generally detailed, in the history of elephantiasis, Dr. Adams has stated, that "in the upper and anterior part of the thigh, nearly in contact with the lower part of the scrotum, there is, in almost every case, a firm (to appearance) glandular swelling, moveable and prominent, or concealed, according as the patient is fat or lean, or in proportion to the progress of the disease. It is remarkable that none of the women are without it. In most of the men these tumours are particularly prominent, extending gradually upwards. In some there are also inguinal buboes. In every case the swellings are indolent, never giving pain, nor becoming discoloured, nor shewing any disposition to suppurate." P. 273. The description, which the same writer gives of the characteristic tubercles of elephantiasis, is also worthy of attention. "Among the unequivocal marks," he observes, "we may consider tubercles about the face, particularly on the external ear, *alæ nasi*, eye-brows, or forehead. These tubercles, till an advanced stage of the disease, are not only smooth, but have for the most part a higher complexion than the natural skin, approaching nearer to the sanguineous hue, appearing as if semi-transparent, splendid as if the surface were smeared with oil, and, on a closer examination, sometimes exhibiting small blood-vessels ramifying on their surface. At first they rise only a little above the skin, have the natural colour of that membrane, or are even paler. The circumscription is irregular, seldom circular, but beset with lateral projections, which, however, are not angular. The colour and elevation of the tubercles will, in most instances, remain stationary for a considerable time; as they become redder, or in people of a fairer complexion, more transparent, they acquire the splendour before-mentioned. Commonly the centre becomes more elevated, and so on towards the edges, so as to render the tubercle somewhat rougher. They still, however, retain their splendour, till they crack in one part, in consequence of which the tubercle is suffused with a white furfuraceous substance," &c. p. 271.

Dr. Adams says nothing of the mode in which the elephantiasis proves fatal; he observes, indeed, that "they, for the most part, seem to die of other complaints;" he does not mention the fœtid breath, and carious teeth; and was unable to discover ulceration in the throat, although he admits that the *uvula* disappears, and the *os vomer* is lost, and the nose therefore flattened. It is probable, indeed, that the fears of the ancients led them to exaggerate in their description of the humours of the disease, which they were loath to investigate minutely; and somewhat of the same apprehensions might have been felt by Hillary, Peysonel, and others of the moderns, who have described it as not less loathsome. In the account of Dr. Adams, which is illustrated by a portrait of a lazar, though it occasions deformity enough, it certainly appears under much less hideous colours.

Method of Treatment.—It were almost absurd to talk of the *cure* of a disease, which modern, not less than ancient, experience has uniformly denounced as incurable, when once established in the habit; and which has been said to be completely

pletely eſtabliſhed at the time when the unequivocal ſymptoms of the diſeaſe firſt make their appearance. Both the ancient and modern phyſicians, however, concur in aſſerting the poſſibility of curing it at its very commencement. Dr. Hillary has given the moſt ample directions for the plan of procedure both medicinally and dietetically.

"If the diſeaſe be taken in time," he obſerves, "namely, at the beginning, and firſt appearance of its ſymptoms, the ſpots above-mentioned, &c., we have ſufficient reaſons to believe it may be cured; and I have ſeen ſome inſtances of its being cured.

"Notwithſtanding that the ſeat of the venereal diſeaſe is allowed to be chiefly in the expanſions of the membrana adipoſa vel celluloſa, as well as in this diſeaſe; and is principally cured by the uſe of *mercury*, or different preparations of it; yet it is very remarkable that this diſeaſe is ſo far from being either cured, or relieved by it, that, on the contrary, it is greatly increaſed, and all its ſymptoms much aggravated by the uſe of mercurials. I grant that it ſeems to abate the diſtemper for a little time, but it ſoon returns with almoſt double force and violence after it: and *antimony*, or the beſt preparations of it, which are of little ſervice in the former, are found to be the moſt efficacious medicines in the cure of this diſeaſe, if properly given, and the diſeaſe be taken in time.

"When the above-mentioned ſpots firſt appear, either of a yellowiſh, or browniſh purple colour, in order to diſtinguiſh whether they are the true ſpots of this leproſy, (the lepra Arabum,) or they are ſpots of another kind, which are not uncommon in this climate, and look like them, but proceed from another cauſe, and are of no bad conſequence; anoint the ſpots gently with a little oleum tartari *per deliquium*, and a little after rub it well off, and if the ſpots diſappear, and return not again, they are not leprous ſpots; but if they remain, or ſoon return again after being thus anointed and rubbed, they are the true leprous ſpots, though the patient finds himſelf perfectly well in all other reſpects, and may continue ſo for many months. Wherefore it is neceſſary to attempt the cure before the diſeaſe gains further ground, and becomes inveterate.

"To which purpoſe, if the patient be of a ſanguine plethoric conſtitution, it is adviſable to bleed, to ten, twelve, or fourteen ounces; after which an antimonial vomit ſhould be given; and then let them enter on the following courſe of medicines, and continue it for two or three months." This treatment, it may be remarked, is a copy of that recommended by the ancients, from hypothetical notions of the morbid condition of the humours in elephantiaſis, and was probably repeated by Dr. Hillary from ſimilar notions, without good grounds; for as the diſeaſe is altogether of a chronic nature, and as it is well aſcertained, that, in other chronic cutaneous affections, general bleeding, and emetics are altogether deſtitute of utility, we may preſume that theſe meaſures had little influence in eſtabliſhing the cure, when that was accompliſhed.

The following are Dr. Hillary's formulæ: ℞ *ſulphuris antimonii præcipitati*, drachmas iii; *mercurii calcinati levigati*, grana xxx; *gummi guaiaci pulveris*, drachmas iii; *balſami guaiaci* quantum ſufficit; *olei ſaſſafræ*, guttas xx; miſce, fiant pilulæ 90: Of theſe pills the patient is directed to take three every night, at bed-time, together with fifty drops of the following tincture, and three ounces of the decoction.

The tincture conſiſts of antimonial wine ℥ii, aromatic tincture ℥ſs; and the decoction is as follows.

℞ *radicis ſarſuparillæ*, uncias iii; *corticis ſaſſafræ* unciam; *ſalis diuretici* unciam dimidiam; miſce, et coque, vaſe clauſo, in *aquæ puræ* libris miſs ad libras iiſs, et cola; colaturæ adde *tincturæ antimonii* unciam; *aquæ juniperi compoſitæ* unciam cum ſemiſſe; *ſaccheri* quantum ſufficit. miſce.

Three ounces of this decoction, with fifty drops of the tincture, are alſo ordered to be taken every morning.

"This method," Dr. Hillary ſays, "ſhould be continued two months, or longer, if the ſpots do not entirely diſappear before that time, for it is neceſſary to continue them for ſome time after the ſpots are gone off. And the ſpots ſhould be rubbed well once or twice a day, with a warm dry flannel cloth, firſt holden a little over the fumes of burning ſulphur, mixed with a little antimony, and daily continued as long as the ſpots remain. If the diſeaſe does not abate, and the ſpots, torpor, and numbneſs decreaſe, it is ſometimes neceſſary to repeat the antimonial vomit two or three times during this courſe, eſpecially when the diſeaſe is hereditary or proves obſtinate: and in this caſe it is neceſſary to repeat the whole courſe over again two or three months after, however in the next ſpring or autumn following, or both, if the leaſt ſymptoms then appear, as we know no diſeaſe that is more obſtinate or more difficult to cure.

"As to the dietetic part of the cure, it is not only neceſſary that the patients live temperately, but there are ſeveral things which muſt be placed among the *lædentia* in this diſeaſe, from which the patient muſt abſtain. They muſt religiouſly abſtain from all ſwine's fleſh, and all fat meats, and every thing that is oily, fat, or greaſy, either in ſauces or other ways, and that not only during the time they are under this courſe of medicines, but for many years after. They may eat any ſort of fleſh meats at noon, that are not too fat, too much ſalted, or too high ſeaſoned, with roots, greens, and plain ſauces; but the more plain, ſimple, and the lighter, and more eaſily digeſted they are, the better: they ſhould be alſo very temperate in the uſe of wine and all ſpirituous liquors, and ſtrictly abſtain from all kinds of malt liquors, for they are by no means a proper drink in the hot climates, as they are too viſcid and glutinous a liquid, they require more labour and action, in order to digeſt and animalize them, than can be well uſed here (in the Weſt Indies); and as the heat is great, and we perſpire much and ſoon," &c "they often do much hurt, as I have often obſerved, and therefore mention it here. Small punch, moderately acid, is a much more proper beverage for the hot climates. Their diet alſo mornings and nights ſhould be light and eaſily digeſted, and gently attenuating and diluting.

"Theſe rules may ſeem to be too rigid and ſevere to ſome, but they are abſolutely neceſſary, if the patient is obliged to continue in a hot climate, and yet deſires to recover his health, and live free from this dreadful diſtemper. It is highly probable, that removing into a colder climate may conſiderably contribute to their recovery, and re-eſtabliſhing their health, eſpecially as a hot climate is the parent and producer of this diſeaſe."

Other writers confirm the ſtatement that mercury, the effectual remedy for the venereal diſeaſe, which the elephantiaſis reſembles in ſome of its ſymptoms, is uſeleſs, if not abſolutely pernicious, in the latter. Dr. Joannis, ſpeaking of the difference between the two diſeaſes, remarks, that the leproſy is not ſo eaſily communicated as ſyphilis; "nor will it yield to the ſame remedies. On the contrary its virulence is increaſed by them, and they make it break out with more violence. This has been particularly experienced, when, after due preparations, mercurial frictions have been employed." (Med. Obſ. and Inquiries, before quoted, p. 210.) And Dr. Peyſonel ſays, that antivenereal remedies were of no ſervice, and "very often haſtened the progreſs of the diſeaſe."

Mr. Bruce procured a quantity of the inſpiſſated juice of

 cicuta,

cicuta, (the conium maculatum of Linnæus,) prepared by Baron Storck, at Vienna, which he administered diligently to some persons, labouring under the disease, in Abyssinia, but without any success. At Martigues, sulphur, both internally and externally, sudorifics, antiscorbutics, mercurials, sweeteners, diluents, viper-broths and whey, were had recourse to, but they had little or no effect; so that, when Dr. Joannis wrote, they contented themselves with prescribing a mild and moist diet, and left them to wait the last moment which was to free them from their sufferings. In a word, it is obvious that the moderns, with all their powerful additions to the catalogue of the Materia Medica, have not been more successful than the ancients in the cure of elephantiasis, and have been led by experience to follow the plan which they adopted, in respect to the dietetic course, as a slender palliative. Dr. Adams, indeed, affirms, that a *generous* diet certainly protracts life, and renders it more tolerable, according to the experience of the lazaretto in Madeira; but he admits that all other remedies have proved ineffectual (Loc. cit. p. 281.) It may be observed, however, that an active medicine, which has not long been admitted into practice, has occasionally proved successful in the cure of some partial affections which have sometimes been deemed cancerous, and sometimes considered as elephantiasis, namely, the *lupus*, or *noli me tangere;* which corrodes and destroys by ulceration the parts that it attacks. This medicine is the arsenic, a preparation of which was introduced by Dr. Fowler, of York, and which experience has proved to be a safe and valuable remedy, for several diseases. Whether this substance might prove beneficial in the early states of elephantiasis is a question, which can as yet only be replied to on conjecture, deduced from a slight analogy.

The cure of the *thick leg* of warm climates, which is commonly at present called elephantiasis, is not prosecuted with more success, when it is once established, than the disease of which we have just been speaking. The chief measures of those physicians, who have treated the disorder in those climates in its commencement, have been directed to diminish the febrile paroxysms, by which it is preceded, by emetics, cathartics, diaphoretics, and the usual remedies of fever; and afterwards to strengthen the system by the use of Peruvian bark, the mineral acids, and the cold bath. This method succeeds when the leg is not already grown large; but afterwards, Dr. Hillary observes, "we can only say with Rhases, that it is incurable; and nothing but amputation can relieve them from such a load of leg; but, alas! this does not relieve the unhappy patient from the disease, unless the fever be taken off also, as above; for this operation has been often performed, but always without removing the disease, for the fever has certainly returned, and the morbid matter has as constantly fallen upon the other leg, and produced the same effects." (Loc. citat. p. 316.)

ELEPHANTINE, something that relates to, or partakes of, the qualities of elephants.

The term is chiefly applied to certain books of the ancient Romans, wherein were recorded the transactions of the emperors, and the proceedings, acts, &c. of the senate. This we learn from Pollio and Vopiscus, in the life of the emperor Tacitus, where he observes, that in the sixth press of the Ulpian library, was kept one of these libri elephantini; wherein, for a long course of time, were written down the decrees and edicts of the senate. In some of these books were registered all the acts and proceedings of the senate, and the magistrates of Rome; in others, the proceedings and events in the provinces, the armies, &c. There were about thirty-five large volumes of them, as many as there were tribes. In them were likewise contained the births, and classes of the citizens, with the musters, and all things belonging to the census. They are renewed every five years with the censors, and were all anciently kept in the ærarium, or public treasury, in the temple of Saturn.

Vigenere, and several others, believe these books to have been called elephantine, by reason of their enormous bulk. but Loisel, on the seventeenth chapter of the eleventh book of Aulus Gellius, gives us a different etymology; and assures us, they were called elephantine, because composed of ivory leaves or tablets, which every body knows is a production of the elephant. See DIPTYCHA.

ELEPHANTINE, in *Ancient Geography*, a town and island of Egypt, on the Nile, about a semi-stadium distant from Syene. This island is half a league long by a quarter wide. The town described by Strabo no longer subsists; but a small village is built upon its ruins, near to which is a superb gate of granite, which formed the entrance of one of the porticoes of the temple of "Cnept." A building surrounded by thick walls and rubbish formerly made a part of it; an elevated rampart at the point of the island served to defend it against the inundation. The nilometer formed of a block of marble, so favourably situated in this place, for discovering the first appearance of the increase of the waters, and for regulating the labours of the husbandman, is no more, a part of it being probably buried under the sand and mud of the Nile.

ELEPHANTIS, a promontory of Asia Minor, on the Bosphorus of Thrace, towards the northern part of the promontory Caracion.

ELEPHANTOPUS, in *Botany*, so named by Vaillant from ἐλέφας, *an elephant*, and πους, *the foot*, because, as he himself informs us in the Memoires de l'Academie des Sciences for 1719, of the form and position of the radical leaves in E. *scaber*. The classical meaning of the word, however, is rather ivory-footed. Linn. Gen. 452. Schreb. 589. Willd. Sp. Pl. v. 3. 2389. Juss. 178. Gærtn. t. 165. Mart. Mill. Dict. v. 2. Class and order, *Syngenesia Polygamia segregata*. Nat. Ord. *Compositæ*, Linn. *Corymbiferæ*, Juss.

Gen. Ch. *Common calyx* many flowered, permanent, of three large, broad, acute leaves: *partial* four-flowered, oblong, imbricated; its scales lanceolate-awl-shaped, pointed, erect, four of them equal and longer than the rest. *Cor.* compound, tubular: *florets* all perfect, four, or five, equal, ranged in a simple series; their petal tubular, with a narrow limb, in five deep, nearly equal, divisions. *Stam.* Filaments five, capillary, very short; anthers united into a cylindrical tube. *Pist.* Germen ovate, crowned; style thread-shaped, the length of the stamens; stigmas two, slender, spreading. *Peric.* none, except the permanent calyx. *Seeds* solitary, compressed; down of five bristles. *Recept.* naked.

Obs. Gærtner has rightly corrected the description of Linnæus and Schreber, that the "florets are ligulate," an error supposed to have arisen from their two external segments being occasionally glued, as it were, together. This mistake involved a much more important one, retained in the *Genera Plantarum*, that "this genus shews there are no limits between the floscular (tubular) and semi-floscular (ligulate) flowers of Tournefort;" which remark now falls to the ground.

Ess. Ch. Partial calyx with four or five tubular florets, all perfect. Receptacle naked. Down bristle-shaped.

Linnæus describes two species of this genus, Willdenow six, all natives of the West Indies, except the first and original one, E. *scaber*, which grows in moist shady sandy places in the East Indies. This is the Ana-Schovadi of Rheede'a Hort. Malab. v. 10. 13. t. 7, who informs us that this Malabar name is equivalent to "the traces of an elephant's foot,"

as if the leaves had been trodden flat by the steps of that animal; and that its appellation among the Bramins, Astipada, has the same signification. This idea was adopted in the generic name by Vaillant. The qualities of the herb are slightly astringent. Its *root* is woody and perennial. *Leaves* chiefly radical, depressed, elliptic-oblong, undulated, rough. *Stem* a span or more in height, corymbose. *Flowers* pale crimson, most conspicuous for the large heart-shaped rigid leaves of the common calyx. We know nothing remarkable of the remaining species, some of which have spiked flowers. Their general habit is rough and rigid, like the above.

ELEPHAS. See RHINANTHUS.

ELEPHAS, in *Ancient Geography*, a mountain of Ethiopia, above Egypt, near the Avalite gulf. Ptolemy. Arrian calls it a promontory.

ELEPHAS, in *Zoology*, a genus of the *Bruta* order, in the class Mammalia. The Linnæan character of the genus consists in having no fore teeth in either jaw; elongated tusks in the upper jaw only; proboscis very long and prehensile; and the body rather naked.

Of the elephas, or elephant, genus there is in the opinion of Linnæus only one species, and this, from its vast superiority in size to all other quadrupeds he was acquainted with, he denominates maximus. Since the time of Linnæus we are better informed concerning the natural history of the elephant tribe; and it appears at present there are sufficient reasons for believing not only in the existence of two, if not three distinct recent species, but also one, perhaps two, or even more, the remains of which are found only in a state of petrifaction. Among the number of these it is scarcely to be questioned, in our opinion, that the maximus (or recent elephant) of Linnæus comprehends two distinct kinds, and that the remains of a third, an animal of the antediluvian race, and entirely different from either, is very clearly ascertained. The remainder may require farther consideration.

To the attention bestowed on the pursuits of natural history in France we are in some measure indebted for the ascertainment of the two former, but not entirely so; and it is not to the French naturalists alone that we owe the discovery of the third. It was a fact long since obvious to us, and very probably to many others, that from the structure of the grinders of the elephants brought to Europe for the sake of their ivory, there must be two distinct animals to which these dissimilar teeth belonged. And, whoever has bestowed the least attention to the stupendous remains of the animal popularly called the behemoth, and by naturalists the mammoth, can on no very rational ground dispute that there either does or has existed a third kind of elephant, admitting the latter as one. By the term elephant, as it respects the mammoth, we indeed wish to speak with caution: it possesses some characters which ought, perhaps, to be considered as generically distinct from those of elephas. In this place we nevertheless admit it under that denomination, and that not merely for the purpose of argument, but because we know among the best naturalists of the continent, in the present period, it is so considered; and we shall not incautiously place our solitary opinion against this general conclusion. Its specifical characters are obviously distinct from either of the living kinds, and in its generical distinctions it certainly approaches nearer to the elephant than any other race of animals known to us. Examples of the teeth of both the first mentioned kinds of elephants, of the elephants' teeth and tusks found at a considerable depth in the ground in various parts of the country, and also the remains of the mammoth we possess in great variety, and from a due consideration of these we believe ourselves enabled to decide the important fact, that there are at least two different species of the elephant tribe, and the evident testimony of another, which has existed at some remote period of the earth.

A valuable paper on the subject of the two first appears in the Memoirs of the French National Institute by Cuvier. His observations are offered in a conclusive manner, and corroborate our ideas with respect to the two species of living elephants; the mammoth he admits as very distinct from either, but as a species of elephant. His remarks are the result of an examination of various specimens in the National museum. This collection afforded him examples of the skulls of both species of the living elephants, of which we have only seen one, and the difference of these is very remarkable. The two species are named by Cuvier *Capensis* and *Indicus*, the first inhabiting Africa, about the Cape of Good Hope, the other India. The African sort has the front of the head convex and inclined, the tusks larger, and the perpendicular layers of enamel, which, with the softer osseous matter, compose the grinders, exhibiting on the top, or worn surface, a number of rhomboidal spaces, and which are equally observable in a transverse section of the tooth. The elephant of Asia (Indicus) is larger: the front of the skull, instead of being convex, is deeply concave, and the upper part so dilated as to exhibit two pyramidal elevations; and the grinders have the enamel layers disposed in the osseous substance in distinct transverse parallel lines, instead of rhomboidal compartments. The grinder of the mammoth, we may add, has the upper surface divided into eight, ten, or more distinct conic prominences, rising at least an inch above the surface, and disposed tranversely in pairs. This last has rather the appearance of the tooth of some carnivorous animal than that of the elephant; and we rather suspect, in contradiction to the current opinion, that its habits were different. See our article MAMMOTH.

From the consideration of species, we must descend to varieties, of which there are several in the elephant tribe; some of which may perhaps hereafter be admitted as distinct species, as well as the former. The natural colour of the common, or Indian, elephant is cinereous, from which they sometimes vary to white. The latter colour has been said, in some instances, to arise from illness, or particular maladies to which the animal is liable; an assertion to which the less degree of probability must be attached, as we know the high consideration in which the white elephants are held in India. The elephants of the Cape are of a red, or reddish colour, as we are well assured, and in particular by Levaillant in his second journey through the interior of Africa. But what we consider more remarkable and deserving of further investigation, is that, in his subsequent travels through the same parts, he speaks of a race of elephants which never have tusks, and the head of which is less elongated than the other sorts. This seems to point out the existence of a third living species.

And lastly, while treating on this subject, we must not omit to mention that mysterious animal the sukotyro. This is the animal introduced to the notice of Europe by a description and figure given in the works of Niewhoff, a Dutch traveller, who spent some time in the East Indies, about the year 1563, and pretends to have seen it in the island of Ceylon. To us it appears of the most ambiguous character, and the representation so miserably defective, that we cannot venture any opinion on its genera, except that we believe it is not really what it professes to be, an animal of a new genus. It bears some resemblance to the elephant; and the French writers even call it the dwarf elephant (éléphant-nain); notwithstanding which it exhibits no appearance of a proboscis; its snout is rather that of the

the hog, and, in point of ſize, it correſponds with the buffalo. The leſs confidence muſt be repoſed on the authorities of the French writers in claſſing this uncertain quadruped with the elephants, ſince it is obvious, they have never ſeen the animal, and it is ſeriouſly to be apprehended, we allow more credit to Niewhoff for the exiſtence of his ſukotyro than he really merits.

It has been our aim to point out the diſtinctive characters of the two ſpecies of elephant, *capenſis* and *indicus*, in order to ſhew that what we have heretofore been taught to conſider as a ſingle ſpecies, does certainly comprehend two. It would be improper to affirm the exiſtence of more than two living kinds, although we are inclined to think there muſt be more. Writers often mention the diſcovery of bones, teeth, and tuſks of elephants, found buried at various depths in the earth, and many ingenious remarks and theories on this topic might be related. Few, however, of theſe writers ſeem aware of thoſe definitive characters, by which thoſe remains are referable to different ſpecies of the quadruped race; and it is only the obſervations of thoſe attentive to ſuch characters we can repeat with confidence. After this comment it is unneceſſary to obſerve, that thoſe relics which are generally confounded under the denomination of elephants' teeth and bones, are, in our opinion, the remains of more than one kind of animal. The obſerver ſhould be cautious alſo in deciding between the recent and foſſil bones, or, in other words, between thoſe which have merely undergone a natural decay, from remaining long in the earth, and thoſe which are ſtrictly mineralized; the laſt-mentioned, ſo far as our own obſervations extend, being indicative of ſpecies which are never found in a living ſtate. A more obvious inſtance of this than the mammoth affords, need not be adduced.

We ſhall now proceed to the hiſtory of the common elephant of India, the largeſt of all quadrupeds found at this time in a ſtate of nature. The ſize of this animal, its ſtrength, and ſagacity, have rendered it in all ages the admiration of mankind. The height of the elephant, which is often exaggerated by the early writers, appears to be from 10 to 14 feet, and one of the larger ſize is generally about 16 feet long from the front to the origin of the tail. The circumference of the neck 17 feet, and of the body in its moſt dilated part about 26 feet. The legs are ſhort and about ſix feet in circumference, and the tail ſlender, and about ſix feet long. Theſe are the dimenſions of the largeſt elephants, and exceed thoſe of the ordinary ſize by nearly one-third. In proportion to the ſize of the elephant his eyes are very ſmall, but they are lively, brilliant, and capable of great expreſſion. The mouth appears behind the trunk, which latter hangs between the two large tuſks, which are the principal weapons of the elephant's defence. The feet are ſhort, clumſy, and divided into five hoofs, or toes; the tail is terminated by a few large hairs. The teats in the female elephant are two in number, and ſituated at a ſmall diſtance behind the fore legs. But the moſt ſingular organ of the elephant is the trunk, which is at once the inſtrument of reſpiration, and the limb by which the animal ſupplies itſelf with food. The trunk of an elephant is about eight feet long, five feet in circumference near the mouth, and eighteen inches near the extremity. It is a pipe of an irregular conic figure, and widened at the end; the ſuperior ſide of the trunk is convex, and furrowed tranſverſely, and the inferior ſide is flat, and has two longitudinal rows of ſmall protuberances. The upper part of the trunk correſponds with the extremity of the noſe in other quadrupeds, and the inferior as an upper lip, including the noſtrils. The trunk is a continued canal, divided into two cavities by a longitudinal partition: theſe cavities aſcend along the fore part of the upper jaw, where they make a turn inwardly and deſcend into the palate, and then terminate in two ſeparate orifices: they have likewiſe each a ſeparate orifice at the end of the trunk. At the place where the cavities make a turn, and before they enter into the bones of the head, there is a moveable cartilaginous plate ſituated in ſuch a manner as enables the animal to ſhut the canal, and to prevent the water, with which it occaſionally fills the trunk, from entering the paſſage of the noſe, where the organs ſerving for the ſenſation of ſmell are placed: the tip is flattiſh, circular, and furniſhed with a projecting point, or fleſhy moveable hook, of extreme ſenſibility, and with which he can ſuck up the ſmalleſt objects at pleaſure, and which he manages with as much dexterity as a man does his hand, taking up grains of corn, or the ſmalleſt pieces of graſs, and conveying them to his mouth. When he drinks he thruſts his trunk into the water, and fills it by drawing in his breath and exhauſting the air. When the trunk is thus filled with water, he can either throw it out to a great diſtance, or drink it, by putting the end of the trunk in his mouth. In each jaw are four large flat grinding teeth, with the upper ſurfaces flat, and ſtriated or ſcored. The two large tuſks, by ſome called the horns of the elephant, produce the fineſt ivory. Thoſe imported into Europe are chiefly ſuch as are found in the woods of Africa. Inſtances have ſometimes occurred in which, on ſawing a tooth, a muſket bullet has been found completely imbedded in the central part without any viſible indication on the outſide, the ivory having gradually grown over and enclofed it. The ears are large and long, ſituated cloſe to the head, and are commonly pendulous, but he can raiſe them or move them with great facility, and frequently uſes them as a fan, to cool himſelf, or to defend his eyes from duſt and inſects.

The texture of the ſkin is uneven, wrinkled, and knotty, full of deep fiſſures, and reſembling the bark of an oak tree; and in the fiſſures, which are moiſt, are ſome briſtly hairs.

Buffon ſuppoſed the ancients to have been deceived when they tell us that the elephants cover like other quadrupeds, and has brought forward a multitude of arguments to prove its impoſſibility, from the peculiar ſituation of the parts of generation in the female. The vagina being placed in the middle of the abdomen ſeems to have been his principal objection, and hence Buffon aſſerts that the union of the elephants could not be accompliſhed in the ordinary way of quadrupeds. De Feynes and Travenier poſitively aſſure us that the ſituation of the ſexual organs confirms this fact, and that theſe animals cannot intermix unleſs they have more time and conveniency for the purpoſe than other quadrupeds, and that it is for this reaſon they never evince their natural paſſions, unleſs in the enjoyment of full liberty and retirement. Many anecdotes on this ſubject are related by travellers, and which in general tend to ſupport the conjectures of Buffon; but from the obſervation of M. Bleſs, who was ſecretary for the ſpace of twelve years to the Dutch government in Ceylon, M. Buffon was ſo far convinced both his judgment and the information he obtained had deceived him, that in his ſupplement he retracts the opinions advanced in the former part of his Natural Hiſtory. The obſervations of M. Bleſs are to the following effect: "I have perceived (ſays this writer) that the count de Buffon is deceived with regard to the copulation of the elephants. I know that in ſeveral parts of Aſia and Africa theſe animals, eſpecially during the ſeaſon of love, remain in the moſt inacceſſible places of the foreſts: but in the iſland of Ceylon, where I lived twelve years, the land being every where inhabited

habited, they cannot ſo eaſily conceal themſelves, and having often examined them, I perceived that the female organ is ſituated nearly under the middle of the belly, which would lead us to think, with M. Buffon, that the males cannot cover the females in the manner of other quadrupeds. However, there is only a ſlight difference of ſituation. When the female courts the careſſes of the other ſex, ſhe proſtrates her fore legs only on the ground, and every difficulty is thus removed. I can likewiſe affirm that the elephants go with young about nine months. In the ſeaſon of love the males are ſtrongly chained for four or five weeks, and are, during that period, ſo furious, that their cornacks, or governors, cannot come near them without danger. The domeſtic female elephant, on theſe occaſions, ſometimes make their eſcape and join the wild ones in the woods. Some days afterwards her cornack goes in queſt of her, and calls her by name, till ſhe comes. She ſubmits with complacence, and allows herſelf to be conducted home, and ſhut up in the ſtable. According to the recent obſervations of Mr. Corſe, related both in the Philoſophical Tranſactions of London, and the Tranſactions of the Bengal Society, it appears, however, that the elephants both couple and produce young in a ſtate of domeſtication. In order to determine this experiment, a couple of elephants were put to rut in an incloſed ſpace, where they had abundance of food, and every neceſſary accommodation. At firſt they were only ſociable, at length they became more familiar, and began to ſhew ſigns of fondneſs, by frequently careſſing each other with their trunks, and on the 28th of June, at night, the expectations of their obſervers were fulfilled. They were ſeen to cover like the horſe, and this was witneſſed no leſs than five times in the courſe of ſixteen hours.

Elephants, even in a ſavage ſtate, are peaceable and gentle creatures, and are ſaid never to uſe their weapons but in defence of themſelves or companions. Their ſocial diſpoſitions are ſo ſtrong that they are ſeldom found alone, but march always in large troops; the oldeſt and moſt experienced lead the van; the younger or lame ones keep in the middle, and thoſe of a ſecond rate, as to age, walk in the rear. The females carry their young on their tuſks, embracing them at the ſame time with their trunk. They ſeldom march in regular order but when they reckon the journey dangerous, ſuch as an expedition to cultivated lands, where they expect to meet with reſiſtance, on other occaſions they are leſs cautious: ſome of them falling behind, or ſeparating from the reſt, but ſeldom ſo far as to be without the reach of aſſiſtance, by alarming and aſſembling their companions. It is dangerous to offer them the leaſt injury; for they run ſtraight upon the offender; and although the weight of their body be great, their ſteps are ſo large, that they eaſily outrun the ſwifteſt man, whom they either pierce with their tuſks, or ſeize with their trunk, dart him into the air like a ſtone, and then trample him under the feet. But they are ſaid never to attack any perſon unleſs provoked. However, as they are extremely ſenſible and delicate with regard to injuries, it is always prudent to keep out of their way. Travellers, in countries they inhabit, kindle large fires, and beat drums during the night, in order to prevent their approach. After being once attacked by men, or falling into an ambuſh, they are ſaid never to forget the injury, but ſeek every opportunity for revenge. As they are endowed perhaps with a more exquiſite ſenſation of ſmell than any other animal, owing to the great extent of their noſe, they can ſcent a man at a great diſtance, and trace him by his footſteps.

Elephants are peculiarly fond of the banks of rivers, deep vallies, and marſhy grounds, eſpecially in the depths of foreſts. They delight in drawing up water into their trunks, when they do not drink it, and amuſe themſelves in daſhing the water around: they cannot endure cold, and are equally averſe to an exceſs of heat: in order to avoid the ſcorching heat of the ſun, they retire to the thickeſt and moſt ſhady parts of the foreſt. The bulk of their bodies is ſo enormous that they do not often go into deep waters. The ordinary food of the elephant conſiſts of roots, herbs, the tender branches of trees, fruit, and grains, and they abhor animal food. When any of them diſcovers a fine paſture, he invites his companions to the repaſt, and as they devour a large quantity of food in a ſhort time, they are always ſhifting their paſture. When they meet with cultivated grounds they make prodigious deſolation, and deſtroy more plants by treading them down than they uſe for nouriſhment, which laſt is very conſiderable, and amounts to about 150 pounds of herbage every day. As they conſtantly graze in large troops they lay waſte whole fields in an hour. The Indians and negroes employ every art to prevent them from viſiting their cultivated lands, by making great noiſes and burning large fires round their fields. However, theſe precautions are not always ſufficient to prevent the elephants from viſiting them. They chaſe away the domeſtic animals, put the inhabitants to flight, and ſometimes throw down their habitations. Elephants are hardly ſuſceptible of fear; the only things which can ſurpriſe them, or ſtop their courſe, are fire works, ſuch as ſquibs, crackers, &c. the effects of which are ſo ſudden and ſo quickly repeated, that the elephants frequently turn back, and when one runs, all the reſt follow his example.

Although the ſocial diſpoſition in the elephant be remarkable, in the rutting ſeaſon their docility gives place to the ſtronger impulſe of love. They ſteal off in couples to the moſt ſecret parts of the foreſt. The elephant, when it comes into the world, is as large as a young boar, and equal to an ox in ſize when ſix months old. The young ſuck the teats of the female with the mouth, and not the trunk, as erroneouſly repreſented.

The manner of taking and taming elephants merits attention. In foreſts, and ſuch places as are frequented by elephants, the Indians chooſe a ſpot, and incloſe it with ſtrong paliſadoes: they uſe the largeſt trees as the principal ſtakes, to which are fixed ſmaller ones, in a tranſverſe direction. Theſe croſs trees are ſo fixed as to allow a man to paſs eaſily through. There is likewiſe a large entrance left for the elephant, over which is ſuſpended a ſtrong barrier, which is let down afterwards as ſoon as he enters. In order to decoy him into the incloſure, the hunters take along with them a tame female in ſeaſon, and travel about till they come ſo near that the cry of the female can reach the male, whom they previouſly obſerve in the foreſt; then the guide of the female makes her give the cry peculiar to the ſeaſon of love, to which the male inſtantly replies and approaches. The guide then makes the female proceed towards the artificial incloſure, repeating her cries as ſhe proceeds; ſhe enters the incloſure, the male follows her, and the Indians immediately ſhut the port behind him. He no ſooner diſcovers that he is enſnared than his paſſion for the female is converted into rage and fury. The hunters entangle him with ſtrong ropes, and bring two or three tame elephants to pacify him, and in a word, by the application of torture and careſſes, reduce him in a few days to obedience.

There are many other methods of catching elephants. Inſtead of making large incloſures with paliſadoes, like the kings of Siam and other monarchs, the poor Indians are content to adopt a moſt ſimple method; they dig deep pits in the roads, frequented by elephants, covering them with branches of trees and turf, into which the elephants are precipitated by-

by their enormous weight in attempting to paſs, and being unable to extricate themſelves, are eaſily taken.

The elephant, when tamed, is the moſt friendly and obedient of all animals, and is entirely attached to the perſon who feeds and takes care of him. He readily underſtands ſigns and the ſounds of his maſter's voice, and diſtinguiſhes the language of paſſion, command, and ſatisfaction. He receives his orders with attention, and executes them with alacrity and prudence. He eaſily learns to lower his body for the convenience of thoſe who mount him. He careſſes his friends with his trunk. With this wonderful organ he alſo lifts burdens, and aſſiſts thoſe who are loading him in laying them on his back. When yoked in a cart or waggon, he pulls equally and cheerfully, unleſs abuſed, or injudiciouſly chaſtiſed. His guide is generally mounted on his neck, with a ſmall iron rod ſharp at one end, and with this he directs his motion by pricking him on the ears and head, but more frequently it is ſufficient to direct him by the voice. A tame elephant will do more labour than ſix horſes, and he requires a quantity of food in proportion. They are the principal beaſts of burden in many parts of Africa and the Eaſt Indies. They carry ſacks and bundles of all kinds on their neck, back, and tuſks. They never loſe or damage any thing committed to their care; and it is ſaid, they will ſtand on the edge of a river, take bundles off their neck and tuſks, and lay them carefully in any part of the boat deſired, and try with their trunk whether they are properly ſituated, and if they be loaded with caſks, they go in queſt of ſtones to prop them, and prevent them from rolling.

The elephant is not only the moſt tractable, but the moſt intelligent of animals, ſenſible of benefits, reſentful of injuries, and endowed even with a ſenſe of glory. Some extraordinary inſtances of this, though often related, may bear repetition. In India they were once employed in launching ſhips; one was directed to force a veſſel of large ſize into the water, the work proved ſuperior to his ſtrength, his maſter, with a ſarcaſtic tone, deſired the keeper to take away this lazy beaſt and bring another; the poor animal inſtantly repeated his efforts, fractured his ſkull, and died on the ſpot. The celebrated ſtory of the taylor at Delhi is recorded as a remarkable example of the elephant's ſagacity. The elephant, paſſing along the ſtreets, put his trunk into the window of a taylor's ſhop, where ſeveral people were at work, one of whom pricked the end with his needle; the beaſt paſſed on, but in the firſt dirty puddle filled his trunk with water, and on his return diſcharged it over thoſe who offended him, and ſpoiled their work. This is related by Ludolph. (Hiſt. Æthiop.) who alſo gives the following anecdote. An elephant at Adſmeer, which often paſſed through the market, as he went by a certain herb-woman always received from her a mouthful of greens. At length he was ſeized by one of his periodical fits of rage, broke from his keeper, and running about the market, put the crowd to flight. Among others, was this woman, who in her haſte forgot a little child ſhe had brought with her. The animal recollected the ſpot where his benefactreſs uſually ſat, and taking the infant up gently with its trunk, removed it to a place of ſafety.

Buffon relates, that a ſoldier at Pondicherry, who was accuſtomed, whenever he received his portion of proviſions, to convey a certain quantity of it to one of theſe animals, having one day drank rather too freely, and finding himſelf purſued by the guard, who were going to take him to priſon, took refuge under the elephant's body and fell aſleep. In vain did the guard try to force him away from this aſylum, as the elephant protected him with his trunk. The next morning the ſoldier, recovering from his drunken fit, ſhuddered with horror to find himſelf ſtretched under the belly of this huge animal. The elephant, which, without doubt, perceived the man's embarraſſment, careſſed him with his trunk, in order to inſpire him with courage, and make him underſtand that he might now depart in ſafety.

In the memoirs of the French Academy of Sciences, we are told the following circumſtance. A painter was deſirous of drawing the elephant which was kept in the menagerie at Verſailles in an uncommon attitude, namely, that of holding his trunk raiſed up in the air with his mouth open. The painter's boy, in order to keep the animal in this poſture, threw fruit into his mouth, but as the lad frequently deceived him and made an offer only of throwing him the fruit, he at laſt grew angry, and as if he had known the painter's intention of drawing him was the cauſe of the affront, inſtead of revenging himſelf on the lad, he turned his reſentment on the maſter, and taking up a quantity of water in his trunk, threw it upon the paper on which the painter was drawing, and ſpoiled it.

At the Cape of Good Hope it is cuſtomary to kill theſe animals for the ſake of their teeth by the chace. Three horſemen well mounted and armed with lances attack an elephant alternately, each relieving the other as they ſee their companion preſſed, till the beaſt is ſubdued. Three Dutchmen (brothers,) who had made large fortunes by this buſineſs, had determined to retire to Europe and enjoy the fruits of their labours; but reſolved before they went, to have a laſt chace by way of amuſement; they met with their game, and began in the uſual manner; but unfortunately one of their horſes fell down and flung its rider; the enraged elephant inſtantly ſeized the unhappy man with its trunk, flung him up to a vaſt height in the air, and received him on one of its tuſks; then turning towards the two other brethren, as if it were with an aſpect of revenge and inſult, held out to them the impaled wretch writhing on the bloody tooth.

By the ancient Indians, elephants were much uſed in war. Porus, the Indian monarch, is ſaid to have oppoſed the paſſage of Alexander over the Hydaſpes with eighty-five elephants. A number of theſe taken by Alexander were afterwards, as is recorded, ſent into Greece, where Pyrrhus employed them ſome years after againſt the Romans in the battle of Tarentum. Both the Greeks and Romans ſoon learnt to get the better of theſe monſtrous animals; they opened their ranks and allowed them to paſs through; neither did they attempt to hurt them, but endeavoured to kill their guides. Now that fire-arms are the principal inſtruments of war, elephants, who are terrified at the noiſe and flame, inſtead of being uſeful in a charge, would tend only to embarraſs an army. However, in Cochin and other parts of Malabar, and alſo in Tonquin, Siam, and Pegu, where fire-arms are little underſtood, they are ſtill uſed in battle. The guide ſits aſtride upon the neck, and the combatants ſit or ſtand upon the other parts of his body. They are more commonly uſed in thoſe provinces of India where the uſe of fire-arms prevails, for fording rivers, and carrying magazines, military cheſts, or even the field pieces in ſwampy grounds, where they cannot readily be drawn by horſes. In croſſing rivers after the keepers have loaded them ſufficiently, (and they carry from three to four thouſand weight,) they faſten ropes to them, of which the ſoldiers taking hold, either ſwim or are drawn acroſs the river. They are alſo uſeful in forcing open the gates of a city or garriſon, or forcing any entrance, to prevent which, moſt of the garriſons in India have large ſpikes ſtuck in their gates that project to a conſiderable diſtance.

Elephants are however retained by princes in India, rather for the purpoſes of luxury and magnificence than any real utility, and the expence of keeping them is prodigious. The greateſt care is taken in the management and decoration of

of these animals, which after their daily feeding, bathing, oiling, and rubbing, are often painted about the ears and head with various colours, and their tusks surrounded with rings of gold and silver. When they appear in state to grace processions or other ceremonies, they are cloathed in the most sumptuous trappings. It is said to be not an uncommon circumstance, if a nabob is disposed to ruin a private gentleman, to make him a present of an elephant, which he is afterwards obliged to maintain at a greater expence than he can afford; by parting with it, he would certainly fall under the displeasure of the grandee, besides forfeiting all the honour which his countrymen think is conferred upon him by so respectable a present. That the elephant lives to a great age is not unknown; in a state of slavery and labour, some have been said to live from one hundred to one hundred and thirty years; whether, as some writers assert, in its state of wildness, it lives to the age of two hundred years cannot easily be determined; they are also said not to attain their full growth till they are thirty years old, and that their propagative abilities do not fail at the age of one hundred and twenty. In Africa, where elephants are far more numerous than in Asia, the natives hunt them for the sake of their flesh as well as the ivory of their tusks. The trunks they esteem a delicious morsel. So numerous are the herds of elephants in some parts of Africa, that the natives are compelled to live in subterraneous dwellings to avoid them. Their tusks, which are found in the woods by the negroes, form an article of immense commerce in Congo and Guinea, and also in Acra, Ante, Benin, Rio de Calbari, and on the Gold Coast.

The ancients held the elephant in high veneration for his sagacity. They pretended that he understood the language of men, and, what was infinitely more to its honour in their ideas, the worship of the gods: they adored the sun and moon, and offered supplication for favours, and gratitude for benefits bestowed. The moderns entertain other notions, and ascribe it to a superiority of intellect over the whole brute creation: for it is not instinct merely, but reason which they allow the elephant to possess. From the observations, however, of our countryman, Mr. Corse, whose residence in India afforded him an opportunity of investigating the subject with exactness, it does not appear that the elephant is altogether entitled to that elevated character with which it has been so frequently honoured; and that neither its docility nor its memory can be allowed a very high rank, when compared with those of some other animals; and that the scrupulous delicacy which, it was pretended, forbad all public demonstration of its natural passions, is a mere fable. A female elephant has been known to forget her young one, after having been separated only for the short space of two days, and to repel its advances: and an elephant, also, which had escaped from its confinement, has again suffered itself to be trepanned, and reconducted to its former state of captivity.

The account alluded to is given by Mr. Corse in the Philosophical Transactions for the year 1799, and cannot fail to prove highly conclusive and satisfactory to every curious reader. Mr. Corse observes, that both male and female elephants are divided by the natives of Bengal into two castes, namely, the Koomareah and the Mergee. The first consists of the large and full-bodied kind; the second, of the more slender, with longer legs and thinner trunk in proportion: it is also a taller animal, but not so strong as the former. A long trunk is always considered as a great beauty in an elephant; so that the koomareah is preferred, not only on this account, but for his superior strength in carrying burthens, &c. Many indistinct varieties are again produced from the intermixture of these two breeds. The torrid zone seems to be the natural clime of the elephant, and the most favourable for the production of the largest and hardiest race; and, when this animal migrates beyond the tropics, the species degenerates. On the coasts of Malabar, elephants are taken as far north as the territories of Coorgah Rajah; but these, according to Mr. Corse, are much inferior to the Ceylonese elephant.

"The tusks in some female elephants," says Mr. Corse, "are so small as not to appear beyond the lip; whilst in others, they are almost as large and long as in one variety of the male, called mooknah. The grinders are so much alike in both sexes, that one description may serve for both. The largest tusks, and from which the best ivory is supplied, are taken from that kind of male elephant, called dauntelah, from this circumstance, in opposition to mooknah; whose tusks are not larger than those of some females. An elephant is said to be perfect, when his ears are large and rounded, not ragged or indented at the margin; his eyes are of a dark hazel colour, free from specks; the roof of his mouth and his tongue without dark or blackish spots of any considerable size; his trunk large; his tail long, with a tuft of hair reaching nearly to the ground. There must be five nails on each of his fore-feet, and four on each of the hind ones; his head well set on, and carried rather high; the arch or curve of his back rising gradually from the shoulder to the middle, and thence descending to the insertion of the tail; and all his joints firm and strong. In one variety of the elephant, the tusks point downwards, projecting only a little way beyond the trunk. The tusks of the elephant are fixed very deep in the upper jaw; and the root of the upper part, which is hollow and filled with a core, goes as high as the insertion of the trunk, round the margins of the nasal opening to the throat; which opening is just below the protuberance of the forehead. Through this opening the elephant breathes, and by its means he sucks up water into his trunk: between it and the roots of his tusks there is only a thin bony plate. The first or milk tusks of an elephant never grow to any considerable size, but are shed between the first and second year, when not two inches in length. The time at which the tusks cut the gum varies considerably: sometimes a young elephant has his tusks at five months old, and sometimes not till seven. Even in a fœtus, which has arrived at its full time, these deciduous tusks are formed. A young elephant shed one of his milk-tusks on the 6th of November, 1790, when about thirteen months old; and the other on the 7th of December, when above four months old. Two months afterwards, the permanent ones cut the gums; and on the 19th of April, 1791, they were an inch long. Another young elephant did not shed his milk-tusks till he was fixteen months old; which proves that the time of this process varies considerably. The permanent tusks of the female are very small, compared with those of the male; and do not take their rise so deep in the jaw. The largest elephant tusks Mr Corse ever saw in Bengal did not exceed the weight of 72 pounds avoirdupois; at Tiperah, they seldom exceed 50 pounds each. Both these weights are very inferior to that of the tusks brought from other parts to the India House, where some have weighed 150 pounds each. These, Mr. Corse suspects, were from Pegu. The African elephant is said to be smaller than the Asiatic; yet the ivory-dealers in London affirm that the largest tusks come from Africa, and are of a better texture, and less liable to turn yellow than the Indian ones: a circumstance which corroborates the truth of the specifical distinction between the Asiatic and African elephants. The increase of the tusks arise from circular layers of

of ivory applied internally, from the core on which they are formed, similar to what happens in the horns of some animals. The grinders of elephants may be considered as composed of several distinct laminæ or teeth, each covered with its proper enamel; and these teeth are merely joined to each other by an intermediate softer substance, acting as a cement. This structure, even at first glance, must appear very curious, being composed of a number of perpendicular laminæ, which may be considered as so many teeth; each covered with a strong enamel, and joined to one another by the common osseous matter: this, being much softer than the enamel, wears away faster by the mastication of the food; and in a few months after these teeth cut the gum, the enamel rises considerably higher, so that the surface of each grinder soon acquires a ribbed appearance, as if originally formed with ridges. The number of these teeth, or proportions, of which an elephant's grinder is composed, varies from four to twenty-three, according as the animal advances in age; so that the grinder, or case of teeth, in a full grown elephant is more than sufficient to fill one side of the mouth. The shape of the grinder of the lower jaw differs from those of the upper, which are very convex on the back part; whereas the lower has a bent or curved direction, adapting itself to the shape of the jaw, and is concave on the surface. The grinders, like the tusks, are already formed even in the very young animal. The first set of grinders, or milk-teeth, begin to cut the gum eight or ten days after birth; they are not shed or cast as the milk tusks are, but are gradually worn away during the time those of the second set are coming forward. Mr. Corse could not ascertain the exact time at which the second set of grinders makes its appearance; but when the elephant is two years old, the second set is then completely in use. At about this period the third set begins to cut the gum; and from the end of the second to the beginning of the sixth year, the third set comes gradually forward as the jaw lengthens, not only to fill up this additional space, but also to supply the place of the second set, which is, during the same period, gradually worn away. From the beginning of the sixth to the end of the ninth year, the fourth set of grinders comes forward, to supply the gradual waste of the third set. After this period, other sets are produced; but in what proportion, and in what time, is not yet ascertained: but it is reasonable to conclude that every succeeding grinder takes a year longer than its predecessor to be completed; and consequently that the fifth, sixth, seventh, and eighth sets of grinders will take from five to eight years (and probably much longer) each set, before the posterior lamina has cut the gum.

The curious reader, desirous of farther information on the history of elephants, may consult the following, among other valuable publications on the subject, with advantage: "Descriptio nova Elephanti," &c. P. Gillius, 1562, 1565, (seorsim edita 1614); "Historia Elephanti," J. Prætorius, 1607; "Elephas, das ist, Historischer und Philosophischer Discurs vondem Elephantem," C. Horn, 1629; "L'Histoire des Elephants," S de Priezac, 1650; "Elephas Brutum non-brutum," &c. J. Lipsius, 1650; "An Account of taking and taming Elephants in Zeylon," Strachan, Phil. Trans.; "De Elephantis," &c. C. Cuperus, 1719; "Sur un Elephant qui a vecu à Naples plusieurs Années," Mem. Fr. Acad.; "Geschichte des Elephanten," Berl. 1777; "Account of catching wild Elephants at Tipura," Corse, Bengal Trans., &c.

ELEPORUS, in *Ancient Geography*, a river of Italy, in Brutium.

ELERA, a town of Asia, in Batanæa, a country of Syria. Ptolemy.

ELERO, in *Geography*, a river of Piedmont, which runs into the Tanaro, near Carri.

ELESCHEVI, a town of Russian Siberia, in the government of Tobolsk, on the Tchulim; 84 miles E.N.E. of Tomsk.

ELEVATIO, in *Prosody*, the same as arsis. See Arsis.

Elevatio, *Arsis*, in *Music*, the lifting up the hand or foot in beating time, serves to mark the unaccented parts of a bar, and is called the *up*, or that tact or portion of a bar which occupies the second or fourth part of a measure. It was the contrary with the ancients. An elevation of voice, in singing, is ascending to the acute.

In the Roman Catholic church, the lifting up the host or body of our Saviour is called elevatio, or the elevation, for which there is a particular service.

ELEVATION, the altitude or height of any thing. See Altitude.

The word is formed from *elevare*, to raise or lift up.

Elevation *of a Star*, or other point, in the sphere, is an arch of the vertical circle, intercepted between such star, or other point, and the horizon.

Hence, as the meridian is a vertical circle, a meridian altitude or elevation, *i. e.* the elevation of a point in the meridian, is an arch of the meridian, intercepted between that point and the horizon.

Elevation *of the Pole*, denotes the altitude of the pole above the horizon of any place, or an arch of the meridian, intercepted between the pole and the horizon.

Thus, in *Plate* XII. *Astronomy*, *fig.* 102, A Q being supposed the equator, H R the horizon, H Z P N the meridian, and P the pole; P R is the elevation of the pole.

In which sense elevation stands opposed to depression or depth. See Depression.

The elevation of the pole is always equal to the latitude of the place; that is, the arch of the meridian intercepted between the pole and the horizon, is always equal to the arch of the same meridian, intercepted between the equator and the zenith. Thus, the north pole is elevated 51° 32′ above the horizon of London; and there is the same distance, or number of degrees, between London and the equator; so that London is likewise in 51° 32′ of northern latitude.

To observe the elevation of the pole of any place, see Pole and Latitude.

Elevation *of the Equator*, is an arch of the meridian, less than a quadrant, intercepted between the equator and the horizon of the place.

Thus A Q, as before representing the equator, H R the horizon, P the Pole, and H Z P N the meridian; H A is the elevation of the equator. See Equator.

The elevations of the equator, and of the pole, together, are always equal to a quadrant; consequently, the greater the elevation of the pole, the less the elevation of the equator, and *vice versâ*.

Thus, in the figure just cited, P A is supposed by the construction a quadrant, and H A + A P + P R a semicircle; consequently, H A + P R is a quadrant.

Elevation *of the Equator, to find the*. Find the elevation of the pole, after the manner hereafter directed, under the article Pole.

Subtract the elevation found from a quadrant, or 90°; what remains is the elevation of the equator. Thus, the elevation of the pole 51° 32′, being subtracted from 90°; leaves the elevation of the equator 38° 28′.

Elevation, in *Architecture*, is the orthographic projection of an edifice, or object, by a system of rays parallel to the horizon. Hence its use in describing the vertical parts of

of objects, particularly when these objects consist of planes, and when these planes are parallel to the plane of projection. By the use of plans and elevations, we are enabled to communicate our ideas of a design to others, who are thereby enabled to put them in practice.

ELEVATION, in the *Romish Religion*, is applied to that part of the mass wherein the priest hoists or raises the host, with the cup above his head, for the people to adore it, after having first consecrated and adored it himself.

Whilst the priest officiates at mass, a bell is rung at the elevation, to apprise the people to cast their eyes upon their new-formed Saviour and adore him.

St. Lewis decreed, that they should fall on their knees at the elevation, in imitation of certain religious whom he does not name. The Chartreux, and the religious de la Trappe, still observe this ceremony of prostrating themselves at the elevation.

ELEVATION, *Angle of*, in *Mechanics*, is the angle A R B (*Plate* XXII. *Mechanics fig.* 4.) comprehended between the line of direction of a projectile A R, and the horizontal line A B. See PROJECTILE and ANGLE.

ELEVATION *of a Cannon or Mortar piece*, is the angle which the chase of the piece, or the axis of the hollow cylinder, makes with the plane of the horizon.

ELEVATOR, in *Anatomy* is a name given to several muscles of the body, which have the office of elevating or drawing upwards the parts into which they are inserted. It has the same import with levator or attollens, and is directly opposite to depressor.

ELEVATOR *Alæ Nasi*, is a name given by Cowper to the *Compressor narium*, which see.

ELEVATOR *Auris*, is the same with attollens auriculam. See EAR.

ELEVATOR *Humeri*, is an old name for the *Deltoides*, which see.

ELEVATOR *Labiorum communis*, the same with levator anguli or . See DEGLUTITION.

ELEVATOR *Labii inferioris*, is described in the article DEGLUTITION, under the name of levator menti.

ELEVATOR *Labii superioris*, is a name given by some authors to that part of the levator labii superioris and alæ nasi, which is inserted into the upper lip. See DEGLUTITION.

ELEVATOR *Oculi*, is the superior straight muscle of the eye. See EYE.

ELEVATOR, in *Surgery*, an instrument for raising depressed portions of the skull.

Besides the common elevator, now generally preferred by all the best operators, several others have been invented, as, for instance, the tripod elevator, and another which was first devised by M. I. L. Petit, and afterwards improved by M. Louis.

The common elevator is an exceedingly simple kind of instrument, being in fact a mere lever, the end of which is somewhat bent, and made rough, in order that it may be less apt to slip away from the piece of bone which is to be raised. This instrument may be used by forming a fulcrum for it, either in the hand which holds it, or on the fingers of the other hand; or the operator may make a fixed point for it on the edge of the opening made with the trephine, or of that which the accidental violence has occasioned. In the first case, it has been objected, that the instrument cannot be employed with much force; the hand may give way; or the elevator may slip away from the bone against which it presses, and thus produce a considerable concussion. In the second case, it has been found objectionable, that the part on which the instrument is placed may be forced inward.

Such were the inconveniences which led to the invention of the tripod elevator, one piece of which consists of three branches uniting above into one common trunk. This part of the elevator is pervaded by a long screw, having below a kind of hook, and above a sort of handle for turning it. It is with the hook that the depressed portion of bone is to be elevated. This part of the instrument is to be introduced into the opening made in the cranium, as soon as the elevator has been put in a proper position; and it is to be made to ascend, by turning the screw. Formerly, the tripod elevator was also sometimes used conjointly with a sort of screw, which was first fixed in the piece of bone about to be elevated, and then drawn upward, by placing the hook in a ring, which was attached to its upper part.

The inventors of the tripod elevator were certainly very well acquainted with the imperfections of the common one; and they endeavoured to obviate them, by procuring a firmer fulcrum, and a greater degree of power. But it was necessary to change the situation of their elevator, as often as there was occasion to raise a different portion of bone; and the hook, also, being connected with an inflexible piece of steel, the direction of which was always the same as that of the instrument, it became troublesome and difficult to place the hook under the piece of bone, which stood in need of being raised.

On the foregoing accounts, M. J. L. Petit was induced to invent a new elevator. This consisted of a lever, mounted on a handle, and straight throughout its whole length, except just at its very end, which was slightly curved, in order that it might be more conveniently put under the portion of bone which was about to be elevated. The lever under consideration was pierced at various distances from its bent end with several holes, intended for the reception of a little kind of moveable screw-peg, which was fixed on the top of a sort of bridge. This latter part of the instrument consisted of a kind of arch, the ends of which were long and covered with little cushions, while on its centre was placed the little screw-peg already mentioned. M. Petit wished the peg to be joined to the bridge by means of a hinge; and as he often found it necessary to elevate several different pieces of bone in the same case, he thought that the little screw should not be completely fastened in the hole, but that the instrument should be capable of being turned to the right, or left, or to any point of the cranium. However, the structure of the screw only allowed the instrument, on turning this to the right or left, to be applied with its edge obliquely under the bone which one wished to elevate.

M. Louis endeavoured to remove the inconveniences of Petit's elevator, by substituting for the hinge a sort of pivot. This construction rendered the lever capable of being readily moved in every direction, and of being put under any point of bone, which required being elevated, without any necessity for altering the position of the bridge forming the fulcrum.

We have only to repeat, respecting elevators, that all the best modern surgeons give the preference to the common one, which is most simple, and is found to answer every desirable purpose. See TREPAN.

ELEVE, a term purely French, though of late used also in our language. Literally it signifies a disciple or scholar, bred up under any one, being formed from the Italian, *allievo*, an apprentice or novice.

It was first used by the French writers, in speaking of painters; such a painter was an eleve of Da Vinci, of Raphael, &c. From painting it came to be applied to such as studied or learned any other art under a master. In the Royal Academy of Sciences, there were twenty eleves; and in

in that of inſcriptions, ten eleves. The eleves were to act in concert with the penſionaries.

The denomination eleve, however, was afterward ſuppreſſed, and that of adjoint ſubſtituted in its room; becauſe every body did not know the ſenſe affixed to it by the academy: and hence the penſionary academiſts had not, as formerly, each of them an eleve; but the eleves became adjoints, or aſſociates of the academy. See ACADEMY.

ELEUS, in *Ancient Geography*, an iſland of Aſia Minor, on the coaſt of Ionia; placed by Thucydides in the vicinity of the town of Miletus.

ELEUSA, an iſland of Cilicia, according to Pliny; named Sebaſta by Ptolemy; ſituated N. of Rhodes.—Alſo, an iſland of Greece, on the coaſt of Attica, in the Saronic gulf, S. of mount Hymettus, and oppoſite to a ſmall promontory. Pliny.

ELEUSIN, a town of Greece, in the iſland of Thera. Ptolemy.

ELEUSINE, in *Botany*, Gærtn. t. 1. See CYNOSURUS, ſp. 12.

ELEUSINE, in *Ancient Geography*, a village of Egypt, ſituated near Alexandria and Nicopolis, on the canal of Canopus, according to Strabo.

ELEUSINIA, in *Antiquity*, the myſteries of the goddeſs Ceres, or the religious ceremonies performed to her honour; thus called from *Eleuſis*, a maritime town of the Athenians, wherein was a temple of that goddeſs, famous for the celebration of theſe myſteries. See CEREALIA.

Some writers call the city where the Eleuſinia were celebrated, *Eleuſinia* or *Eleuſis*: Harpocration confirms this orthography, in deriving its name from *Eleuſinus*, a ſon of Mercury; to which opinion Pauſanias likewiſe adheres, in his Attics. Others who write it ἐλευσις, *Advent*, ſuppoſe it thus called becauſe Ceres, after running over the world in ſearch of her daughter, ſtopped here, and put an end to her purſuit. Diodorus Siculus, lib. v. will have the name *Eleuſis* to have been given this city, as a monument to poſterity, that corn, and the art of cultivating it, were brought from abroad into Attica.

The Eleuſinia were the moſt ſolemn and ſacred ceremonies in uſe among the Greeks; for which reaſon they were called *myſteries*, by way of eminence. They are ſaid to have been inſtituted by Ceres herſelf, at *Eleuſis*, in memory of the zeal and affection wherewith the Athenians received her.

This is the account Iſocrates gives in his Panegyric: but Diodorus Siculus aſſures us, lib. vi. that the Eleuſinia were inſtituted by the Athenians, in gratitude to Ceres, for having inſtructed them to lead a leſs barbarous and ruſtic life: yet the ſame author, in the firſt book of his Bibliotheca, relates the thing in another manner.

A great drought, ſays he, having occaſioned a miſerable famine throughout all Greece, Egypt, which had that year reaped a moſt plentiful harveſt, beſtowed part of the fruits thereof upon the Athenians. It was Erechtheus that brought this extraordinary ſupply of corn: in commemoration of which benefaction, Erechtheus was created king of Athens, who inſtructed the Athenians in theſe myſteries, and the manner of celebrating them.

This account comes near to what we are told by Herodotus and Pauſanias, *viz.* that the Greeks acquired the knowledge of their gods and their religion from the Egyptians.

Theodoret, lib. i. Græcanic. Affect. writes that it was Orpheus, not Erechtheus, who made this eſtabliſhment, and who inſtituted for Ceres what the Egyptians practiſed for Iſis; which ſentiment is confirmed by the ſcholiaſt on the Alceſtes of Euripides.

Eleuſis, the city where theſe myſteries were celebrated, was ſo jealous of the glory thereof, that, when reduced to the laſt extremity by the Athenians, it would not ſurrender but on this condition, that the Eleuſinia ſhould not be taken away; though theſe were no religious ceremonies peculiar to the town, but were held common to all Greece.

There were two kinds of Eleuſinia, the *greater*, and the *leſs*; thoſe we have hitherto been ſpeaking of were the greater.

The *leſſer* were inſtituted in favour of Hercules; for that hero deſiring to be initiated into the former, and the Athenians not being able to gratify his wiſhes, becauſe the law prohibited any ſtranger being admitted; being loth, however, to give him an abſolute denial, they inſtituted new Eleuſinia, in which he aſſiſted. Theſe were afterwards celebrated at Agra, near Athens. The greater were held in the month of Boedromion, which anſwered to our Auguſt; and the leſſer in the month Anthefterion, which happened in our January. People were only brought to partake of theſe ceremonies by degrees; at firſt, they were to be purified; then admitted to the leſſer Eleuſinia; and at laſt initiated into the greater. Thoſe, who were yet only at the leſſer, were called *myſtæ*; and thoſe admitted to the greater, *epoptæ*, or *ephori*, i. e. *inſpectors*. They were uſually to undergo a probation of five years, before they paſſed from the leſſer to the greater. Sometimes, indeed, they were contented with a ſingle year; immediately after which they were admitted to the moſt ſecret religious parts of the ceremony. When any perſon was initiated, he was introduced by night into the temple, after having his hands waſhed at the entry, and a crown of myrtle put upon him. Then was opened a little box, containing the laws of Ceres, and the ceremonies of her myſteries; which the initiated perſon was to read and tranſcribe. A ſlight repaſt ſucceeded this ceremony; after which the myſta entered into the ſanctuary, over which the prieſt drew the veil, and then all was inſtantly in darkneſs. A bright light ſucceeded, and exhibited to view the ſtatue of Ceres, magnificently adorned; and while they were attentively contemplating it, the light again diſappeared, and was ſucceeded by profound darkneſs. Peals of thunder, and flaſhes of lightning, and a thouſand monſtrous figures that were perceived on all ſides in the midſt of the ſanctuary, filled the initiated with conſternation and horror; but the next moment a calm ſucceeded, and there appeared in broad day-light a pleaſant meadow, in which all ſeemed to dance and participate of mirth. Amidſt this jollity and mirth, it is ſaid, the tenets of the myſteries were revealed. Meurſius has an expreſs treatiſe on the Eleuſinia, where moſt of theſe points are proved.

Secrecy, as Le Clerc after this writer ſuggeſts, was enjoined with great ſtrictneſs, not ſo much to conceal the abominations charged on theſe myſteries by the Chriſtian fathers, as becauſe the initiated were thus let into the firſt hiſtory of Ceres and her daughter, which it was neceſſary to conceal from the public; but if it were known that theſe two goddeſſes were merely mortal women, their worſhip would have become contemptible. Cicero (Tuſc. Quæſt. l. i. c. 13.) favours this opinion. See MYSTERIES.

The matter of theſe myſteries, as related by Arnobius and Lactantius, was an imitation, or repreſentation, of what mythologiſts teach of Ceres. They laſted ſeveral days; during which, the people ran about with burning torches in their hands; ſacrificed abundance of victims, not only to Ceres, but alſo to Jupiter; made libations from two veſſels, one of them to the eaſt, and the other to the weſt; marched in

in pomp to *Eleusis*, making pauses from time to time, wherein they sung hymns, and sacrificed victims; and this they performed not only in going to *Eleusis*, but in returning back to Athens. For the rest, they were obliged to keep it an inviolable secret; and the law condemned to death any one who should dare divulge their mysteries. Tertullian, in his book against the Valentinians, relates, that the figure shewn in the Eleusinia, and which was so expresly prohibited to be made public, was that of a man's privy parts. Theodoret, Arnobius, and Clemens Alexandrinus, likewise make mention of it; but they say it was the figure of a woman's privities.

The day after the feast, the senate assembled at *Eleusis*, apparently to examine whether every thing had been managed according to order.

ELEUSINUS Sinus, in *Ancient Geography*, an ancient name for the Saronic gulf.

ELEUSIS, a town of Attica, on the bank of the Saronic gulf, N. W. of Athens; in which the Eleusinian mysteries were celebrated. See the preceding article.

Dr. Adam Clarke has lately (*viz.* in 1808) published a fac simile of a Greek inscription found on a stone, which was formerly discovered at Eleusis. This inscription, according to the suggestion of the late learned professor Porson, was posterior to the subjugation of Greece by the Romans, as appears by the mixture of the Roman with the Greek names. The stone was seen by M. Spon at Eleusis in 1676, and probably by Mr. George Wheeler, who accompanied him, and who afterwards settled in England. But Dr. Chandler, about 100 years after, could not meet with it, though he made diligent search for it: the stone was, therefore, probably removed before his time. It is not improbable that Wheeler might have brought it with him. By some accident or other it fell into the hands of some person, who, ignorant of its value as a relic of Grecian antiquity, put it down in the back kitchen of a house in North-green, Worship street, London, where it long served the purpose of a paving stone and chopping block. Here it was discovered in the year 1807.

ELEUTHERA Cilicia, a port of Cilicia, situated at the angle which was formed by mount Taurus and mount Amanus, in the vicinity of Cappadocia and of Syria.

Eleuthera, a town placed by Ptolemy in the interior of the isle of Crete, and so called from Eleuther, one of the Curetes.

Eleuthera, or *Alabaster island*, in *Geography*, one of the Bahama islands, whose climate is healthy and soil fertile. It has a fort and a garrison. N. lat. 25° 14′. W. long. 76° 31′.

ELEUTHERÆ, in *Ancient Geography*, an ancient town of Bœotia, which was afterwards transferred to the Athenians. In this town was a temple dedicated to Bacchus, and also a cavern and a fountain.—Also, a town on the river Ister. Steph. Byz.

ELEUTHERIUS, in *Biography*, bishop of Rome, was a native of Nicopolis, and flourished in the second century. He was first a deacon of the church, and about 177, or perhaps sooner, was elected bishop on the death of Soter. Soon after his elevation, letters were addressed to him by the martyrs of Lyons, then shut up in prison, on the subject of the peculiar tenets of Montanus and his followers; the object of which was to recommend healing and temperate measures in the treatment of that sect. During the episcopate of Eleutherius, the church is said to have enjoyed much peace, notwithstanding the parties which rose up, and which zealously contended for the truth. Among these were persons headed by Florinus and Blastus, both presbyters, who maintained that God was the author of evil as well as good. They were degraded for this heresy, and cut off from the body of the faithful. Eleutherius died in the year 192, and he is remembered by the additions which he made to the pontifical code, and which reflect credit on his liberality: of these, one enacted that a man should not abstain from any sort of meat that was commonly eaten; and the other, that sentence should not be pronounced against any one accused of crimes, unless he were present to make his defence. According to Bede it was at this period that an embassy was sent by Lucius, king of Britain, to Rome, to request the pope to send over proper persons to explain to him and his people the nature of the Christian faith. Eusebius and other early historians not having noticed this fact, it stands on very doubtful authority. Lardner. Moreri.

Eleutherius, Ἐλευθέριος, in *Antiquity*, a Greek word, signifying *liberator*, or *deliverer*. It was used by the Greeks as a surname, or epithet of Jupiter, given him on occasion of his having gained them the victory over Mardonius, general of the Persians, and killed, as they say, 300,000 men of his army; and, by that means, delivered them from the danger they were in of being brought under the Persian yoke.

The word is formed from ἐλευθέρος, *free*.

There were also feasts solemnized on this occasion, in honour of Jupiter Eleutherius, and called *Eleutheria*. They were held every five years, with races of armed chariots, &c. The Scholiast on Pindar, Olymp. Od. 7. says, they were celebrated at Platea, the place where the victory was obtained.

The Samians had another festival of this name, in honour of the god of Love; and slaves, when they obtained their liberty, were wont to keep a stated holiday in remembrance of the happy day in which they were made free. Potter's Archæol. Græc. lib ii. cap. xx. tom. i. p. 388.

ELEUTHEROPOLIS, in *Ancient Geography*, a town of Palestine, situated at the distance of 6 miles S. of Diospolis, 20 miles from Jerusalem, and 24 miles from Ascalon, according to Antonine's Itinerary. On the W. and N. it was bounded by a plain, and on the E. by the mountains of Judea. It was an episcopal see under the metropolis of Cæsarea; and after the division of Palestine into two provinces, it belonged to Palestina Prima.

ELEUTHERUS, a river of Phœnicia, whose source was among the northern eminences of mount Libanus, and which, swelling at certain times of the summer by the liquefaction of the snow, might derive its name, (ἐλευθέρος, *free*,) from this circumstance. Sandys, and others after him, suppose it to be the same with the Cassimair, betwixt Sidon and Tyre. Whereas Ptolemy, with whom Dr. Shaw agrees, places it according to the present position of the "Nahr el Berd," 6 miles to the northward of Tripoly. Both these rivers agree in a circumstance mentioned by Pliny, that at a certain season of the year, this river is so full of tortoises, that they were easily taken. This river forms the boundary betwixt Syria and Phœnicia.—Also, a river of Sicily, the source of which is marked in De l'Isle's chart, in mount Cratas, and its mouth E. of Orethus. Its modern name is "Fiume di Misimeh."

ELF, or Elves Locks, in *Antiquity*, locks of hair longer than the rest, or complicated and matted hairs, which are supposed to have been twisted into knots by the latent influence of elves or fairies, to which Shakespear adverts.

——— "This is that very mab,
That plats the manes of horses in the night,
And cakes the elf locks in foul sluttish hairs;
Which once entangled much misfortune bodes."
Midsummer Night's Dreams.

A superstitious notion, which originated in the ignorance of

of the dark ages, and is ſtill prevalent amongſt the ſecluded vulgar; who conſider it ominous of ill luck to have theſe pulled or ſhorn: they are therefore preſerved with great care, as being eſteemed a favourable appearance. To this cuſtom Apuleius alludes, when he ſays, "Adjuro per dulcem capilli tui nodulum."

ELFS, or *Elvæ*, called alſo *Fairies*, the names of deities honoured among the Saxons, with a kind of ſacrifice called *Alf blot*.

ELFS *arrows*, a name given by the people of ſome parts of Scotland to certain ſtone weapons which they find, and which have been in uſe before tools and weapons of iron were uſed there. It is not only in Scotland that theſe are found, but in America, and many other places alſo. They are ſtyled by ſome *ceraunia*, and *thunder-bolts*, and are ſuppoſed to have fallen from the clouds in ſtorms of thunder; others, not leſs erroneouſly, ſuppoſe them to be natural foſſils; but their true origin is from the workmanſhip of man, out of common flints, and other ſtones. Woodward's Cat. Foſſ. ii. p. 52.

ELFCARLEBY, or ELFKARLEBY, in *Geography*, a ſmall town of Sweden, in the government of Upial, on the Baltic ſea, near the place where the river called the Dal Elbe, or Dal Elfwe, diſcharges itſelf into that ſea.

ELFDAL, or ELFDALEN, a ſmall town of Sweden, in the province of Dalecarlia.

ELFEDSJ, a mountain of Arabia, in the province of Yemen; 12 miles N. E. of Abuariſch.

ELFRIC. See ÆLFRIC.

ELFSBORG, OLD, a town of Sweden, in the province of Weſt Gothland, with a ſtrong caſtle near the ſea; 4 miles S. W. of Gothenburg.

ELFSBORG, *New*, a fortreſs of Sweden, in Weſt Gothland, on an iſland at the mouth of the Moldal; 4 miles W. of Gothenburg.

ELGA, a river, which riſes 3 miles N. from Penna Macor in Portugal, and runs into the Tagus, between Alcantara and Ruſmarthal, ſeparating the counties of Spain and Portugal, during its whole courſe of about 30 miles.

ELGATTAN, a town of Africa, in the kingdom of Algiers; 37 miles S. of Bona.

ELGEND, a town of Arabia, in the country of Hadramaut; 60 miles W. of Hadramaut.

ELGERSBURG, a ſmall town of Germany, in the duchy of Saxe Gotha, not far from the Thuringian foreſt, remarkable for its manufacture of lamp black.

ELGG, a town and lordſhip of Switzerland, in the canton of Zurich.

ELGIEHAMA, a town of Africa, in the empire of Morocco, about 2 leagues from mount Atlas.

ELGIN, the capital of the county of Elgin, formerly an epiſcopal ſee, but at preſent a royal burgh, or borough, is ſituated upon the river Loſſey, about ſeven miles from the point where it falls into the North ſea, at the diſtance of 108 miles from Edinburgh. The name of Elgin, from whence the county has received one of its denominations, the other being Moray, is ſuppoſed to be derived from *Helgy*, general of the army of Sigard, the Norwegian earl of the Orknies, who, about the year 927, conquered that part of Scotland north, comprehending the preſent counties of Caithneſs, Roſs, Sutherland, and Moray. For the Norwegian hiſtory relates that he built a town to the ſouthward of Duffeyrus, and Elgin anſwers that deſcription as to its ſeite, which is alſo confirmed by the name. The Norwegians had an harbour at Burgh Duffeyr; ſeveral of their princes were named *Helgy*, and the inſcription on the common ſeal of this place is, "ſigillum commune civitatis de Helgyn." During the irruptions to which this part of Scotland was ſubjected by the northern men, Elgin had a royal fort. It appears to have been firſt incorporated in the time of Alexander II. about the year 1234. The charter grants a common guild to the burgeſſes, whence it probably then poſſeſſed ſome foreign commerce; for, in 1383, a large veſſel, called *Far coaſt*, was the property of the guild. Mr. Pennant deſcribes it as a good town, having many old houſes built after the ancient manner, the fronts projecting over piazzas, like thoſe in the city of Cheſter; and it abounds with eccleſiaſtical antiquities, which beſpeak its former conſequence. The noble cathedral, from its ruins, appears to have been once a magnificent pile. A large tower on the north and ſouth ſide of the building ſtill remains; but the central one, with the lofty ſpire and the whole roof, are fallen, which, with the mutilated fragments of monumental figures, repreſenting prelates, peers, and knights, in awful diſlapidation, beſpeak the vanity of all attempts at poſthumous perpetuity. At the eaſt end two tiers of lancet-pointed windows remain; but the body is ſo ruinous as to be not eaſily defined. The weſt door is richly decorated with carving, and the choir is beautiful, with a light baluſtraded gallery running round the whole. Among other diſtinguiſhed perſonages, Boethius ſays, king Duncan I., who was ſlain by Macbeth at the ſiege of Inverneſs, is buried here. This cathedral was built by Andrew de Moray, A D. 1224, on land granted by Alexander II., whoſe remains, the ſame year, were depoſited in the choir. The principal tower was erected, and ſome other additions made to the building by biſhop Innes, as appears from an inſcription on a column. The country in the vicinity being fertile, extremely pleaſant, and proviſious plentiful, are circumſtances that induce many wealthy families to take up their winter abode in Elgin, which may be conſidered to the highlands what Edinburgh is to the lowlands of Scotland. In 1792 it contained 658 families, and 2920 ſouls. Pennant's Tour in Scotland, and ſir John Sinclair's Statiſtical Account of Scotland.

ELGIN, *County of*. See MORAYSHIRE.

ELGIS, a town of Egypt; ſix miles S. of Abu-Girgè.

ELGUS, in *Ancient Geography*, a ſmall town of Aſia Minor, in Lycia.

ELHAM, or ELAM, in *Geography*, a town of Kent, England, was at a former period a place of ſome note and conſequence; for, according to Philpott, in his hiſtory, &c. of the county, "though now the magnificent ſtructures, which in elder times were here, be diſmantled, and have only left a maſs of deplored rubbiſh to direct us where they ſtood, yet in Domeſday Book it is written, that the earl of Ewe, a Norman, and near in alliance to the Conqueror, held it, and left the reputation of an honour unto it, as the reputation of the aid granted at the making of the Black Prince a knight, in the twentieth of Edward III., doth warrant." The grant of the market was made in the thirty-ſixth of Henry III., at the inſtance of prince Edward, who then owned the manor, and who afterwards alienated it to archbiſhop Boniface. It is now the property of ſir Henry Oxenden, bart. of Broome. Elham park, of which mention occurs in the records of the time of Henry III., is now, like ſeveral other ancient parks in this part of the county, overgrown with wood. The church is a large building, conſiſting of a nave, aiſles, and chancel, with a maſſive embattled tower, crowned with a ſmall ſpire. The nave, which is divided from the aiſles by pointed arches, opens to the chancel by a very large pointed arch. Elham is ſixty-five miles diſtant from London, contains 27 houſes and 144 inhabitants, and has four annual fairs; the market has been long diſcontinued. Hacked's Hiſtory of Kent.

EL-

EL-HAMMA, a town of Africa, in the country of Tripoly. N. lat. 34°. E. long. 10° 40′.

ELI, in *Biography*, high-priest of the Israelites, and judge of that people for 40 years, was a descendant of Ithamar, the younger branch of Aaron's house, and united the offices of high-priest and judge about the year 1156 B.C. He is charged with contributing to the degeneracy of the people over whom he presided, however pious and good with respect to his own character, by want of resolution to reprove and punish immorality, and by a culpable inattention to the conduct of his own sons. The negligence of Eli in the discharge of his office entailed calamities both on the Israelites and on his own family. The former were defeated by the Philistines, the two sons of Eli were slain, and the ark, which was a symbol of the divine presence, was captured by the enemy. The afflictive intelligence overpowered the remaining strength of Eli, so that he fell backwards from his seat, and broke his neck, and died in the 98th year of his age.

ELIA, in *Ancient Geography*, a place of Greece, in the Peloponnesus; supposed by Polybius to be the most pleasant part of Laconia. Livy says that it lay E. of the mouth of the Eurotas.—Also, a town of Palestine, between Naplous and Ascalon, according to Antonine's Itinerary. Some suppose that it was the same with Jerusalem, which the Romans called "Ælia."

ELIAC School, in the history of *Philosophy*, a school established by Phædo of Ælis, and so called from the place of his birth. This school adhered so closely to the doctrine of Socrates, that it is scarcely to be considered as a separate sect. Phædo, its founder, was descended from an illustrious family, but being deprived of his patrimony in early life, he was sold as a slave at Athens. Socrates, however, accidentally observing in his countenance traces of an ingenuous mind, persuaded one of his friends, Alcibiades or Crito, to redeem him. From this time Phædo became a disciple of Socrates, and devoted himself to the diligent study of moral philosophy under his instruction; and he adhered to the last to his master with the most affectionate attachment. He instituted a school at Elis, after the Socratic model, which was continued by Plistanus, an Elian, and afterwards by Menedemus of Eretria, whence it obtained the name of the "Eretrian" school. Menedemus, having removed this school to Eretria, delivered his lectures to his disciples, not seated on circular benches around him, which was the usual mode, but whilst they attended him in whatever posture they pleased, standing, walking, or sitting. Menedemus rose, from the contempt with which he was first received, on account of the vehemence of his mode of disputing, into high esteem, and was intrusted with a public office, to which was annexed an annual stipend of 200 talents. He discharged his trust with fidelity, and accepted only a fourth part of the appointment. He was honoured with several important embassies, by which he essentially served his countrymen; but becoming jealous of his intimacy with Antigonus, who became one of his disciples, they induced him to make his escape to this prince. Thus mortified and disappointed, he precipitated his end by abstaining for several days from food, and died in the 84th year of his age, and about the 124th olympiad. His genius was versatile and his elocution fluent. Severe in inveighing against the vices of others, and pure in his own manners, he commanded universal respect. In his mode of living he was singularly temperate; and his entertainments, consisting chiefly of vegetables, were always enlivened by liberal conversation.

Nothing farther is known concerning the preceptors of the Eliac or Eretriac schools, but that they studiously avoided, and strenuously opposed, the sophistical fooleries of the Megaric sect, and adhered closely to the simple doctrines, and useful precepts, which they had received from Socrates. Brucker's Philos. by Enfield, vol. i.

Elias Levita, in *Biography*, a celebrated Jewish rabbi, who flourished in the 16th century, was a native of Germany, but spent the greatest part of his life at Rome and at Venice, where he was employed in teaching the Hebrew language. He was distinguished not only by his learning, but by his critical judgment; and accordingly he exploded many of the unfounded traditions of the Jews; and particularly that which referred the introduction of the vowel points to the time of Ezra, rightly ascribing it to a much later period, or about the 6th century of the Christian era. He was the author of several valuable works, that facilitate an acquaintance with the Hebrew language and writings. Among these we may enumerate his "Masoret Hammasoret," and his "Sepher Zickroneth," or collection of Masoretic observations from ancient authors: his "Chaldaic, Talmudic, and Rabbinic Lexicon," published in 1541, fol.;—his Hebrew glossary, entitled "Thisbi," published by Fagius in 1542, 8vo.;—and several works on Hebrew grammar, &c.

Elias, Matthew, or Matthias, a painter of history and portraits, born at Cassel in 1658. His parents were very poor, and he was employed in taking care of cattle, and whilst they were grazing he amused himself by endeavouring to draw figures on the ground. A painter of history, of the name of Corbeen, one day saw him drawing a fortification, with some figures, in his usual mode; and pleased with the youth's ingenuity, requested of the parents of Elias to let him educate him, and teach him the art of painting. Corbeen behaved liberally to him; and Elias repaid it by diligent study, and making very considerable progress in the art, being very grateful for the great kindness he had received from his master. Corbeen appears to have maintained him some time at Paris for his improvement, whence he went to Dunkirk, and there painted an altarpiece, representing the death of St. Barbe, which raised his reputation. He designed correctly, and composed his pictures well, but did not succeed so well in colouring. His works cost him much labour to sketch out, and prepare for the easel, which defect of his genius he was conscious of, and endeavoured to conceal, by not allowing any one to see his preparations. His portraits of men are generally more approved than those he painted of women, which want grace and beauty. He died in 1741, aged 83.

Elias, *Mount St.* in *Geography*, a mountain near the shore of the N.W. coast of America, N.W. of Admiralty bay, and S.E. of Prince William's sound.

ELIBERIS, or Illiberris, in *Ancient Geography*, a large and rich town of Gallia Narbonnensis; situated S. of Rusciono. Constantine the Great re-established this town, and built a castle, which he called after the name of his mother Helena. It is supposed to be the modern *Elna*.—Also, the name of a river, which watered the above-mentioned town, supposed to be *Le Tec*.—Also, a town of Spain, in Bœtica, which was a considerable place, and seated on a mountain, called *Sierra d'Elvira*.

ELIBIA, an episcopal town of Africa, in the proconsular province.

ELICA Pashnum, in *Natural History*, a name given by the people of the East Indies to a kind of red orpiment, found very frequently in that part of the world, and given internally after calcination, in intermitting fevers.

ELICE, or Helice, in *Botany*, a name by which the ancient Greek writers have sometimes called the willow, though the more general name among them is *hea*. Hesychius

ſychius gives many inſtances of the willow being called *helice*.

ELICHMAN, John, in *Biography*, an eminent phyſician, was a native of Sileſia, and practiſed medicine with great reputation in the 17th century. His ſkill as a linguiſt was extraordinary, for he was well verſed in ſixteen languages. He propagated an opinion, which, to thoſe acquainted with the idioms and ſounds of the two tongues, muſt appear extremely excentric: that the German and the Perſian were cognate, or derived from the ſame origin. He made a Latin tranſlation of the Tablet of Cebes, which, with the Arabic verſion and the original Greek text, were publiſhed in the year 1640, under the inſpection of that celebrated critic Salmaſius, who prefixed an ample and learned introduction.

ELICHRYSUM, in *Botany*, ἑλιχρυσος, or ἑλειοχρυσος, from ἑλειος, *marſhy*, and χρυσος, *gold*, is an ancient Greek appellation for ſome yellow flower growing in marſhy ſituations. The deſcription of Dioſcorides may very well apply to *Gnaphalium orientale*, or rather to G. *Stoechas* of Linnæus; eſpecially as he mentions rough and rugged ground, not marſhes, for the place of growth of his ἑλιχρυσον What the poets intended by the above name is more difficult to determine; nor does Theophraſtus lend us much aſſiſtance. Among the moderns Matthiolus has taken *Tanacetum annuum* for the plant in queſtion, but without much probability. Tournefort adopted the name for a genus of his own, which includes the two *Gnaphalia* above-mentioned, among numerous other ſpecies whoſe flowers are not yellow, neither do ſcarcely any of them grow in moiſt places. Linnæus, therefore, who united this genus to the *Gnaphalium* of the ſame author, retained the latter name, as by far the moſt ſuitable of the two. This deciſion was reverſed by Gærtner, becauſe he followed Tournefort in eſtabliſhing *Santolina maritima* as the only true *Gnaphalium*; and by aſſuming the ſpecific name *verum*, he ſeems to imply that this plant is the γναφαλιον of Dioſcorides, a point equally difficult to confirm or refute. Finally, Willdenow, at the ſuggeſtion of Juſſieu, in judiciouſly ſeparating from the Linnæan *Xeranthemum* ſuch ſpecies as, contrary to the generic character, have a naked receptacle, has choſen for them the name *Elichryſum*, by which many of theſe plants had already been called in various books. Willd. Sp. Pl. v. 3. 1903. (Xeranthemum; Linn. Gen. 420. Schreb. 551. Ait. Hort. Kew. v. 3. 179. Mart. Mill. Dict. v. 4. Juſſ. 179.) Claſs and order, *Syngeneſia Polygamia-ſuperflua*. Nat. Ord. *Compoſitæ nucamentaceæ*, Linn. *Corymbiferæ*, Juſſ.

Gen. Ch. *Common calyx* imbricated; ſcales numerous, lanceolate, ſcarioſe, permanent, the inner ones longer than the diſk, coloured, ſhining, forming a radiant circle round the whole compound flower. *Cor.* compound, unequal; *florets* of the diſk very numerous, all perfect, tubular, funnel-ſhaped, much ſhorter than the calyx, in five equal ſpreading marginal ſegments; thoſe of the circumference fewer, female, tubular, the length of the former, five-cleft, but rather unequally. *Stam.* (in the perfect florets) Filaments five, very ſhort; anthers forming a cylinder about as long as the corolla. *Piſt.* (in the ſame florets) Germen ſhort; ſtyle thread-ſhaped, longer than the ſtamens; ſtigma cloven: the female florets differ only in having a ſimple club-ſhaped ſtigma, and no traces of ſtamens. *Peric.* none, except the calyx ſcarcely at all altered. *Seed* in both kinds of florets alike, oblong; down capillary or feathery. *Recept.* naked.

Eſſ. Ch. Receptacle naked. Down capillary or feathery. Calyx imbricated, its inner ſcales forming a coloured ſpreading radius.

Willdenow enumerates twenty-three ſpecies of this genus, which include moſt of the fineſt everlaſting-flowers of the Cape of Good Hope. Several more, however, require to be added to this liſt from New Holland, eſpecially *Xeranthemum bracteatum*, Venten. Jard. de la Malmaiſon, t. 2, Andr. Repoſ. t. 375, an annual ſpecies of great ſplendour, which, if raiſed on a hot-bed in the ſpring, or even in the natural ground, proves very ornamental to the flower-garden in autumn, and may be preſerved for a winter noſegay of long duration. This flower outvies the *fulgidum*, Jacq. Ic. Rar. t. 173, Curt. Mag. t. 414, an old inhabitant of the greenhouſe, native of the Cape. More elegant Cape ſpecies, perhaps, are the *faſciculatum*, Andr. Repoſ. t. 242, and *ſeſamoides*, Curt. Mag. t. 425; but eſpecially *proliferum*, Andr. Repoſ. t. 374. All theſe laſt require the ſhelter of a green-houſe or conſervatory, and regular, but moderate ſupplies of water in winter.

ELICIT, or Elicite, in *Ethics*, is applied to an act of the will, immediately produced by, and of the will, and received within the ſame.

Such are willing, nilling, loving, hating, &c. Theſe acts are denominated elicit, becauſe, being before in the power of the will, they are now brought forth into act. But they are ſo far intrinſic, that ſome authors conſider them as the will itſelf; and deny they ought to be diſtinguiſhed from it any more than light is to be diſtinguiſhed from the ſun.

ELIDION Promontorium, in *Ancient Geography*, a promontory of Thrace, in the ſouthern part of the promontory "Eſtiæ," and in the eaſtern part of the "Rhodiorum portus," on the Boſphorus of Thrace.

ELIDRION, a word uſed by the early writers in *Medicine*, in ſeveral different ſenſes; ſome uſing it as the name of maſtic, others of raphontic, and others of crude mercury. Some of the chemical writers have alſo made it expreſs a certain mixed metal, compoſed of three parts; one ſilver, another braſs, and the third gold.

ELIENESS, in *Geography*, a cape of Scotland, on the S. coaſt of the county of Fife, at the mouth of the Frith of Forth. N. lat. 56° 10′. Long. 0° 22′ E. of Edinburgh.

ELIENSIS, in *Ancient Geography*, an epiſcopal town of Africa, in the Byſacene territory.

ELIGENDO Viridario. See Viridario.

ELIGIBILITY, in the Romiſh *Canon Law*. A bull of eligibility, is a bull granted by the pope, to certain perſons, to qualify them to be choſen, or inveſted with an office, or dignity, whereof they were before incapable, by reaſon of want of age, birth, or the like.

The word is formed of the Latin *eligere*, to choſe; whence the word eligibilitas, &c.

In ſeveral churches in Germany, a perſon, who is not of the chapter, cannot be elected biſhop, without a bull of eligibility.

ELIGII Morbus, a name given by ſome medical writers to a fiſtula.

ELIGMA, a name given by Nicolaus, Myrepſius, and ſome other authors, to that form of medicine, now called a linctus or lambative.

ELIJAH, or Elias, ſurnamed the *Thiſbite*, from his native town or territory, in *Biography*, was one of the moſt diſtinguiſhed of the Jewiſh prophets. He commenced the exerciſe of the prophetic office about 920 years B. C. and his firſt commiſſion was directed againſt Ahab, whoſe impious character and encouragement of idolatry merited reproof. The ſovereign, however, was incenſed, and the prophet was obliged to withdraw from the threatened effects of his indignation. During his retirement, Providence miraculouſly afforded him the means of ſubſiſtence. In the mean while the country was viſited with a famine, as a token of divine diſpleaſure, and at the termination of this diſtreſs, which laſted three

three years, the prophet made another attempt, under divine admonition, to reclaim Ahab from the profligacy of his conduct. The first interview produced mutual recrimination; but Elijah determined to evince to the full satisfaction of the assembled Israelites the absolute nullity of those Sidonian deities, in whom they had confided. The contest between the prophet and the priests of Baal is beautifully narrated in the sacred writings; the result, however, was the complete triumph of the former, and the ignominious defeat of the latter, who became victims to the indignation of the people, whom they had deluded into the practice of idolatry, and the violation of the divine law. The dominion of Jehovah, as the only true God, was signally displayed: and Elijah manifested his divine commission, by the succeeding event. The country was relieved under the distress occasioned by a severe drought; for in answer to the prayers of the prophet, and in fulfilment of his promise, rain fell in great abundance. Jezebel, Ahab's wife, was enraged, and Elijah was obliged to withdraw into the kingdom of Judah, and to conceal himself for some time in the wilderness, depending for his support on the extraordinary interpositions of Providence. Elijah was afterwards employed in various commissions, which he executed with a fidelity and fortitude very honourable to his character. His companion in the closing scenes of his life was Elisha, who was selected to be his successor in the prophetic office, and who was permitted to be the witness of his miraculous translation, by which he was exempted from the common lot of mortality. This event took place in the year 896 B. C. (See 1 Kings, xvii. xviii. xix. xxi. 2 Kings, i. ii.) At a subsequent period, the Jews, misinterpreting the prophecy of Malachi (iv. 5.) entertained an opinion that Elijah would again appear on earth as the harbinger of the Messiah. But this prophecy, properly understood, would only have led them to expect a forerunner and herald of the Messiah, possessing the special power of Elijah, and animated by similar resolution and zeal in the cause of public piety and virtue. It is needless to recite the apocryphal tales that have been related by Christians and Mahometans with regard to this justly celebrated prophet; or to mention the supposititious writings that have been ascribed to him. Bayle will supply the curious with specimens of such fables.

ELIM, in *Ancient Geography*, a place on the eastern coast of the Red sea, which was the sixth station of the Israelites.

ELINE, in *Music*, the name given by the Greeks to the weaver's song. See SONG.

ELINI, in *Ancient Geography*, a people of Greece, in Thesprotia. Steph. Byz.

ELINS, in *Geography*, a town of Poland, in the palatinate of Braclaw; 26 miles N. E. of Braclaw.

ELJOBELI, a town of Arabia, in the country of Yemen; 28 miles S. of Abu-Arisch.

ELIOT, JOHN, in *Biography*, known by the title of the apostle of the North American Indians, was a native of England, and born about the year 1604. He was educated at Cambridge, and engaged himself as an assistant to a school, till an opportunity should occur when he might embark in the work of the ministry. Connecting himself with the Puritan party he was obnoxious to all the evils which the Puritans suffered during the reign of Charles I. To enjoy his own opinions uncontrolled he embarked for America, and became a member of an independent church at Boston. He officiated for the pastor of that congregation during his absence in England, and would have been chosen afterwards to the joint office of minister, but he considered himself bound by a promise to reserve his services for some friends who projected a voyage similar to that which he had undertaken. These friends left their native country in the year 1632. and settled at Roxburg, in New England. Here Mr. Eliot became their minister, and passed with his countrymen and friends the greater part of his life in the active discharge of those duties which belong to the pastoral office. In England he had suffered persecution, yet he had not learned to respect the right of private judgment, with respect to others, and, in America, maintained the divine right of congregational church authority, while he denied that of episcopacy or presbyterianism. This was the fault of the times, and persecution, it is more than probable, would have been exercised by every party, had they possessed the power of drawing the sword. Mr. Eliot, in the year 1646, began to devote himself most ardently to the cause of the native Indians, whom he wished to introduce to the advantages of civilization and Christianity. For this purpose, he learned their language, and preached among them with considerable success. He was exposed in this arduous undertaking to many and very serious hazards; but he sustained every evil with fortitude in the persuasion that his labours and sufferings would be productive of much good. He undertook and accomplished the mighty task of translating the bible into the Indian language: this was printed at Cambridge, in New England, in the year 1664, and a short time before Mr. Eliot's death, it was reprinted with corrections by Mr. Cotton, his fellow-labourer in the Indian mission. By the exertions and influence of this excellent man, many of the wandering Indian tribes were collected into regular societies, and formed into congregations, which were instructed by him, and by others who joined him, in the manner best adapted to their capacities. At Roxburg he established a free grammar school, which has been eminently beneficial to the interests of learning in the New England states: and among the Indians he formed schools in which many were trained to useful knowledge, and some of whom became qualified for a liberal education, which they afterwards received at college. The measures adopted by Mr. Eliot were aided by large contributions from England, with which estates were purchased and placed in the hands of trustees, who were afterwards incorporated under the title of "The society for the propagation of the Gospel in foreign parts." This venerable apostle continued his labours till he arrived at his eighty-fourth year. He died in the latter end of the year 1689, having attained to the great age of eighty-six. Gen. Biog.

ELIOTT, GEORGE AUGUSTUS, lord Heathfield, youngest son of sir Gilbert Eliott of Stubbs, in Roxburghshire, Scotland, was born about the year 1718. He was educated at home by a domestic tutor till he was of an age fit to be sent to the university of Leyden, where he made considerable progress in the ancient and modern languages. At the royal military school of La Fere in Picardy, he made himself master of tactics, and of the several branches of science connected with military life. He next made a tour through those parts of the continent which were best calculated to exhibit to him in practice what he had studied in theory. Prussia was a model for true military discipline, and in her army he served for some time as a volunteer. At the age of 17 he returned to his native country, and was introduced by his father to lieutenant-colonel Peers of the 23d regiment of foot, as a youth anxious to serve his king and country in the profession of arms. He was accordingly entered as a volunteer in that regiment, where he continued something more than a year, when he joined the engineer corps at Woolwich, and pursued the studies of the place with great ardour till he was made adjutant of the second troop of horse grenadiers. With this body he went to Germany, was soon introduced into active service, engaged in several severe actions, and was wounded

wounded at the battle of Dettingen. He rose through the gradations of captain, major, and lieutenant-colonel, and resigned the commission which he held as engineer. After this he was appointed aid-de-camp to George II., and became highly distinguished for his zeal and talents in the military service. In the year 1759 he was appointed to raise a regiment of light horse, which was celebrated for activity, discipline, and enterprize, under the name of "Eliott's light horse." This he commanded in Germany, where he acted as a staff officer, and on every occasion he maintained a very high reputation. He was called from the continent to be employed the second in command at the Havannah. On the peace of 1763, his regiment was reviewed by the king, when they presented him with the standards they had taken from the enemy. His majesty, in testimony of their high merit, allowed them to be denominated, "The 15th, or King's Royal Regiment of Light Dragoons." In 1775 general Eliott was appointed commander in chief of the forces in Ireland, but his stay in that country was very short, and soon after he was appointed to the command of Gibraltar, where he had full opportunity to display the greatness and energy of his character. His system of life was peculiarly adapted to a service that required great vigilance. He was one of the most abstemious men of his age; his sustenance was a vegetable diet and water. He slept only four hours at a time, and inured himself to habits of order and watchfulness, so that circumstances, painful and difficult to be borne by other men, were to him rendered pleasant by daily practice. With a very moderate number of men, general Eliott foiled all the attempts of a numerous foe; and when the operations of the siege were quickened, and rendered more formidable, he still maintained that superiority of defence which kept danger at a distance. The final very serious attack by the famous floating batteries, says a writer, "only afforded one of the grandest spectacles of destruction that was ever beheld." On his return to England the gratitude of the British senate was as forward as the public voice, in rendering him that homage, which his distinguished conduct deserved. The thanks of both houses of parliament were voted to the general; and his sovereign conferred on him the honour of knight of the Bath, with a pension during his own life, and that of another, whom he should nominate. On the 14th of June, 1787, his majesty advanced him to a peerage, by the title of lord Heathfield, baron Gibraltar, permitting him to take, in addition to his family arms, the arms of the fortress which he had so bravely defended. His lordship died July the 6th, 1790, in the seventy-third year of his age. By his lady, the daughter of sir Francis Drake, he left one son and a daughter

ELIPAND, archbishop of Toledo, flourished in the eighth century. He was the intimate friend of Felix of Urgella, and maintained, with him, that Jesus Christ was the son of God, not by nature, but by adoption. This opinion caused long and violent disputes, and was condemned by the council of the church held in the Friuli, under Paulinus, patriarch of Aquileia, in the year 791. It was afterwards condemned, together with its author, in an assembly of prelates, which had been convened by Charlemagne at Ratisbon. Felix retracted, but Elipand fearlessly avowed his adherence to what he conceived to be the truth; neither the threats of his enemies, nor the persuasions of his friends, could induce him to retract an iota of what he had before vindicated. Some Spanish bishops endeavoured to convince him and Felix, who was again become the convert to his old opinions, of the truth of the reputed orthodox doctrine: they were seconded by a letter of Charlemagne himself to the two bishops, entreating them to renounce their heresy, and to unite with the other prelates of the Catholic church, in a common creed. Felix again yielded to the remonstrances of his superiors, which excited Elipand to write against him. This was in the year 799, and he died very soon afterwards. Moreri.

ELIQUATION, or LIQUATION, in *Metallurgy*, is an ingenious process of separating silver from copper by means of lead, which appears now, however, to be very little employed; but a short account of it may be here given.

When rough unrefined copper contains silver in the proportion proper for this operation, it is first melted with a large quantity of lead, and the mixed alloy is cast into loaves or conical masses. These are then set in a furnace on an inclined plane of iron, with a small channel grooved out and heated to a degree just below that of the melting point of the alloy, during which the lead melts, or, as it were, sweats out of the loaf, carrying with it the silver, and the copper is left behind as a reddish black spongy mass. This last is properly the process of eliquation. The silver-holding lead is then purified on a cupel, in the way which will be described under the article SILVER.

Eliquation can only be performed with certain proportions of the three metals concerned in the process. According to Cramer (Docimasia practica: processus 48), every half ounce of silver requires 17lbs. (or 544 times its weight) of lead for its extraction from copper by a single eliquation; and on the other hand, the lead should not be more than about four times the weight of the copper, otherwise the mass will prove too fusible, and the whole loaf will melt down at the heat necessary for the extraction of the lead and silver. On the other hand, if the lead is less than about $2\frac{1}{2}$ times the weight of the copper, the loaf of liquation will not yield all the lead in one process, and much of this metal, and along with it part of the silver, will remain after the operation.

The above data (allowing four times as much lead as copper) would therefore give for the due proportions of the alloy 544 parts of lead, 136 of copper, and one of silver. Other metallurgists diminish the lead somewhat, making it to the copper only as 11 to 3.

The whole process of liquation is described at length in a valuable paper by Duhamel, in the Memoires de l'Acad. for 1788, from which the following is a short extract.

The lead and crude silver-holding copper, being duly proportioned, are thrown into a high blast furnace, the floor of which is lined with a mixture of clay and charcoal, rammed hard, and laid in an inclined direction, so as to convey the melted metal into a separate receptacle. The crude copper is first broken in small pieces when hot, and assayed, to determine the proportion of silver. Either lead or litharge is used in the mixture; if the latter, it is mixed with charcoal to promote its reduction, and 120 parts of the litharge are taken as equivalent to 100 of lead. The furnace being first heated by itself for some hours, a basket full of the scoriæ from the first reduction of the copper ore is thrown in, which soon melts, and forms a vitreous glazing, that protects the walls of the furnace from the violent action of the blast. The mixed metals are then thrown in at intervals, and the whole soon melts into a triple alloy, which flows into the receptacle, whence it is tapped out into iron moulds, whereby it assumes the conical shape requisite for the subsequent eliquation. The heat required in this first operation is much less than that at which copper melts, so that the fusion and reduction of the litharge go on speedily, and in a well-managed furnace, seven loaves of liquation, each weighing about 350lbs., may be cast in an hour.

The next process is the *eliquation*, which is performed in a fur-

a furnace constructed for the purpose, usually holding six loaves, set on iron bars, separated from each other by bricks, and having a channel beneath to convey the silver-holding lead into a bason as it melts out. The management of the heat is here of great importance. If the process goes on well, the lead flows out easily, and the loaves gradually sink down, and become honey-combed, without losing any sensible portion of their copper. If the heat is too great, particles of copper are visibly carried down with the lead, which must be immediately prevented by slackening the fire. When the lead has ceased to flow, the loaves are taken out, and when cold have a dark red colour and a crumbly texture. It requires about four hours to eliquiate the loaves. The first portion of the lead is always the richest in silver, but whatever care is taken in the process a little of both silver and lead remains, together with part of the iron, arsenic, and other impurities of the copper.

To collect the small remaining portion of silver, a number of the porous loaves remaining after liquation are ranged in a kind of oven so as nearly to fill it, and are made moderately red-hot by the flame of wood drawing through it, by which a quantity of mixed metal and scoriæ drops down on the hearth, consisting of lead holding a little silver, of iron, sulphur, arsenic, some copper, and scoriæ. This mass is washed in a stamping machine, by which the scoriæ are got rid of, and the metals alone remain, which undergo a further purification. When the dropping from the oven-furnace begins to be red and compact, it is a sign that all that is heterogeneous to the copper, which can be extracted in this way, is got out, and the copper itself begins to melt. The loaves are then taken out, and appear varnished with a thick vitrescent mass, which, on dropping them into cold water, cracks in every direction, and when cold, may be knocked off with a hammer, leaving the copper considerably pure. This process lasts about 30 hours.

The silver, now transferred to the lead, is afterwards refined in the usual manner.

The process of eliquation, though highly ingenious, is expensive and difficult to conduct, and requires a large supply of lead. To perform it economically, it also requires a copper holding a pretty exact proportion of silver. that is, from $\frac{1}{3}$ds to $\frac{2}{3}$ths per cent. of silver, neither more nor less, and hence, where there are parcels of copper of greater or less richness in silver, much judgment is exercised in mixing them in such proportions as to allow of eliquation with the least expence.

ELIRE. See Conge *d'Elire*.

ELIS, in *Ancient Geography*, a country of Greece, situated to the west of the Peloponnesus, bounded on the north by a part of Achaia, on the east by Arcadia, on the south by Messenia, and on the west by the Ionian sea. The length, from south to north, was about 20 leagues, and its breadth, from west to east, from six to seven. It was watered by a great number of small rivers, which rendered it very fertile. By ancient authors, however, it is chiefly distinguished by its groves of olive-trees; and it was much frequented by the Greeks who attended the Olympic games. Besides its olives, it furnished abundance of hemp, flax, and silk. This country was divided into three parts, *viz.* Triphylia, to the south, the Pisatide, in the middle, and Elide Proper, to the north.

Elis, was also the name of the capital of the fore-mentioned province, situated in the northern part of it, on the river Peneus. This town, indeed, gave its name to the province, and, according to Strabo, was built soon after the siege of Troy. It was adorned with temples, porticoes, and gymnasia, where the athletæ were formed for various kinds of combat. Pluto, Bacchus, and Venus, had their respective temples in this city. The statue of Venus bore the name of "Cœlestis," and it was formed by Phidias of gold and ivory. The feet of the goddess rested upon a tortoise.

ELISHA, in *Biography*, a Hebrew prophet, was the son of Shaphat, and selected by Elijah, from the pursuits of agriculture, to be his successor in the prophetic office. Many instances occur in the abstract of his history, contained in the sacred writings, which evince the miraculous powers with which he was endowed, and which served as testimonies to his prophetic commission. To the scriptures we shall refer the reader for an account of them. Elisha's life and office were continued to a very advanced age, and terminated about the year 830 B.C. See 1 Kings, xix. 2 Kings, ii—ix. xiii.

ELISI, Filippo, an Italian singer of the first class, with a *soprano* voice of great compass; who, though an admirable singer, was still a greater actor: his figure was large and majestic, and his voice clear, well-toned, and full.

He was fond of distant intervals, of 14 or 15 notes, and took them well. Several airs of Jomelli, which he introduced in different operas, were calculated to show the dexterity and accuracy with which he could form these remote intervals. He sung an "Aria parlante in Arianna e Teseo: fra stupido e pensoso," composed most admirably by Galuppi, in a new and fine style of dramatic music; in which the accompaniments, in two of three small triplets after each note in the base, had a new and fine effect.

Elisi remained here at first only one season, part of 1760 and 1761. But the impression which his performance made on lovers of music and judges of good singing, was not soon forgotten.

ELISION, in *Grammar*, the cutting off, or suppressing a vowel at the end of a word, for the sake of sound or measure.

Elisions, excepting in poetry, are but little known in English; in Latin, French, &c. they are frequent, and consist mostly in suppressions of the final *a*, *e*, and *i*: as in *Phillida amo ante alias. Si ad vitulum spectes*, &c.

In writing, elisions are often marked by an apostrophe; as *egon' quem quæram?* for *egone. Emin' ego te?* for *emine. Venissin'* for *venissine*, &c. *Cett' esperance*, for *cette; l'homme*, for *le homme*.

In the pronunciation we make frequent elisions, but do not mark them in writing: thus we write *risque it*, but pronounce *risq' it*. So the French pronounce *un' ame*, but write *une ame*. In effect, they never mark any elisions but at the end of the monosyllables *je*, *me*, *le*, *te*, *ce*, *que*, and *la*. They never elide in the *o*, nor *u*, nor *i*, but in the conjunction *si*, before *il*; nor *a*, but in *la*.

In poetry, the syllable in which a vowel is elided, is never reckoned; and great care is taken to avoid the clashing of syllables where there is no elision, this making what they call a *hiatus* or *chasm*.

Some reduce the *ecthlipsis* under the head of elisions; as in *monstrum, horrendum, ingens*, &c. See Ecthlipsis.

ELISORS, or Electors, in *Law*, are two clerks of the court, or two persons of the county named by the court, and sworn, to whom the *venire* shall be directed, in cases of exception or challenge to the sheriff or coroners for kindred or partiality, for the choice of a jury. These elisors shall indifferently name the jury, and their return is final: no challenge being allowed to their array.

ELISSUS, in *Ancient Geography*, a town of the Peloponnesus, in Arcadia, which was destroyed by the Lacedæmonians.

monians.—Alſo, a river of the Peloponneſus, in Sicyonia, the ſame with *Eliſſon*.

ELIXATION, or LIXIVIATION, is the ſeparation by means of ſolution, of a ſimple or compound ſalt, from any inſoluble matter with which it is naturally or caſually mixed. Water is the menſtruum employed for this purpoſe, and the method of performing it varies according as the water is uſed, hot or cold. In the former caſe, a boiler is nearly filled with water, and when the liquor is ſufficiently hot, the ſubſtance to be lixiviated is carefully ſtirred in: the inſoluble reſidue is then withdrawn by means of a rake, or any other convenient inſtrument, and other portions of the mixture are added, and treated in the ſame way as the firſt, till the liquor is ſufficiently ſaturated.

In cold lixiviation (as of alum ore), a caſk with a falſe bottom is filled with the earthy mixture, and water is then poured on till the mixture is covered by it. After remaining in this ſtate for a longer or ſhorter time, according to circumſtances, the plug-hole at the bottom of the caſk is opened and the liquor drains through, carrying with it all the ſoluble parts and leaving the inſoluble behind: the water thus ſaturated is called a lixivium.

ELIXIR, in *Pharmacy*. This term was applied to a large claſs of liquid medicines, conſiſting for the moſt part of reſins, aromatics, or other powerful medicines, infuſed in ſpirits of wine, and employed for internal uſe. In fact, elixirs ſo nearly reſemble the tinctures, in their general compoſition, that the term elixir is now entirely dropped in the modern pharmacopœias, and the formulæ for ſome of the moſt valuable preparations of this claſs have been tranſferred, with ſome alteration and much ſimplification, either to the claſs of *tinctures*, or to that of *ſpirits*. The term elixir, however, is ſtill retained in popular uſe.

Menage derives the word from the Arabic, *eliciſir*, properly ſignifying *fraction*, becauſe elixirs have the force of breaking diſeaſes: others more naturally derive it from the Arabic, *alexiro*, an artificial extraction of ſome eſſence; others from the Greek, ελαιον, *oil*, and συρω, *I draw*, q. d. an extract of the oil, which is the eſſential part of mixts; others from the Greek verb, αλεξω, *I help*, or *aſſiſt*, becauſe of the great ſuccours we receive from elixirs.

ELIXIR *aloes*, a name given in the late London Diſpenſatory to the medicine commonly known by the name of "elixir proprietatis," and now called "tinctura aloes compoſita," which is there ordered to be made in the following manner: take tincture of myrrh a quart; powder of ſocotrine aloes, and fine ſaffron, of each three ounces; digeſt them a due time, and then preſs off the tincture, and filtre it for uſe. The "elixir proprietatis" is a remedy ſaid to have been firſt invented by Paracelſus. See TINCTURE.

ELIXIR *myrrhæ compoſitum*, is now called "tinctura ſabinæ compoſita." See TINCTURE.

ELIXIR *paregoricum*, a name given in the late London Diſpenſatory to the "elixir aſthmaticum" of Quincy, which is there ordered to be made thus:

Take flower of benjamin, and ſtrained opium, of each a dram; camphor, two ſcruples; eſſential oil of anniſeeds, half a dram; rectified ſpirit of wine, a quart; digeſt all together a proper time, and then ſtrain off the ſpirit. This allays tickling coughs, relieves difficult breathing, and is uſeful in many diſorders of children, particularly in the hooping-cough. The doſe for an adult is from 50 to 100 drops. This is now called "tinctura opii camphorata." See TINCTURE.

ELIXIR, *ſacred*. See TINCTURE *of Rhubarb*.

ELIXIR *ſalutis*. See TINCTURE *of Sena*.

ELIXIR *ſtomachic*, is prepared by boiling two ounces of gentian-root, one ounce of Curaſſoa oranges, and half an ounce of Virginia ſnake-root, and infuſing them for three or four days in two pints of French brandy, and then ſtraining out the elixir. This is an elegant ſtomachic bitter. A ſmall glaſs, twice a day, relieves in flatulencies, indigeſtion, want of appetite, and ſimilar complaints. A large doſe alſo relieves the gout in the ſtomach.

ELIXIR *of vitriol, acid*, is prepared by gradually mixing one pint of the aromatic tincture with three ounces of oil of vitriol; and after the fæces have ſubſided, filtering the elixir through paper in a glaſs funnel. This is ſaid to be an excellent medicine for hyſteric and hypochondriac patients, afflicted with flatulencies, ariſing from a relaxation or debility of the ſtomach, and inteſtines. It is to be taken on an empty ſtomach, twice or thrice a day, in a glaſs of wine or water, or of any bitter infuſion; and the doſe may be from 10 to 40 drops.

ELIXIR, among the *Alchemiſts*, is uſed for the philoſopher's ſtone, or the powder of projection; and ſometimes for an univerſal medicine, which will cure all diſeaſes, called, by way of excellence, the *grand elixir*.

Thoſe two things moſt alchemiſts take to coincide; ſo that what will make gold, they think, will cure all diſeaſes. See PHILOSOPHER'S *ſtone*.

The notion of a grand elixir is of a long ſtanding.

ELIXIS, a name given by ſome of the *Old Writers* to that form of medicine now called a linctus.

ELIXOIA, in *Ancient Geography*, an iſland of the Hyperboreans, at the mouth of the river Caramboea (the Dwina;) now the *Podeſemſka* at the mouth of the Dwina.

ELIZABETH, in *Biography*, queen of England, one of the moſt celebrated ſovereigns of this or of any country, was the daughter of Henry VIII. by his queen Anne Boleyn, and born in the year 1533. She was educated in the principles of the Proteſtant religion, and was diſtinguiſhed for her attainments in claſſical literature. By the laſt will of her father ſhe was nominated third in order of ſucceſſion, but by the influence of the duke of Northumberland, ſhe was by an act of Edward VI. excluded from the crown, to which nevertheleſs ſhe attained on the death of her ſiſter Mary. During, however, the reign of that ſiſter, ſhe was treated with the utmoſt indignity and ſeverity, committed to the Tower, and threatened with ſtill more awful calamities. Her confinement in this fortreſs was ſhort, for even the judges of Mary could find no plea againſt her, and ſhe was ſent from thence to Woodſtock, where, though kept in ſafe cuſtody, ſhe was treated with much reſpect. Her ſufferings and her principles endeared her to the nation, and ſhe became ſo extremely popular that it was, in a ſhort time, deemed impolitic to put any reſtraint upon her. When ſet at liberty ſhe choſe ſtudy and retirement, and was very ſubmiſſive to the will of her ſiſter. Attempts were made to draw her into ſome heretical declarations, but in every inſtance ſhe acted with ſo much prudence and caution as to give her enemies no hold upon her. She complied with the external forms of the eſtabliſhed religion, though it was well known, ſhe was inimical to the principles which her ſiſter eſpouſed, and which led her to the moſt atrocious acts of cruelty.

On the death of Mary, Elizabeth was immediately proclaimed ſovereign, to the ſatisfaction of the great majority of the people; indeed almoſt all deſcriptions of perſons rejoiced in the change, as that in which the glory of the country, and the ſafety of individuals ſeemed ſo much concerned. Elizabeth was at Hatfield when ſhe heard of her ſiſter's death, and, after a very few days, ſhe repaired to the

he metropolis through immenſe crowds of the people, who ſtrove with each other who ſhould diſplay the ſtrongeſt teſtimonies of their reſpect and affection. On her entrance into the Tower, her mind was ſo ſtrongly affected with a compariſon of her preſent proſperity with her former ſufferings, that ſhe fell on her knees, and expreſſed the warmeſt acknowledgments to Almighty God for the deliverance which had been afforded her from the moſt cruel perſecution; a deliverance, ſhe ſaid, no leſs miraculous than that which Daniel had received from the den of lions. From this moment, in the true ſpirit of the Chriſtian religion, ſhe determined to forget all the injuries ſhe had endured, and forgave all who had been inimical to her principles during the reign of Mary.

Propoſals of marriage had been formerly made her by the king of Sweden, which ſhe thought fit to decline: a ſimilar offer was now made by Philip of Spain, her late ſiſter's huſband, which ſhe likewiſe rejected, ſignifying, in both caſes, that ſhe was determined to lead a ſingle life. She now turned her thoughts to the reſtoration of the principles of the reformation, which was effected by the firſt parliament that met after her acceſſion, and from this period England took the decided ſtation among Proteſtant countries, which it has ever ſince maintained.

Elizabeth at this time arrogated to herſelf that ſupremacy over the faith and worſhip of her ſubjects, which before was ſuppoſed to belong excluſively to the court of Rome. In her ſeveral plans reſpecting religion, ſhe proceeded with great caution; ſhe checked the forward zeal of thoſe who were for overſetting, at once, the eſtabliſhed religion of the country; ſhe publiſhed a proclamation by which ſhe prohibited all preaching without a ſpecial licence, and though ſhe diſpenſed with theſe orders in favour of ſome preachers of the Proteſtant religion, ſhe took care that they ſhould be the moſt calm and moderate of the party.

By the Catholics, Mary, the young queen of Scotland, who had received her education in France, was regarded as the true ſovereign of England; ſhe even aſſumed the enſigns and title of Engliſh royalty, which Elizabeth could never forget nor forgive. Mary, when ſhe found it was in vain to look to the crown of England, in oppoſition to the reigning queen, wiſhed to be regarded as the preſumptive ſucceſſor to the throne, which was refuſed. From this time Mary was conſidered as a rival, and every means was taken to thwart her projects, and diſappoint her expectations. The conduct of Mary, which will be more diſtinctly noticed under her own article, was not only imprudent in the higheſt degree, but furniſhed ample ſcope for the invectives of her enemies. In 1568, ſhe was obliged, from fear of her own ſubjects, to take refuge in England, and her retreat was ſo ſudden, that ſhe had no opportunity of giving to Elizabeth any previous intimation of her intentions. It was reſolved by the Engliſh miniſtry to detain her a perpetual priſoner, and a ſort of pretext was given them, by her offer to ſubmit the juſtice of her cauſe to the judgment of her ſiſter queen. An accuſation was accordingly brought againſt her by the regent Murray, and commiſſioners appointed to hear the caſe. Mary refuſed to reply to the charges exhibited againſt her, and demanded to be reſtored to her kingdom, or to be ſent to France, a favour which was as poſitively denied. The conſequence of this meaſure was a ſecret negociation between Mary and the duke of Norfolk, the head of the Catholic party, who propoſed marriage to her, and was ſupported in his views by the kings of France and Spain. The diſcovery of this project cauſed the duke to be committed to the Tower. This was followed by other rebellions and inſurrections which excited in the mind of Elizabeth much uneaſineſs; and various negociations were carried on with the Scots for her reſtoration, but without effect.

Elizabeth was now conſidered as the head of the Proteſtant party in Europe, and in this character ſhe made a treaty of alliance with the French Hugonots, and afforded them aid in men and money, and received in return the port of Havre-de-Grace, which was held ſome time by an Engliſh garriſon, but was at length obliged to ſurrender. Between France and Spain there was an avowed league for the extirpation of hereſy, and Elizabeth felt herſelf juſtified, by way of ſelf defence, to give aſſiſtance to the cauſe of Proteſtantiſm, wherever it was in danger of being ſuppreſſed by force. She not only gave a favourable reception to the Flemiſh exiles who took refuge in England, from the tyranny of the duke of Alva, and brought over their arts and induſtry, but ſhe ventured upon ſtopping a large loan of money which ſome Genoeſe merchants were ſending by ſea to the duke, and which ſome Hugonot privateers had ſeized and brought into the Engliſh ports. The Spaniſh court retaliated, by exciting an inſurrection among the Engliſh catholics, at the head of which was the duke of Norfolk, who was afterwards diſcovered, tried, convicted and beheaded, for his crimes. On the horrible maſſacre at Paris, in Auguſt 1572, Elizabeth put herſelf and court into deep mourning, and received, with a marked and ſolemn ſilence, the French embaſſador who was ſent to apologize for the bloody deed. But ſhe was too prudent to break entirely with the French court, and ſuffered negociations to be carried on for her marriage with the king's brother, the duke of Alençon, the youngeſt ſon of Catherine de Medicis, whom, after a long courtſhip, ſhe rejected, and ſent back to the Netherlands in great wrath.

In 1575, Elizabeth, as the head of the Proteſtants, was offered the poſſeſſion and ſovereignty of the revolted Dutch provinces, on condition of becoming their protectreſs againſt the Spaniards. This for the preſent ſhe rejected, though in about three years after ſhe ventured to ſign a treaty of alliance with the united ſtates. In the year 1584, an aſſociation was entered into by the ſubjects of England, comprehending perſons of all ranks, with a view of affording her perſonal protection againſt her enemies, who were ſuppoſed to be chiefly adherents to Mary Queen of Scots. About this period laws of great ſeverity were enacted againſt the Jeſuits and popiſh prieſts, a plot having been diſcovered to aſſaſſinate the queen, which was known to be favoured by the papal court. Elizabeth now ventured to ſet at defiance the hoſtility of Spain, by entering into a treaty with the revolted Low Countries, by which ſhe engaged to aſſiſt them with a conſiderable force, on condition of having ſome of their ports put into her hands for ſecurity. She might indeed have poſſeſſed herſelf of the ſovereignty, but was ſatisfied with having her favourite, the earl of Leiceſter, admitted into the council of the ſtates. At the ſame time ſhe ſent a powerful armament againſt the Spaniſh ſettlements in the Weſt Indies, under ſir Francis Drake, and entered into a league of mutual defence with James king of Scotland, whoſe friendſhip ſhe cultivated, though ſhe kept his mother in priſon.

Another conſpiracy againſt the life of Elizabeth was detected in 1586; the perſons principally engaged in it unqueſtionably maintained a correſpondence with the unfortunate Mary, though it has been doubted whether ſhe was privy to the intended aſſaſſination. The plot was unravelled by her miniſter Walſingham, who ſuffered the plan to be carried on till he had detected all the conſpirators, and had ſufficient evidence under her own hand, to involve the queen of Scots as a participator in the intended offence. Fourteen of the conſpirators were convicted and executed, and Mary

herſelf

herſelf was brought to trial before a grand commiſſion of forty noblemen and privy counſellors, who after the uſual forme pronounced and ſigned a ſentence of death againſt her. But Elizabeth was unwilling to ſign the warrant of execution, and was anxious to remove the odium of the deed from herſelf. Parliament, probably by her deſire, demanded the execution of the ſentence, as ſhe wiſhed it to be ſuppoſed that her compliance was extorted from her by the clamours of the people. She is, however, charged with being privy to an attempt made upon the keepers of the priſoner to induce them to diſpatch her in a more private manner. This they nobly rejected, and a letter, ſigned by Walſingham to ſir Amias Poulet, on this ſubject is ſtill extant, to the diſgrace of that miniſter who could condeſcend to ſo baſe an expedient. At length the warrant was made out, and the deed was executed. Feb. 8. 1586–7. As ſoon as the news was communicated to the queen, ſhe affected an exceſs of grief and aſtoniſhment. She even pretended that the thing had been done contrary to her inclination, and committed to priſon Daviſon, who had been her agent in the buſineſs, and had him brought to trial and heavily fined. In no inſtance, perhaps, was hypocriſy carried to a higher pitch than in this by Elizabeth, which was equally derogatory to her good ſenſe, and to the known firmneſs of her mind in difficult caſes. The diſſimulation of the queen was not, however, without its effect; it ſoftened the reſentment of the king of Scotland, who, inſtead of revenging the death of his mother, entered into an amicable correſpondence with the court of England.

The next thing which engaged the attention of the queen and her miniſters was the famous Armada, which, as we have ſeen, was intended for the entire conqueſt of the iſland. (See Armada.) Elizabeth next became the ally of Henry IV. in order to vindicate his title, and eſtabliſh him firmly on the throne of France, and for ſome years the Engliſh auxiliaries ſerved in France, while ſeveral naval expeditions, undertaken by individuals, or by the queen, raiſed the reputation of England to an extraordinary height. At this period Robert Devereux, earl of Eſſex, the queen's favourite, highly diſtinguiſhed himſelf, but the events of his life have been already deſcribed. See Devereux.

In 1601, Elizabeth held a conference with the marquis de Roſni, who is better known in hiſtory as the celebrated Sully, for the purpoſe of eſtabliſhing, in concurrence with England, a new ſyſtem of European power, with a view of controlling the vaſt influence of the houſe of Auſtria, and producing a laſting peace. The queen coincided with his projects, and the French miniſter departed in admiration of the ſolidity and enlargement of her political views. The queen, having ſuppreſſed an inſurrection in Ireland, and obliged all the Spaniſh troops ſent to its aſſiſtance to quit the iſland; ſhe turned her thoughts towards relieving the burdens of her ſubjects; ſhe aboliſhed a number of monopolies, and became extremely popular. But the execution of her favourite, the earl of Eſſex, gave a fatal blow to her happineſs. When ſhe learnt from the counteſs of Nottingham, that he had ſolicited her pardon, which had been concealed from her, ſhe at firſt became furious with rage, and when the violence of anger ſubſided, ſhe fell into the deepeſt and moſt incurable melancholy, rejecting all conſolation, and refuſing food and ſuſtenance of every kind. She remained for days ſullen and immoveable, "feeding," ſays the hiſtorian, "her thoughts on her afflictions, and declaring life and exiſtence an inſufferable burden to her". Few words ſhe uttered, and they were all expreſſive of ſome inward grief, which ſhe cared not to reveal: but ſighs and groans were the chief vent which ſhe gave to her deſpondency, and which, though they diſcovered her ſorrows, were never able to eaſe or aſſuage them. Ten days and nights ſhe lay upon the carpet, leaning on cuſhions which her maids brought her, and her phyſicians could not perſuade her to allow herſelf to be put to bed, much leſs to make trial of any remedies which they preſcribed to her. Her anxious mind at laſt had ſo long preyed on her frail body, that her end was viſibly approaching; and the council being aſſembled, ſent the keeper, admiral and ſecretary, to know her will with regard to her ſucceſſor. She anſwered with a faint voice, that, as ſhe had held a regal ſceptre, ſhe deſired no other than a royal ſucceſſor. Cecil requeſting her to explain herſelf more particularly, ſhe ſubjoined, that ſhe would have a king to ſucceed her, and who ſhould that be, but her neareſt kinſman, the king of Scots? Being then adviſed by the archbiſhop of Canterbury to fix her thoughts upon God, ſhe replied, that ſhe did ſo, nor did her mind in the leaſt wander from him. Her voice ſoon after left her; her ſenſes failed; ſhe fell into a lethargic ſlumber, which continued ſome hours, and ſhe expired gently, without farther ſtruggle or convulſion, in the 70th year of her age, and forty-fifth of her reign.

"So dark a cloud overcaſt the evening of that day which had ſhone out with a mighty luſtre in the eyes of all Europe. There are few great perſonages in hiſtory who have been more expoſed to the calumnies of enemies, and the adulation of friends, than queen Elizabeth, and yet there is ſcarcely any whoſe reputation has been more certainly determined by the unanimous conſent of poſterity. The unuſual length of her adminiſtration, and the ſtrong features of her character, were able to overcome all prejudices; and obliging her detractors to abate much of their invectives, and her admirers ſomewhat of their panegyrics, have at laſt, in ſpite of political factions, and, what is more, of religious animoſities, produced an uniform judgment with regard to her conduct. Her vigour, her conſtancy, her magnanimity, her penetration, vigilance, and addreſs, are allowed to merit the higheſt praiſes, and appear not to have been ſurpaſſed by any perſon that ever filled a throne: a conduct leſs rigorous, leſs imperious, more ſincere, more indulgent to her people, would have been requiſite to have formed a perfect character. By the force of her mind, ſhe controlled all her more active and ſtronger qualities, and prevented them from running into exceſs. Her heroiſm was exempt from temerity, her frugality from avarice, her friendſhip from partiality, her active temper from turbulency and a vain ambition; ſhe guarded not herſelf with equal care or equal ſucceſs from leſſer infirmities; the rivalſhip of beauty, the deſire of admiration, the jealouſy of love, and the ſallies of anger."

Under the wiſe conduct of Elizabeth the Proteſtant religion was firmly eſtabliſhed, factions reſtrained, government ſtrengthened, the power of Spain nobly oppoſed, and withſtood, oppreſſed neighbours ſupported, a navy created, commerce rendered flouriſhing, and the national glory aggrandized. No ſovereign was ever more jealous of power and prerogative; yet ſhe was truly ambitious of obtaining the general affections of her ſubjects. She made, during her long reign, frequent progreſſes, and paid many domeſtic viſits, which were partly the reſult of policy, partly of economy. She wiſhed to be thought a friend to literature, but never diſplayed the liberality of a patroneſs. Her manners and language were but little ſuited to the delicacy of the female character.

"When we contemplate her as a woman," ſays Mr. Hume, "we are apt to be ſtruck with the higheſt admiration of her great qualities and extenſive capacity, but we are apt alſo to require ſome more ſoftneſs of diſpoſition, ſome greater

greater lenity of temper, fome of thofe amiable weaknefles by which her fex is diftinguifhed. But the true method of eftimating her merit, is to lay afide all thefe confiderations, and confider her merely as a rational being, placed in authority, and entrufted with the government of mankind: We may find it difficult to reconcile our fancy to her as a wife or miftrefs, but her qualities as a fovereign, though with fome confiderable exceptions, are the object of undifputed applaufe and approbation." The laxity of her morals in fome particular points has given occafion to reproach, and it is impoffible to juftify her conduct with regard to the queen of Scots, but fhe was nevertheleffs great as a fovereign, though not eftimable as a woman. Hume's Hift. of England.

Elizabeth, empreffs of Ruffia, was the daughter of Peter the Great, was born in 1709, and when arrived at years of maturity, was admired for her perfonal attractions. By the revolution of the year 1741, Ivan, whom the empreffs Anne had nominated for her fucceffor, was fet afide, and Elizabeth renewed in her perfon the line of Peter the Great upon the throne of Ruffia. Although her beauty, as well as rank and large dowry, occafioned feveral offers, none of them were accepted, and fhe died fingle. From the period of her acceffion, fhe renounced all thoughts of the connubial ftate, and adopted her nephew Peter. Her diflike to marriage, however, did not proceed from any difinclination to men; for fhe freely owned to her confidents, that fhe was never happy but when in love; if a capricious paffion, which was ever changing its object, may be dignified by that name. The fame characteriftic warmth of temper hurried her no leffs to the extremes of devotion; fhe was fcrupulouffy exact in her annual confeffions of the wanderings of her heart, in expreffing the utmoft contrition, and in punctually adhering to the minuteft ceremonies and ordinances of the church. With regard to her difpofition, fhe is generally ftyled the humane Elizabeth; as fhe made a vow never to inflict any capital punifhments during her reign, and fhe is alfo faid to have fhed tears upon the news of victories gained by her troops, from the reflection that they were not obtained without great bloodfhed. By an edict paffed in her reign, corporal penalties were fubftituted, except in fome cafes of high treafon, in the room of capital fentences. From this fuppreffion of capital punifhment in all inftances excepting treafon, the humanity of Elizabeth's difpofition has been highly extolled, and fhe has been reprefented, not only by the lively Voltaire, but even by the fagacious Blackftone, as a pattern of legiflative clemency. It fhould be recollected, however, that the ftate prifons were filled with wretched fufferers, many of whom, unheard of and unknown, perifhed in damp and unwholefome dungeons; befides, the ftate inquifition, or fecret committee, appointed to judge perfons fufpected of high treafon, had conftant occupation during her reign; many, upon the flighteft furmifes, were tortured in fecret; many underwent the knoot, and expired under the infliction of this torture. Two ladies of rank underwent this cruel punifhment, had their tongues cut out, and were banifhed into Siberia. The mind of Elizabeth was perpetually haunted by fufpicions of the infecurity of her elevated ftation, and by the dread of a revolution fimilar to that which had placed her on the throne. Elizabeth eftablifhed the Academy of Arts, and annexed it to the Academy of Sciences. (See Academy.)

This empreffs died in 1761, the 21ft year of her reign and the 53d of her age; in December, the fame month in which fhe was born, and in which fhe was advanced to the throne. Peter III. whom fhe nominated as her fucceffor, was in about fix months reduced to the neceffity of abdicating the empire, in favour of Catharine II. (See Catharine.) He died on the 7th day of his confinement at Robfcha, a fmall imperial palace, 20 miles from Peterhof, and his remains were interred in the church of the convent of St. Alexander Nevfki at Peterfburgh. Coxe's Travels in Ruffia.

Elizabeth, in *Geography*, a poft-town of America in Lancafter county and ftate of Pennfylvania, containing about 30 houfes, a Dutch church, and 546 inhabitants; 18 miles N.W. by W. of Lancafter, and 84 W. by N. of Philadelphia.—Alfo, a fhort fouthern arm of James river, in Virginia; affording an excellent harbour, fufficiently capacious for the accommodation of 300 fhips. The channel is from 150 to 230 fathoms wide, and at common flood-tide it has 18 feet water to Norfolk, feated near the mouth of its eaftern branch.

Elizabeth's *Bay*, a bay in the ftraits of Magellan, at the entrance of which are two fmall reefs, that appear above water. All round the bay there is good landing, though it is much expofed to the wefterly winds. The beft place for anchoring is Paffage point. Sufficient wood may be procured here for the ufe of fhips, and there is good watering at a fmall river. The ifland affords celery and cranberries. S. lat. 50° 43′. W. long. 73° 24′. Variation 2 points eafterly.

Elizabeth, *Cape*, a lofty promontory on the N.W. coaft of America, S.W. of Prince William's found. N. lat. 59° 10′. E. long. 207° 45′.—Alfo, a headland and townfhip of North America, in the county of Cumberland, and ftate of Maine. The cape lies in N. lat. 43° 33′. W. long. 70° 10′, E. by S. from the centre of the town 9 miles. The town contains 1355 inhabitants. It was incorporated in 1765, and lies 126 miles N.E. of Boften.

Elizabeth *City*, a county of Virginia, in America, lying between York and James rivers, having Warwick and York counties on the W. and Chefapeak bay on the E. and N. On its fea-coaft are feveral fmall iflands, the chief of which are Long and Egg iflands. The S.E. extremity of the county is Point Comfort. It contains 1256 free inhabitants, and 1522 flaves.

Elizabeth *City*, a town of Pafquatank county in N. Carolina, in which is a poft-office; 299 miles from Wafhington.

Elizabeth's *Iland*, lies in the ftraits of Magellan, and affords a fupply of frefh water, celery, and fome wild fowl. The fhores alfo abound with fhell-fifh.

Elizabeth *Iflands*, a group of fmall iflands on the S.E. fide of Buzzard's bay, extending fouth-weftery from the extremity of Barnftable county in the Maffachufetts, and bearing N.W. from Martha's vineyard; fituated between 41° 24′ and 41° 32′ N. lat., and between 70° 38′ and 70° 56′ W. long. They are about 16 in number; and the chief of them are Nafhawn, Pafqui, Nafhawenna, Pinequefe, and Cattahunk: all thefe belong to Duke's county.

Elizabeth-*Grand*, a town and diftrict of Ruffia, in the province of Catherinenflaf, feated on the Ingul, falling into the Bog.

Elizabeth-*Town*, a poft-town and borough of America, in Effex county, New Jerfey; pleafantly fituated on a fmall creek which enters into Arthur-Kull. Its foil is equal to any in the ftate, of which it is one of the oldeft towns, having been purchafed of the Indians in 1664, and fettled foon after. The compact part of the town contains about 150 houfes, 2 brick churches, one for Prefbyterians and the other for Epifcopalians, and an academy. It lies 15 miles

15 miles S.W. by. W. of New York.—Alſo, a town of Alleghanny county, in Pennſylvania, on the S.E. ſide of Monongahela river, between Redſtone Old Fort and Pittſburg, about 18 miles from each. Many boats are built here for the trade and emigration to Kentucky, and in the vicinity are ſeveral ſaw-mills. It has 1904 inhabitants. Another town of the ſame name in this county contains 111 inhabitants. N. lat. 40° 13′. W. long. 79° 22′.—Alſo, a poſt-town of Maryland, and capital of Waſhington county, formerly called "Hagarſtown," ſeated in the fertile valley of Conegocheague. The houſes are 300. Epiſcopalians, Preſbyterians, and German Lutherans have each a church. The court-houſe and market-houſe are handſome buildings, and the gaol is a ſubſtantial edifice of ſtone. The trade with the weſtern country is conſiderable, and there are many mills in the neighbourhood on Antietam creek.—Alſo, the chief town of Tyrrel county, in Edenton diſtrict, North Carolina. It has a gaol, court-houſe, and a few dwelling-houſes, 40 miles from Fayetteville, and 55 from Wilmington.—Alſo, a poſt-town and the chief in Bladen county, North Carolina, ſeated on the N.W. branch of Cape Fear. It has a court-houſe, gaol, and about 30 houſes, 36 miles S. of Fayetteville, and 47 N.W. of Wilmington.—Alſo, a poſt-town of Eſſex county, in New York, ſituated on the W. ſhore of lake Champlain, N. of Crown point, containing 900 inhabitants; 529 miles N. by E. from Waſhington.—Alſo, a townſhip in the county of Leeds, in Upper Canada; the ninth townſhip in aſcending the river St. Lawrence; well watered by the river Tonianta, and three other ſtreams.

ELK, a creek of America, in Northumberland county, Pennſylvania, which, uniting with Penn's creek, falls into the Suſquehanna, 5 miles below Sunbury.—Alſo, a navigable river of the eaſtern ſhore of Maryland, which riſes in Cheſter county, Pennſylvania, by two branches, *viz.* Big and Little Elk creeks. At their confluence ſtands Elkton.—Alſo, a ſhort navigable river in the ſtate of Teneſſee. It riſes on the N.W. ſide of Cumberland mountain; runs S. weſterly, and falls into the Teneſſee, a little above the Muſcle ſhoals; about 40 miles W.N.W. of the creeks' croſſing place.

Elk *lake*, one of the chain of ſmall lakes which connects the lake of the Woods with lake Superior. N. lat. 48° 41′. W. long. 93°.

Elk, in *Ornithology*, a name by which many have called the cygnus ferus, or wild ſwan, a ſpecies of *Anas*. See Duck.

Elk, in *Zoology*, a ſpecies of the cervus, or ſtag. See Cervus *alces*.

ELKARRIE, in *Geography*, a town of Arabia, in the country of Yemen; 24 miles N.E. of Abu-ariſch.

ELKASSARAN, a town of Arabia, in the country of Yemen: 8 miles E. of Chamir.

ELKE, is mentioned in our *Statutes*, as a kind of yew to make bows. 32 Hen. VIII. cap. 9.

ELKHORN, in *Geography*, a ſmall water of Kentucky river, in America. The Elkhorn lands, ſituated in a bend of Kentucky river in Fayette county, where this ſmall river riſes, are much eſteemed.

ELKRIDGE, a ſmall town of America, in Ann Arundel county, Maryland, on the S. bank of Patapſco river, and on the W. ſide of Deep-run; famous for the bright tobacco called "Kite's foot;" 8 miles S.W. of Baltimore, and 19 N.W. of Annapolis. N. lat. 39° 12½′.

ELKTON, a poſt-town of conſiderable trade, at the head of Cheſapeak bay, in Maryland, and the capital of Cecil county; though, ſays Mr. Weld, it is a dirty diſagreeable place. The tide flows up to the town, and it derives great advantages from the carrying trade between Baltimore and Philadelphia. Upwards of 250,000 buſhels of wheat are collected here annually for ſupplying thoſe markets, or the neighbouring mills. Elkton conſiſts of one ſtreet, containing about 90 houſes, irregularly built, a court houſe, and a gaol. On the W. ſide of the town is an academy. It is 10 miles N.E. of Charleſtown, 47 S.W. of Philadelphia, and 56 N.E. of Baltimore.

ELKUVAR, a river of Ruſſia, which runs into the Tobol.

ELL, Ulna, a meaſure, which obtains, under different denominations, in moſt countries.

The ell is the ſtandard, or meaſure, whereby cloths, ſtuffs, linens, ſilks, &c. are uſually meaſured, or eſtimated, anſwering, in good meaſure, to the yard of England, the canna of Italy, the vara of Spain, the palm of Sicily, &c.

Servius will have the ell to be the ſpace contained between the two hands when ſtretched forth; but Suetonius makes it only the cubit.

The ells which occur moſt frequently in England, are Engliſh and Flemiſh; the ell Engliſh contains three feet nine inches, or one yard one quarter, Engliſh meaſure; the ell Flemiſh contains twenty-ſeven inches, or three quarters of a yard; ſo that the ell Engliſh is to the Flemiſh ell as five to three.

M. Ricard, in his Treatiſe of Commerce, reduces the ells thus: an hundred ells of Amſterdam are equal to ninety-eight three quarters of Brabant, Antwerp, and Bruſſels; to fifty-eight and an half of England and France; to an hundred and twenty of Hamburgh, Francfort, Leipſic, and Cologne; an hundred and twenty-five of Breſlaw; an hundred and ten of Bergen and Drontheim; and an hundred and ſeventeen of Stockholm.

ELLEDAT, in *Geography*, a town of Ceylon; 12 miles S. of Candy.

ELLEHOLM, a ſmall and very ancient town of Sweden, in the province of Blekingen; 7 miles from Carlſhamn, which formerly had a caſtle.

ELLENBOGEN, a town of Germany, in the county of Bregentz; 17 miles S.S.E. of Bregentz.

ELLENHOFEN, a town of Germany, in the county of Bregentz; 14 miles E.N.E. of Bregentz.

ELLERENA, a town of North America, in Mexico, and province of Zacatecas; 25 miles W. of Zacatecas.

Ellerena, a town of Spain, in the province of Eſtremadura, ſituated in a low tract abounding with fruits and paſtures, at the foot of Sierra Morena, and containing about 7000 inhabitants, diſtant 17 leagues S.S.E. of Merida, near the border of Andaluſia. In the mountains, 4 miles from the town, a ſilver mine was formerly diſcovered.

ELLESMERE, a market town of Shropſhire, which lies 16 miles N.N.W. from Shrewſbury, and 176 N.W. from London. It is pleaſantly ſituated on an eminence near the margin of a deep lake, which occupies a ſpace of one hundred and twenty acres, well ſtocked with fiſh, and particularly eels, whence the town derives its name. From its form and other circumſtances it appears to have been a very ancient place, and lying in the marches of Wales, being diſtant from the boundary ſtone three miles, a mound called Wat's dyke ſix, and about nine from the celebrated Clawdd Offa: it was at an early period very ſtrongly fortified. According to the Chronicle of Cheſter the caſtle, with the fertile diſtrict around, was given by king John as a dower with his natural daughter Joan, when he beſtowed her in marriage on Llewellin, prince of North Wales. After the death of that prince it came into the family of L'Eſtrange, and John L'Eſtrange was governor of the caſtle in the thirty-third year of Henry I. Leland ſpeaks of the caſtle as

ſtanding in his time, that the town had four well-built ſtreets, and was privileged with two annual fairs; but at that time had no market. The building is now no more, and the ſite, ſtill ſurrounded with three walls and foſſes, is formed into a bowling green, from whence is a moſt delightful proſpect. The number of houſes, as appears by the returns made under the population act, was 1035, inhabited by 5553 perſons.

This town formerly gave name to the hundred, which at preſent is denominated Pim-hill. It gives the title of baron to the family of Egerton. Thomas Egerton, celebrated for his talents and virtues, was made lord keeper of the great ſeal by queen Elizabeth; and high chancellor, baron of Elleſmere, and viſcount Brackley, by king James: and a deſcendant, John William Egerton, is now lord Elleſmere, and earl of Bridgewater. This place has of late been much benefited by a navigation, called the Elleſmere canal, which forms a communication between the river Dee at Cheſter, and the Severn at Shrewſbury. This was cut under the ſanction of an act paſſed in the thirty-fourth year of the preſent reign; and, by ſubſequent acts, has been extended and ramified by collateral branches; which communicate with other parts of Shropſhire, and the interior of Wales. The aqueduct, formed by a bridge of numerous arches, over which the canal paſſes acroſs the wide-flowing river Dee, is conſidered as a *chef d'œuvre* of modern engineering, and maſonry. This ſyſtem of inland navigation in the counties of Cheſter, Flint, Denbigh, and Salop, was firſt ſuggeſted by Mr. John Duncombe in 1789; on which the opinion of Mr. Jeſſop having been taken, and an act obtained, the execution of this grand deſign was confided to Mr. Thomas Telford, the engineer, under whom the ſame has been now nearly completed. (See CANAL.) A rail-way branch has been made to Plas-Kynaſton collieries ſince that article was written. A ſteam-engine at Elleſmere park, erected for the purpoſe of ſupplying the Wirral part of the line with ſalt water from the Merſey, has deſtroyed the fiſh in this part of the canal, and is ſaid to have much inconvenienced ſome farmers on the line, by the want of freſh water for their cattle, although ſome miles inland, as is alſo the caſe on the Droitwich canal, from the ſalt ſprings by which the ſame is ſupplied. On the opening the famous Port-Cyſylty aqueduct, an appropriate oration was delivered, and was ſince printed, ſee the Gentleman's Magazine, vol. lxxv. p. 1228.

ELLEZELLES, a ſmall town of France, in the department of Jemappe, chief place of a canton in the diſtrict of Tournay, with a population of 4008 individuals. The canton contains four communes and 14,430 inhabitants, upon a territorial extent of 70 kiliometres.

ELLICHPOUR, a fine city of Hindooſtan, the capital of a large province or diſtrict of the ſame name; ſubject to the Nizam; but paying a "chout," or nominal fourth part of its revenues to Nagpour. It was anciently the chief city of Berar Proper, by which Mr. Rennell diſtinguiſhes the province known in Ayin Acbaree by that name; for Berar, in modern acceptation, includes the whole country between Dowlatabad and Oriſſa; the eaſtern part of which was neither reduced by Acbar, nor even known, in particulars, to the author of the Ayin Acbaree; 122 miles nearly W. of Nagpour. N. lat. 21° 12′. E. long. 78° 51′.

ELLIGER, OTTOMAR, in *Biography*, called the Old, a painter of fruit and flowers; he was born at Gottenburg in 1633. He ſtudied and imitated with great ſucceſs the peculiarities of Daniel Segers. Elliger's works are much eſteemed upon the continent, but are here very little known. He paſſed ſome time at the court of Berlin, invited there on account of his merit and reputation; it is not known when or where he died.

His ſon, known by the name of the younger Elliger, ſtudied hiſtoric painting. He was born at Hamburgh in 1666, and having acquired ſome facility of handling under his father, he was placed as a diſciple with Michael Van Muſſcher, a ſkilful painter of converſation pieces: but aiming at ſomething of a higher caſt, he took Gerard Laireſſe for his maſter, under whom he quickly acquired thoſe principles of compoſition which he deſired, and working upon them, gained conſiderable reputation.

Several of his largeſt and beſt works are at Amſterdam. The elector of Mentz rewarded, in a very ample manner, the exertion of his talents upon two deſigns, one, the "Death of Alexander," the other, the "Nuptials of Peleus and Thetis," which were much admired and applauded. Elliger, however, politely declined the honour of being appointed principal painter to the elector; and unhappily gave up the latter part of his life to diſſipation and drunkenneſs; which weakened his talents and ruined his reputation. He died in 1732, aged 66.

ELLINGTON, in *Geography*, a townſhip of America, conſiſting of about 200 families and 1209 inhabitants in Tolland county, Connecticut, diſtant about 12 miles N.E. of Hartford city, and 6 W. of Tolland.

ELLIOTT, WILLIAM, in *Biography*, an Engliſh engraver, of a mild and benevolent mind, who reſided in London, and died in the year 1766. He engraved ſome large plates for the elder Boydell, but his works are not highly celebrated. A large landſcape, after Gaſper Pouſſin, ſeveral after the Smiths of Chicheſter, and a portrait of Helena Furmans, (the ſecond wife of Rubens,) are mentioned by Strutt, as among the beſt of his engravings.

ELLIPOMACROSTYLA, in *Natural Hiſtory*, the name of a genus of cryſtals. The word is derived from the Greek ἐλλιπὴς, *imperfect*, μακρὸς, *long*, and στῦλος, *a column*, and expreſſes an imperfect cryſtal, with a long column. The perfect figure of cryſtal being a column terminated by a pyramid at each end; thoſe which want this character are eſteemed imperfect; and accordingly bodies of this genus are defined to be imperfect cryſtals, with ſingle pyramids; one end of their column being affixed to ſome ſolid body, and compoſed of thin and ſlender hexangular columns, terminated by hexangular pyramids. Of this genus there are ſeveral ſpecies.

ELLIPOPACHYSTYLA, the name of a genus of cryſtal. The word is derived from the Greek ἐλλιπὴς, *imperfect*, παχὺς, *thick*, and στῦλος, *a column*, and expreſſes a cryſtal of the imperfect kind, with a thick column. The bodies of this genus are cryſtals compoſed of an hexangular column, conſiderably thick and ſhort, and affixed irregularly at one end to ſome ſolid body, and terminated at the other by an hexangular pyramid. Of this genus there are only two known ſpecies.

ELLIPSE, or ELLIPSIS, in *Geometry*, one of the conic ſections, is formed by the common ſection of a plane and a conic ſurface, when the curve line common to the two ſurfaces completely ſurrounds the cone, and the cutting plane is neither parallel to the baſe of the cone, nor takes a ſuccontrary poſition. See CONICS, Def. 5th, and Schol. Prop. 34.

The periphery of the ellipſe, like the circle, returns into itſelf, and completely incloſes ſpace. In familiar language, this figure is called an oval.

The definitions relating to the ellipſe have already been laid down in the article CONICS, where the principal pro-

perties which it possesses in common with the other figures, produced by the intersection of a plane and a conic surface, have been demonstrated. The more characteristical properties, which are peculiar to the ellipse, will at present engage our attention.

1. If two circles be described, (*Plate* VII. *Conics*, *fig.* 1.) one upon the greater axis of an ellipse, and one upon the lesser axis, these two circles will touch the periphery of the ellipse only at the extremities of the common diameter; and the circle upon the greater axis will fall entirely without the ellipse, and the other circle entirely within it. This is manifest from Prop. 39, Conics.

The circle upon the greater axis is sometimes called the circumscribed circle; and the circle upon the lesser axis, the inscribed circle of the ellipse.

2. If a point, F, be assumed in either axis of an ellipse, and from that point an ordinate be drawn both to the ellipse and to the circle described upon that axis; then shall the ordinate of the circle, F G, be to the ordinate of the ellipse, F H, as A B, the axis upon which the circle is described, to the other axis D E.

For, (Cor. 2. Prop. 28. Conics)

$$AF \times FB, \text{ or } FG^2 : FH^2 :: AB^2 : DE^2,$$

And therefore $FG : FH :: AB : DE$.

3. Let M N, (*fig.* 2.) intercepted between the axes of an ellipse, be equal to the difference of the two semi-axes, A C and C D: then, if M N be produced, so that $MG = CD$ and $NG = AC$; the point G will be in the periphery of the ellipse.

Draw G O and G F perpendicular to C D and A B, and draw C H parallel to N G, and produce F G to meet it in H: then $CH = NG = AC$: therefore H is in the periphery of a circle described upon the axis A B. The two triangles N G O and H C F are plainly equal in all respects, therefore $NO = HF$.

Now, $NO : OC :: NG : MG$;

That is, $HF : GF :: AC : CD$:

therefore the point G is in the periphery of the ellipse (2).

And if *m n*, intercepted between the axes of an ellipse, be equal to the sum of the semi-axes A C and C D; and the point G be taken, so that $nG = AC$, and $mG = CD$: it may be shewn, by the like reasoning, that the point G is in the periphery of the ellipse.

4. If from a point (*fig* 3.) without an ellipse two tangents be drawn to the curve, and a straight line to the centre; the last-mentioned line will bisect the chord that joins the two points of contact.

Draw C P and C Q, semi diameters of the ellipse, parallel to the tangents T M and T N; and produce the same tangents to meet a diameter F G, parallel to the chord M N, in D and E. Then T M and T N are proportional to C P and C Q (Cor. 1. Prop. 28. Conics), and also to M D and N E (2. 6. Euc.); therefore M D and N E are proportional to C P and C Q. Therefore,

$$MD^2 : NE^2 :: CP^2 : CQ^2$$

Prop. 38. Conics, $\begin{cases} NE^2 : FE \times EG :: CQ^2 : CG^2 \\ DF \times DG : MD^2 :: CG^2 : GP^2. \end{cases}$

Consequently $DF \times FG = FE \times EG$ (22. 5. Euc.); and by adding CG^2 to both, $DC^2 = CE^2$. Therefore $DC = CE$; and T C will bisect M N.

Cor.—The tangents T M and T N are inversely proportional to the perpendiculars C R and C S, drawn to them from the centre of the ellipse.

Let M C and C N be joined: because $MO = ON$, the triangle $TMC =$ triangle CNT: therefore $TM \times CR = TN \times CS$, for these rectangles are the doubles of the triangles.

5. If a tangent of an ellipse H B (*fig.* 4.) meet a diameter produced, and an ordinate H F be applied to the same diameter from the point of contact: then, the semi-diameter C A will be a mean proportional between C B and C F, the parts between the centre and the tangent, and the centre and the ordinate.

Let A M, a tangent of the curve, meet H P in M; and draw A H and C M cutting A H in O, and H F in N; join A N. The triangles A O M and H O N are equal in all respects; for they are equi-angular, and $HO = AO$ (4); therefore A M H N is a parallelogram (33. 1. E.) Because N A is parallel to B H, therefore,

$$BC : CA :: MC : CN;$$

and because H F is parallel to A M (Cor. 1. Prop. 16. Conics), therefore,

$$AC : CF :: CM : CN.$$

Consequently $BC : CA :: CA : CF$.

Cor.—The rectangle $BF \times FC = AF \times FD$.

For $BC \times CF = BC \times CA - CF^2 = AC^2 - CF^2 = AF \times FD$.

6. If G P (*fig.* 5.) drawn perpendicular to a tangent of the curve at G, cut the axis A B in P, and the axis D E in Q, then will P G be to Q G as the square of the axis D E to the square of the axis A B.

Let the tangent meet the axis A B produced in T, and draw G F perpendicular to A B. Then, (Cor. 2. P. 28. Conics)

$$DE^2 : AB^2 :: GF^2 : AF \times FB;$$

Because P G T is a right-angled triangle,

Therefore, (Cor. 8. 6. E.) $GF^2 = TF \times FP$; also (Cor. 5.) $AF \times FP = TF \times FC$; therefore

$$DE^2 : AB^2 :: TF \times FP : TF \times FC :: PF : CF.$$

But $PG : GQ :: PF : FC$.

Therefore $PG : QG :: DE^2 : AB^2$.

7. If a parallelogram R S T U (*fig.* 6.) be formed by drawing tangents to an ellipse at the extremities of two conjugate diameters M N and P Q: that parallelogram shall be equal to the rectangle under A B and D E, the two axes of the ellipse.

From D, one of the extremities of either axis, draw D L perpendicular to that axis, and let it meet one of the sides of the parallelogram in L; join C L and D M, and draw C H perpendicular to R S. Because D L and L M are tangents, C L will bisect D M (4), and consequently the triangles C L D and C L M will be equal: therefore $CD \times DL = CH \times LM$. Therefore

$$CD : CH :: LM : DL.$$

But (Cor. 1. 28. Conics) $CP : CA :: LM : DL$;

Therefore, $CD : CH :: CP : CA$;

Consequently, $AC \times CD = CP \times CH$.

But $CP \times CH$ is one-fourth part of the parallelogram R S T U, and $AC \times CD$ is one-fourth part of the rectangle $AB \times DE$: therefore, parallelogram $RSTU = AB \times DE$.

8. The sum of the squares of any two conjugate diameters of an ellipse (*fig.* 7.) is equal to the sum of the squares of the two axes.

From M and P, the extremities of two conjugate diameters of an ellipse, draw M T, P S, tangents of the curve cutting the axis B A in T and S: draw M H and P K ordinates to the same axis, and P O an ordinate to the axis D E. Because M N and P Q are conjugate diameters, therefore M T is parallel to P Q, and P S to M N: hence the triangles C M T and C P S are equi-angular, and the perpendiculars

perpendiculars MH and PK will cut the two bases similarly. Therefore,

$$CT : TH :: CS : CK;$$

And (1. 6. E.) $CT \times CH : CH \times TH :: CS \times CK : CK^2$. But (Cor. 2. 28. Conics) $AC^2 : AH \times HB :: CD^2 : MH^2$; And (5, & Cor.) $AC^2 = CT \times CH$, and $AH \times HB = CH \times TH$; therefore,

$$CS \times CK : CK^2 :: CD^2 : MH^2;$$

And (5.) because $CS \times CK = AC^2$,

$$AC^2 : CK^2 :: CD^2 : MH^2.$$

Now, if this last proportion be compared with the two following ones, *viz.*

$$\text{(Cor. 2. 28. Conics.)} \begin{cases} AC^2 : AH \times HB :: CD^2 : MH^2, \\ AC^2 : CK^2, \text{ or } PO^2 :: CD^2 : DO \times OE, \end{cases}$$

we must infer that $CK^2 = AH \times HB$, and $MH^2 = DO \times OE$. Therefore,

$$CK^2 + KP^2 + MH^2 + HC^2 = AH \times HB + HC^2 + DO \times OE + CO^2.$$

But the first of these sums is $= MC^2 + CP^2$, and the second is $= AC^2 + CD^2$: therefore, $MC^2 + CP^2 = AC^2 + CD^2$.

9. If AG and BK (*fig.* 8.), two tangents of an ellipse, be both parallel to the semi-diameter CD, and be intersected by a third tangent GK; the square of CD will be equal to the rectangle $AG \times BK$, which is contained by the parts of the parallel tangents between the points of contact and the third tangent.

Join AB, which will pass through the centre C (Cor. 18. Conics): draw HQ parallel to AB, and HO to CD: produce CD to meet GK in P. Then AC and CD are conjugate diameters (Cor. 24. Conics), and HO is an ordinate to AB, and HQ to CD. Therefore (5),

$$CT : CA :: CA : CO.$$

Convertendo, $CT : TA :: CA : AO$,

Alter. & Comp. $CT : TB :: TA : TO$.

Therefore, by similar triangles,

$$PC : BK :: AG : HO, \text{ or } CQ.$$

Consequently, $BK \times AG = PC \times CQ$. But,

(5) $PC \times CQ = CD^2$, therefore $BK \times AG = CD^2$.

10. Two right lines, Mf and MF (*fig.* 9.), drawn from a point in the periphery of an ellipse to the two foci, make equal angles with the tangent MT, drawn from the same point.

Let the tangent MT meet the greater axis produced in T, draw MK perpendicular to the same axis, and produce fM to O. Then,

(47. 1. E.) $fM^2 - MF^2 = fK^2 - KF^2$;

that is, $(fM + MF)(fM - MF) = Ff \times (fK - KF)$.

But $fM + MF = 2\,AC$ (42. Conics), $fF = 2\,FC$, and $fK - KF = 2\,CK$: therefore,

$$AC \times \frac{fM - MF}{2} = FC \times CK.$$

$$\text{Therefore, } AC : CF :: CK : \frac{fM - MF}{2}.$$

But (5) $TC : CA :: CA : CK$.

$$\text{Ex æquo, } TC : CF :: AC, \text{ or } \frac{fM + MF}{2} : \frac{fM - FM}{2},$$

And, componendo & dividendo,

$TC + CF$, or $Tf : TC - CF$, or $TF :: fM : MF$: therefore (3. 6. E.) TM bisects the outward angle FMO; that is, FM and fM make equal angles with TM.

11. If MP (*fig.* 10. *Plate* VIII.) touch an ellipse, and Mf be drawn from the point of contact to either focus, then CP, drawn from the centre parallel to Mf, and limited by MP, will be equal to AC, half the transverse axis of the ellipse.

Draw MF to the other focus, and also FR and CS parallel to MP. Because $FC = Cf$, therefore $fS = SR$. And because fM and FM make equal angles with MP (9), it is plain that the triangle MRF will be isosceles, and $FM = MR$. But $2\,SM = fM + MR = fM + MF = 2\,AC$ (42. Conics): therefore $SM = AC$. And, because CSMP is a parallelogram, therefore $CP = SM = AC$.

Cor. 1. If FP be joined, it will be perpendicular to MP.

Let CP meet MF in H; then MF will be bisected in H. Because CP is parallel to Mf, therefore the angle HPM is equal to the angle HMP: therefore $PH = HM = HF$: therefore P is in the circumference of a circle described upon the diameter MF; and the angle MPF, in a semicircle, is a right angle.

Cor. 2. If FP and fQ be drawn perpendicular to a tangent of an ellipse from the two foci, the points P and Q are in the circumference of the circle described upon the transverse axis as a diameter.

12. The rectangle under FP and fQ, any two perpendiculars drawn to a tangent of the curve from the foci, is equal to the square of the less axis CD.

For the points P and Q are in the circumference of a circle described upon the greater axis AB: therefore, if PF be produced to meet that circle again in O, the segment QPO, which contains a right angle, will be a semicircle: therefore QC and CO are in one right line, and the two triangles QCf and OCF will be equal, and Qf will be equal to FO. Therefore $Qf \times FP = OF \times FP = AF \times FP = AC^2 - CF^2 = CD^2$. (Def. 23 Conics.)

13. A straight line Tf (*fig.* 11.), drawn from the intersection of two tangents of an ellipse to one of the foci, will make equal angles with two right lines Mf and Nf, drawn from the points of contact to the same focus.

Draw MF and NF to the other focus, and produce fM and fN till MG be equal MF, and NH to NF: draw TG, TF, TH. Because TM makes equal angles with MG and MF (10), it is plain that $TG = TF$ (4. 1. E.): and, for a like reason, $TH = TF$: therefore $TG = TH$. But $fM + MF = fN + NF$ (42. Conics); that is, $fG = fH$. Hence, it is plain, that the two triangles TGf and THf are equal in all respects (8. 1. E.), and the angle TfG is equal to the angle TfH.

Cor. 1. The two lines Tf and TF, drawn to the foci, divide the angle MTN, contained by the tangents, into equal parts.

For, $GTF - fTF = 2\,MTF - fTF = GTf$,

And, $HTF + fTF = 2\,NTF + fTF = HTf$;

Therefore, $2\,MTF - fTF = 2\,NTF + fTF$:

And hence, $MTf = NTF$

$MTF = NTf$.

Cor. 2. If two tangents of an ellipse (*fig.* 12.), drawn from the extremities of a chord passing through one focus F, intersect in T; then TF is perpendicular to the chord MN. For the angles TFM and TFN (*fig.* 11.) are, in all cases, equal; and when MF and FN are in one right line, each of them becomes a right angle.

14. If a tangent of an ellipse, as DE (*fig.* 13.), intersect two perpendiculars drawn from the extremities of the transverse axis, in the points D and E; then two right lines, drawn from these points to one of the foci F, will contain a right angle.

Draw FM to the point in which DE touches the ellipse: then, because AE and BD are tangents of the curve, FE will

will bisect the angle AFM (13), and FD will bisect the angle DFM; whence the proposition is manifest.

15. If MN (*fig.* 14.) be any chord drawn through the focus of an ellipse, and PQ, likewise drawn through the focus, be ordinately applied to the transverse axis AB: then, four times the rectangle MF × FN will be equal to the rectangle MN × FQ.

Draw MS and NR perpendicular to AB, and NG, MK, PH, perpendicular to the directrix that corresponds to the focus F. Then (43. Conics),

PF : PH, or FL :: NF : NG, or LR.

(17. 5. E.) PF : PH :: NF − PF : FR.

In like manner, PF : PH :: PF − FM : FS.

11. 5. E. and alternando, NF − PF : PF − FM :: FR : FS :: NF : FM;

Therefore, (NF − PF) × FM = (PF − FM) × FN:

And 2 NF × FM = PF × MN;

Therefore, 4 NF × FM = PQ × MN.

16. Let ABCD be a quadrilateral figure inscribed in an ellipse, and from M any point in the curve, let PQ and RS (*figs.* 15, and 16.) be drawn parallel to two adjacent sides AB and AD; and let the first of these lines meet the opposite sides of the figure in P and Q, and the second, the two other opposite sides in R and S: then the ratio of the rectangle MP × MQ to the rectangle MR × MS will be equal to the ratio of the square of the diameter of the ellipse drawn parallel to AB to the square of the diameter drawn parallel to AD.

When the two sides AD and BC (*fig.* 15.) of the quadrilateral are parallel, let the right line, which bisects AD and BC, cut RS in K, and let RS meet the ellipse again in O: because MO, AD, and BC, are all parallel, it is plain that the right line which bisects AD and BC will be a diameter of the ellipse, and will bisect the remaining line MO: but the same line which bisects AD and BC will also bisect RS parallel to AD and BC, and terminated by the right lines which limit AD and BC: hence, it is plain, that RO = MS. Therefore the ratio of the rectangle RM × MS to MP × MQ is equal to the ratio of RM × MO to RA × AD; that is (28. Conics), to the square of the diameter of the ellipse drawn parallel to AD to the square of the diameter parallel to AB.

When BC is not parallel to AD (*fig.* 16.) let it, produced if necessary, meet AD and RS in T and U; let RS meet the curve again in O, and join BO, QS. Then, by similar triangles,

BT : TA :: BU : UR,

CT : TD :: CU : US.

Therefore, BT × CT : TA × TD :: BU × UC : UR × US,

but (28. Conics), BT × CT : TA × TD :: BU × UC : MU × UO;

Therefore, MU × UO = RU × US; and

US : UO :: UM : UR :: UQ : UB.

Therefore (2. 6. E.) SQ and BO are parallel; consequently the triangles QMS and BRO are equi-angular, and,

SM : OR :: MQ : RB;

Therefore, SM × MR : OR × RM :: MQ × MP : RB × RA.

Alternando,

SM × MR : MQ × MP :: OR × RM : RB × RA.

But (28. Conics) the ratio of OR × RM to RB × RA is equal to the ratio of the square of the semi-diameter of the ellipse parallel to AD to the square of the semi-diameter parallel to AB: whence the proposition is manifest.

Cor. 1. The ratio of SM × MR to MP × MQ is constantly the same, wherever the point M is assumed in the periphery of the ellipse.

Cor. 2. If, from any point M (*fig.* 17. *Plate* IX.) assumed in the periphery of an ellipse, four right lines, MH, MK, MG, and ML, be drawn so as to make given angles with the four sides of a quadrilateral inscribed in an ellipse; then the ratio of MK × MG, the rectangle contained by two of the lines drawn to the opposite sides of the quadrilateral, to MH × ML, the rectangle of the lines drawn to the other two opposite sides, will be constantly the same, wherever the point is assumed in the periphery.

For, having drawn the lines MPQ and RMS, as in the proposition; the four lines MK, MG, MH, and ML will have given ratios to the four lines MP, MQ, MR, and MS, each to each: and hence the ratio of MK × MG to MH × ML, is compounded of the ratio of MP × MQ to MR × MS and given ratios: whence the corollary is manifest.

Of the description of an ellipse in plano.

1. When the transverse axis (*fig.* 18.) and the two foci of an ellipse are given, any number of points in the curve may be thus found: Take any point O in the transverse axis AB, and from F and *f*, the two foci, as centres, with radii respectively equal to AO and BO, let arcs of circles be described to intersect in M and *m*; and these two points will be in the periphery of the ellipse (42. Conics): and, by assuming different points in the transverse axis, as many points as shall be thought necessary may be found in the periphery of the figure.

When the two axes are given, the foci may be readily found (Cor. Def. 23. Conics); and then the curve may be described by this method.

2. Divide the semi-conjugate axis CE, (*fig.* 19.) and the two halves of the transverse axis AC and CB, into the same number of equal parts, in the points, 1, 2, 3, &c.: with the radius CE describe a quadrant of a circle, and draw 1 *r*, 2 *r*, 3 *r*, &c. ordinates of the circle; also draw 1 L, 2 L, 3 L, &c. perpendicular to AB, and respectively equal to 1 *r*, 2 *r*, 3 *r*, &c: then will all the points L, L, L, &c. be in the periphery of an ellipse, of which AB and ED are two axes. The reason of this construction is manifest from (1).

3. An ellipse (*fig.* 18.) may also be described in various ways, by a point which is made to move by proper mechanical contrivances. And, first, if the ends of a thread, which is exactly equal in length to the transverse axis AB, be fixed in the foci F and *f*; and a describing pencil be carried quite round, till it return to the place it set out from, in such a manner as to keep the thread always stretched out; then the curve, so described, will be the periphery of an ellipse, as is manifest from P. 42. Conics.

4. If two rulers, as FH and *f*K, (*fig.* 20.) each equal in length to the transverse axis AB, have their extremities fixed in the foci so as to be moveable round these points; and if the other extremities of the rulers be connected by a third ruler HK, which is equal in length to F*f*, the distance of the two foci, so as to be moveable about the points H and K: then if the ruler HK be moved round the centres F and *f*, the intersection of the rulers *f*K and FH will describe the periphery of an ellipse, of which AB is the transverse axis, and F and *f* the two foci.

For join FK: it is plain that the triangles FHK and *f*FK are equal in all respects, for the three sides of the one are equal to the three sides of the other, each to each: therefore the angle MFK is equal to the angle FKM:

therefore $FM = MK$. Therefore $FM + Mf = fK = AB$: consequently M is in the periphery of an ellipse, of which A B is the transverse axis, and F and f the foci.

5. If P M (*figs.* 21, and 22.) be taken in a straight ruler equal to the semi-transverse axis, and M Q equal to the semi-conjugate axis; and if P Q, which is equal to the sum or difference of the two semi-axes, be so moved that its extremity Q may slide along B A, and its extremity P along the line C D; then the point M will describe the periphery of the ellipse which has A C and C D for its semi-axes. This is manifest from (3). Elliptical compasses are an instrument constructed as in *fig.* 21.

6. If a ruler C O, (*figs.* 23, and 24.) equal to half the sum or half the difference of the semi-axes of an ellipse, be moveable about the centre of the ellipse C; and another ruler O P, of an equal length, be connected with it so as to be moveable about the point O; and if O M be taken in O P, so as to be equal to half the difference of the same semi-axes in the first case, and to half their sum in the other case: then if the ruler C O be moved round about the centre C, while the point P is made to slide along the transverse axis A B; the point M will describe the periphery of the ellipse.

In C O, or in C O produced, take O K and O L each equal to O M; join M L and M K, and let M K, produced if necessary, cut the transverse axis A B in H: because the two lines C O and O M are, the one, equal to half the sum, and the other, to half the difference of the semi-axes A C and C D; it is plain that $CK = CA$, and $CL = CD$: and because $OP = OC$ and $OM = OL$, therefore M L is parallel to A B: but the angle K M L, in a semi-circle is a right angle, and therefore K H is perpendicular to A B. Now,

$$CK : CL :: AC : CD :: KH : HM;$$

and, because K is in the periphery of the circle described upon the transverse axis, therefore M is in the periphery of the ellipse (2).

Of the area of an ellipse.

1. The area of a circle described upon the transverse axis of an ellipse, is to the area of the ellipse, as the transverse axis is to the conjugate axis.

Let a polygon (*fig.* 25.) of an even number of sides, be inscribed in the circle upon the transverse axis, so as to have two of the angles that are diametrically opposite situated in A and B; and from all the other angular points of the polygon let perpendiculars, F O, G C, &c. be drawn to A B, and let a polygon be formed within the ellipse by joining all the points where the perpendiculars cut the periphery: because the ordinates F O, G C, &c. of the circle, have a constant ratio to the correspondent ordinates N O, D C, &c. of the ellipse, namely, the ratio of A C to C D; therefore the several triangles F B O, F O C, F G C, &c. that compose the polygon in the circle will have the same constant ratio of A C to C D, to the several triangles N B O, N O C, and D N C, &c. that compose the polygon in the ellipse, each to each (1. 6. E.); consequently the polygon inscribed in the circle will have to the polygon inscribed in the ellipse the ratio of A C to C D (24. 5. E.)

And because a polygon of an even number of sides may be inscribed in the circle, which shall be greater than any space less than the circle, it is clear that no space less than the circle can have to the ellipse the same ratio that A C has to C D: for if so, then a polygon greater than the ellipse might be inscribed in it.

And, again, no space greater than the circle can have to the ellipse the same ratio that A C has to C D: for then the circle would have to a space less than the ellipse, the same ratio that A C has to C D: but a polygon may be inscribed in the ellipse that shall be greater than any space less than the ellipse; and, then from what has been shewn, the corresponding polygon in the circle would be greater than the circle itself.

Therefore the circle upon the diameter A B is to the ellipse as A C is to C D.

Cor. The area of the ellipse is equal to the area of a circle described with a radius equal to a mean proportional between the semi-axes A C and C D.

For the circle upon the diameter A B has to the circle, whose radius is equal to a mean proportional between A C and C D, the same proportion that A C has to C D.

By this proposition the quadrature of the ellipse is made to depend upon the quadrature of the circle. And this is true not only of the whole elliptic area, but of any segment of it. For, by the like reasoning, it may be shewn that any segment of the circumscribing circle, as M B F, has to the corresponding segment of the ellipse K B N, the same proportion that A C has to C D; that is, the same proportion that the whole circle has to the whole ellipse.

Of the rectification of the ellipse.

The length of a circular arc and the area of the sector which stands upon it, increase in the same proportion: and hence the mensuration of circular areas, and the finding of the lengths of the bounding arcs, are problems so nearly connected, that the solution of the one is a consequence of that of the other. But the arc of an ellipse is a curve line of unequal and continually varied flexure, and increases after a very different rate from the area which it bounds. And the finding of the lengths of such arcs has been found to be a problem of a higher and more difficult class than the mensuration of the correspondent spaces. There are few problems on which more has been written than on the rectification of the ellipse. The complete solution of it has required the successive labours of many ingenious mathematicians, and has been the occasion for inventing some of the nicest artifices in the whole compass of analysis. The subject is too abstruse to be discussed in this place, and we shall be content with giving a useful formula for the computation of an elliptic arc.

Let A C, (*fig.* 26.) the semi-transverse axis of an ellipse, be $= 1$; C D, the semi-conjugate, $= b$; $1 - b^2 = e^2$; $CF = x$, $FE = y$: then

$$AC^2 : CD^2 :: AF \times FP : FE^2;$$

that is, $1 : b^2 :: 1 - x^2 : y^2$:

and hence $y = b\sqrt{1-x^2}$. Also, let E denote the length of the elliptic arc D E, between the conjugate axis and the ordinate: then, $\dot{E} = \dot{x}\sqrt{1 + \frac{b^2 x^2}{1-x^2}} = \frac{\dot{x}\sqrt{1-e^2x^2}}{\sqrt{1-x^2}}$.

To find the fluent, we may assume $E = A^0 + \int \frac{\dot{x}}{\sqrt{1-x^2}}$ $+ \left\{ A^{(1)}x + A^{(3)}x^3 + A^{(5)}x^5 +, \&c. \right\}\sqrt{1-x^2}$; then by taking the fluxion of this expression, and equating it to the former value of $\dot{E}$ reduced into a series, we shall easily obtain the following equations for determining the assumed co-efficients, $A^{(1)}$, $A^{(3)}$, $A^{(5)}$, &c. *viz.*

$1 =$

$$1 = A^{(0)} + A^{(1)}$$
$$-\frac{1}{2}e^2 = 3\,A^{(3)} - 2\,A^{(1)}$$
$$-\frac{1\cdot 1}{2\cdot 4}e^4 = 5\,A^{(5)} - 4\,A^{(3)}$$
$$-\frac{1\cdot 1\cdot 3}{2\cdot 4\cdot 6}e^6 = 7\,A^{(7)} - 6\,A^{(5)}$$
&c. &c.

And by combining these equations so as to exterminate $A^{(1)}$, $A^{(3)}$, $A^{(5)}$, &c. we get,

$$A^{(0)} = 1 - \frac{1}{2}\cdot\frac{1}{2}e^2 - \frac{1\cdot 1}{2\cdot 4}\cdot\frac{1\cdot 3}{2\cdot 4}e^4 - \frac{1\cdot 1\cdot 3}{2\cdot 4\cdot 6}\cdot\frac{1\cdot 3\cdot 5}{2\cdot 4\cdot 6}e^6, \text{ \&c.}$$

By means of this series $A^{(0)}$ may be computed, and then the remaining co-efficients of the assumed series will be found by the following easy formulas:

$$A^{(1)} = 1 - A^{(0)}$$
$$A^{(3)} = \frac{2}{3}A^{(1)} - \frac{1}{2}\cdot\frac{e^2}{3}.$$
$$A^{(5)} = \frac{4}{5}A^{(3)} - \frac{1\cdot 1}{2\cdot 4}\cdot\frac{e^4}{5}.$$
$$A^{(7)} = \frac{6}{7}A^{(5)} - \frac{1\cdot 1\cdot 3}{2\cdot 4\cdot 6}\cdot\frac{e^6}{7}.$$
&c. &c.

When $x = 1$, or when E becomes a quadrant of the ellipse, the expression will be reduced to its first term $A^{(0)} \times \int \frac{\dot{x}}{\sqrt{1-x^2}} = A^{(0)} \times \frac{\varpi}{2}$, ϖ denoting 3.14159, &c. the periphery of a circle whose diameter is 1: and hence the quadrant of the ellipse is equal to

$$\frac{\varpi}{2} \times \left\{ 1 - \frac{1}{2}\cdot\frac{1}{2}e^2 - \frac{1\cdot 1}{2\cdot 4}\cdot\frac{1\cdot 3}{2\cdot 4}e^4 - \frac{1\cdot 1\cdot 3}{2\cdot 4\cdot 6}\cdot\frac{1\cdot 3\cdot 5}{2\cdot 4\cdot 6}e^6, \text{\&c.} \right\}$$

On the subject of the rectification of the ellipse, see the Edin. Transactions, vol. iv. and v. London Transf. 1804. Landen's Memoires. Le Gendre, Mem. de l'Acad. 1786. Le Gendre Mem. sur les Transcendantes Elliptiques. Euleri opuscula, Berlin, 1750. See QUADRATURE, and RECTIFICATION.

ELLIPSIS, in *Grammar* and *Rhetoric*, is a verbal figure, or a figure of syntax, wherein something is suppressed, or left out, in a discourse, and supposed or understood; or it is a defect or omission of some part of a sentence, which must be supplied in order to render the construction complete and fully to express the sense. See on this subject the Port Royal Latin Grammar, vol. ii p. 168, &c. See ZEUGMA.

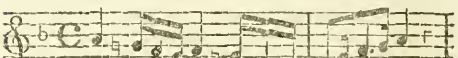
This figure is often used in proverbial speeches, as when we say; "many men, many minds," that is, "have many minds;" also, "the more danger, the more honour," that is, "gains more honour." This figure also occurs, when, being under the transport of a violent passion, a man is not at leisure to speak every thing out at length, the tongue being too slow to keep pace with the rapid motions of the mind, so that on these occasions we only bring forth broken interrupted words and expressions, which represent the violence of a passion better than any consistent discourse. When used in this sense, it is more generally called *aposiopesis*, which see. See also ASYNDETON.

F. Bossu considers the ellipsis as a mode of disguising sentences, by suppressing the word which should make the particular application, and leaving the whole in a kind of ingenious ambiguity. Thus, the Trojans, in Virgil, being reduced by Turnus to the last extremity, and ready to be destroyed, by Æneas coming to assist them; upon which the poet says, "Spes addita suscitat iras." Which expression signifies either, in particular, that the hope they conceive retrieves and augments their courage; or in general, that the hope of assistance at hand naturally raises courage, and gives people new strength.

If the poet had added a word, and said, "Ollis spes addita suscitat iras," the passage had been expressly restrained to the first sense, and had ceased to be a sentence, and commenced only the application of a sentence: the suppression of that word makes it a sentence in form.

This, that excellent critic looks on as one of the finesses of the Latin tongue, wherein it had vastly the advantage of the modern tongues. Trait. du Poeme Epique, p. 460, &c.

ELLIPSIS has a place in Walther's Lexicon as a musical term, to express a passage when broken, and rendered imperfect by a rest; but though some note is left out in moments of rage and perturbation, it is understood, or the time would be broken.



ELLIPSOID *Figure of the Earth*, in *Geology*. The terraqueous globe, having been found by the measurement of degrees in different latitudes, by the rates of the vibration of a pendulum in different parts, &c. to agree nearly with an ellipsoid, having the polar axis for its conjugate diameter, which sir Isaac Newton had shewn to be the form which a fluid mass revolving on an axis would assume; Mr. Whitehurst, Mr. Kirwan, and other geological writers, have thence inferred, that the solid matters of the globe were once *in a fluid state*. It is worthy, however, of consideration, that the present appearances and the Newtonian theory may be perfectly reconciled, without having recourse to a soft or liquefied state of the hard substances which now appear in the earth; the inconceivable number of fragments into which the earth is now divided by its faults or fissures, appear to give it a facility for obeying the impulses of gravity and centrifugal force towards an equilibrium, almost as great as in a fluid, taking the immensity of the mass into consideration; and it is only by the just equilibrium of all its present parts, aqueous and solid, that the continents and islands now preserve an elevation above the aqueous spheroid, which they evidently once had not; as their aquatic mineral remains testify.

The term spheroid is sometimes used when speaking of the earth's figure, synonymously with ellipsoid; but M. Bouguer having applied the term spheroid to a solid generated from a curve of the fourth order, which he conceived would agree better with the terrestrial measurements then known than an ellipsoid, it will be well hereafter to preserve these distinctions, and not use the term ellipsoid, but for the figure generated by a true Apollonian ellipsis, reserving the term spheroid for any other kind of solid, generated by the rotation of an oval curve, or nearly approaching thereto.

ELLIPTIC, or ELLIPTICAL, something that belongs to an ellipsis.

ELLIPTIC *Arch*, in *Architecture*, a part of the curve of an ellipsis employed in an arch It has this advantage over a circle when employed in bridge building, that it not only saves materials, but gives more room under the arch at the hanches, and therefore, in a navigable river or canal, vessels will pass more easily under it than under a circle.

ELLIPTIC *Arc*. See CATENARIA.

ELLIPTIC *Motion*. Theory of the elliptic motion of the planets round the sun. (*Plate* XII. *Astronomy*, *fig* 103.)

Definitions.—The excentricity of the orbit is the distance C S of the centre from the focus. The radius vector is the

line drawn from the centre of the sun to the centre of the planet. If M represent the place of the planet for a given instant, S M is its radius vector.

The line of apsides is the greater axis of the ellipse, and it marks the aphelion and perihelion of the planet. The aphelion A, or superior apside, is the point in which the planet is at its greatest distance from the sun. The perihelion P, or lower apside, the point in which it is the nearest.

The anomaly is in general the distance of a planet from its aphelion, but some modern astronomers have adopted the method of reckoning the anomaly from the perihelion; for since this must be done in the case of comets, it appears more uniform and consistent to make a general rule serve for all. However, as this is a matter totally indifferent to the theory, we shall for the present suppose the anomaly reckoned from the aphelion.

There are several ways of considering this distance.

The *true* anomaly is the angle formed at the focus of the ellipse, by the radius vector and the line of apsides, as A S M.

The *excentric* anomaly is the angle formed at the centre of the ellipse, by the greater axis and the radius of a circumscribing circle, drawn to the extremity of an ordinate passing through the place of the planet, as N C A. The *mean* anomaly is the distance from the aphelion supposed proportional to the time. So that a planet which should employ six months to go from A to P, would at the end of one month have 30° of mean anomaly. If a line C X be taken to mark the mean anomaly, and this line be supposed to revolve uniformly round the centre C, the line C X will at first be more advanced than the line C N, because A N increases slower towards the aphelion, the real motion of the planet being less than the mean motion. and this distance X N will increase, as long as the real motion is slower than the mean motion.

The difference between the *true anomaly* and the *mean anomaly* forms the *equation of the centre.*

Since the mean anomaly is proportional to the time, and is a portion of the time of a whole revolution, it may be measured by any quantity that has a uniform increase; thus, not only A X, the angle A C X, and the sector A C X, may be taken to represent the mean anomaly, but even the elliptic sector or area A S M formed by the radius vector S M, the portion of the greater axis S A, and the elliptic arc A M. Because the areas described are proportional to the times.

Kepler, having found that the planets described ellipses, with areas proportional to the times, it only remained to conclude the true place for a given time.

When the whole time of a revolution of a planet is known, for example, that of the earth equal to 12 months, and it is required to assign its place in its orbit at the end of one month, the problem consists in determining the sector A S M such, that it will be $\frac{1}{12}$th of the whole surface of the ellipse: this sector is the mean anomaly, and may be expressed in degrees by dividing 360° by 12. It is in degrees, minutes, and seconds that the anomalies are always found in astronomical tables.

When the mean anomaly is known, or the surface of the sector A M S, a question arises, how to find the true anomaly, or the angle A S M of this sector. Kepler perceived the difficulty of this problem, "having given the mean anomaly to find the true," even in a circle, for the difficulty is the same as in an ellipse, and he invited the mathematicians of his time to endeavour to find a solution. This problem still continues to be called the "Problem of Kepler," who thus expresses himself on the subject.

Hæc est mea sententia; quæ quominus videbitur geometricæ pulchritudinis, hoc magis adhortor geometras ut mihi solvant hoc problema. Datâ areâ partis semicirculi, datoque puncto diametri, invenire arcum et angulum ad illum punctum: cujus anguli cruribus et quo arcu data area comprehenditur; vel aream semicirculi ex quocumque puncto diametri in data ratione secare. Mihi sufficit credere solvi a priore non posse propter arcus et sinus ἐπιρρητεύειν.

This problem has never yet been solved in any other manner than by approximation. But in practice the investigation is very much simplified by reversing the question, and supposing known the true anomaly to find the mean. This method is shorter and often more exact than the direct method; it was very successfully employed by La Caille in determining the motion of the sun; and is founded on two theorems, which only suppose known some properties of trigonometry and the conic sections.

Lemma.—In an ellipse A M P, about which is circumscribed the circle A N P, C X being the line of mean anomaly, M the true place of the planet, R M N an ordinate passing through the planet, the circular sector A N S A shall always be equal to the circular sector A C X, which represents the mean anomaly.

Demonstration.—Let T be the whole time of a revolution, and t the time employed by the planet in going from A to M, then, because the areas are proportional to the times, we have t : T :: sector A M S : to the whole surface of the ellipse. In the same manner, since A C X is the mean anomaly, t : T :: A C X : surface of the circle. But by the property of the ellipse A M S : A N S :: the surface of the ellipse : the surface of the circle. We have thus two proportions, with three terms in common, from which it may be inferred that A C X and A N S are equal to each other.

The square root of the perihelion distance is to the square root of the aphelion distance as the tangent of half the true anomaly is to the tangent of half the excentric anomaly.

Demonstration.—In the triangle R S M (by the property of right-angled triangles,) the tangent of half the angle R S M is equal to the opposite side R M, divided by the sum of the two other sides S R, S M. Hence in the right-angled triangles M S R, N C R, we have this proportion:

$$\text{tang. } \tfrac{1}{2} \text{ M S R} : \text{tang. } \tfrac{1}{2} \text{ N C R} :: \frac{\text{R M}}{\text{S R} + \text{S M}} : \frac{\text{R N}}{\text{C R} + \text{C N}}.$$

Instead of the ratio R M : R N, substitute C D to C A, which is equal to it by the property of the ellipse, and instead of S R + S M its value P R . $\frac{\text{S A}}{\text{C A}}$, and likewise P R instead of C R + C N, then the above proportion will be changed into the following.

$$\text{Tang. } \tfrac{1}{2} \text{ M S R} : \text{tang. } \tfrac{1}{2} \text{ N C R} :: \frac{\text{C D . C A}}{\text{P R . S A}} : \frac{\text{C A}}{\text{P R}}$$

:: C D : S A. If a be the semi-diameter of the ellipse. e the excentricity C S, then tang. $\frac{1}{2}$ M S R : $\frac{1}{2}$ N C R :: C D : S A :: $\sqrt{a^2 - e^2} : a + e$; dividing the two last terms by $\sqrt{a + e}$; tang. $\frac{1}{2}$ M S R : tang. $\frac{1}{2}$ N C R :: $\sqrt{a - e} : \sqrt{a + e}$ :: $\sqrt{\text{P S}} : \sqrt{\text{S A}}$, or the square root of the perihelion distance is to the square root of the aphelion distance as the tangent of half the true anomaly is to the tangent of half the excentric anomaly.

The difference between the excentric anomaly and the mean anomaly is equal to the product of the excentricity by the sine of the excentric anomaly.

Demonstration.—The circular sector A N S A is equal to the sector of the mean anomaly A C X, if the common portion A C N be taken from both, the sector N C X will be equal to the triangle C N S. The area of the circular sector N C X

N C X is equal to the product of C N by half the arc N X. The area of the triangle C N S is equal to the product of C N by half the height S T, which is a perpendicular let fall from the focus S upon the base N C, continued beyond the centre C; thus the two areas being equal, and having one of the multipliers C N common to both, the other multipliers are also equal; therefore the arc N X is equal to the straight line S T. But in the triangle S T C, T being a right angle, S T is equal C S. fin. T C S, according to the common expression of rectilinear trigonometry; therefore N X = C S . fin. T C S = C S . fin. A C N; therefore the difference N X between the excentric anomaly A N, and the mean anomaly A X, is equal to the product of the excentricity C S by the sine of the excentric anomaly A C N.

In order that the lines N X, S T, C S. may be compared with each other, they must be expressed in parts of the same denomination.

The mean anomaly is expressed in degrees. minutes, and seconds; therefore S T, and the excentricity C S, must be expressed in seconds. To obtain it, it is sufficient to know, that the radius A C of any circle whatever, A N X, is equal to about 57°, or to the arc of 206264″.8; thus the arc equivalent to the excentricity C S may be obtained by stating this proportion: the mean distance, or the radius A C, is to the excentricy C S as the arc equal to the radius is to the arc equivalent to C S, or to the number of seconds which the excentricity contains. Therefore this number is $\frac{206264''.8 \ CS}{AC}$.

If we state A C : C S : : 1 : e, that is to say, if e is the excentricity in parts of the mean distance, e will be equal $\frac{CS}{AC}$; and to express the excentricity in seconds, it would be sufficient to multiply the number 206064″.8 by e, the logarithm of which is 5.3144251332. This is also the arithmetical of the log. fin. of 1″, so that $206264''.8 = \frac{1''}{\text{fin. } 1''}$, and the fin. $1'' = \frac{1''}{206264''.8}$. Whenever Mayer wishes to express a quantity in seconds, he divides it by the sine of 1″. If, on the contrary, he wishes to express a number of seconds, in decimals of the radius, he multiplies it by the sine of 1″. In fact, the sine and the arc of 1″ are apparently equal. We may say 1″ : fin. 1″ : : a number of seconds is to the same number expressed in similar parts to those of the sine 1″, that is to say, in decimals of the radius, and the fourth term of this proportion is in fin. 1″. This method may be retained more easily, and fin. 1″ takes up less room in a formula. Sometimes 57° is written instead of 206264.″8.

It is the same in all quantities which are found in calculations expressed in parts of radius; where it is required to have them in seconds, they are multiplied by 206264″, where the constant log. 5.3144251332 is added to their log.

It is the contrary if their arcs are in seconds, and they are required in decimals of the radius.

Before we proceed to give an example of the above theorems, we shall insert the following table for each planet, which contains the two constant logarithms computed for the proportions of the two theorems.

The first for the excentric anomaly, is half of the difference between the logarithm of the aphelion distance and that of the perihelion distance; this added to the logarithm of the tangent of half the true anomaly gives the logarithm of the tangent of half the excentric anomaly.

The second logarithm serves to find the mean anomaly; it is the sum of the logarithm of the excentricity and of the log. of 57°, &c. an arc equal radius. This constant logarithm added to the sine of the excentric anomaly gives the logarithm of the difference between the excentric and mean anomalies. In the same table is annexed the logarithm of the minor axis, which serves to find the distance. It is the half sum of the logarithms of the aphelion and perihelion distances.

Planets.			
Mercury	0.0905430	4.6272651	9.5784504
Venus	0.0029905	3.1522975	9.8593275
The Sun	0.0072927	3.5394899	9.9999387
Mars	0.0405448	4.2833172	0.1810076
Jupiter	0.0208955	3.9963597	0.7157339
Saturn	0.0244430	4.0643360	0.9788940
The Moon	0.0239255	4.0556625	9.9993412
Herschel	0.0206824	3.9919124	1.2801270

Example.—Suppose the true anomaly of Mars to be 1° 0° 8′ 40″, and that it be required to convert it into mean anomaly, the logarithm of the aphelion distance, according to the tables of De la Lande, is 5.221552; the log. of the perihelion distance 5.140463; the half difference of their logarithms 0.0405448, this is the constant logarithm for the first analogy, as in the above table.

The distances which answer to the two logarithms of the tables, are 1665530 and 1381856, the half sum of these two distances is 1523693, this is the semi-axis of the ellipse, or the mean distance of Mars from the Sun, the half of the difference between these distances is 141837, or the excentricity. This excentricity must be converted into a fraction, the mean distance of Mars being taken as unity; thus,

152369 : 1 : : 14183 : 0.0930877, which is a decimal fraction of the distance of Mars, and its logarithm is 8.9688921. To reduce it into seconds, it must be multiplied by the arc equal radius, which gives 19200, whose logarithm is 4.2833172.

Log. of excentricity 14183.7	- -	4.1517895
Subt. log. of semi-axis 152369	- -	5.1828974
Difference - - - - -		8.9688921
Add log. of 57° or arc = rad.	- -	5.3144251
Sum of the constant log. of the 2d proportion		4.2833172
Constant log. for the 1st.	- - -	0.0405448
Log. tang. of ½ true anom. 15° 4′ 20″		9.4302374
Log. tang. of ½ excent. anom. 16° 28′ 13″.8		9.4707822
Therefore the excent. anom. is 3256.176.		
Const. log. for the 2d proportion	- -	4.2833172
Log. fin. excent. anom. 37° 56′ 27″.6	-	9.7354193
Log. of 10440″.9, or - 2 54 09	-	4.0187365
Add. excent. anom. - 32 56 27.6		
Mean anomaly - = 35 50 28.5		

If the true anomaly surpasses 180° or six signs, take its supplement to 360°, and after having found the mean anomaly, take its supplement to 360°, that the mean anomaly may be always reckoned according to the signs.

In this manner we may find the mean anomaly having given the true, but it is usually the true anomaly we wish to find. The mean anomaly being given, we must then proceed thus;

By inspection of the tables, it may be seen nearly what equation of the centre corresponds to the degree of anomaly which is given. This is to be applied to the mean anomaly, to have the

the true, and this true anomaly is to be converted back again into mean, by the preceding rules. If the mean anomaly which results is the same as that given, it shews that the equation employed is correct; if the mean anomaly is found too great, then the supposed true anomaly must be diminished, and thus by these two suppositions, by a simple proportion, a mean anomaly may be found which exactly accords with the given one, the difference between this and the true anomaly employed to find it is the exact equation sought.

The radius vector, or the distance of the planet from the sun, is found by means of the true anomaly, and the excentric anomaly by making the following proportion.

Sin. of true anom. : sin. excen. anom. : : $\frac{1}{2}$ minor axis : radius vector.

Demonstration.—Draw the line NQ parallel to the radius vector MS; then by similar triangles SM : QN :: RM : RN :: CD : CK or CN; hence SM : CD :: QN : CN :: sin. QCN : sin. CQN :: sin. RCN : sin. RSM, and sin. RSM : sin RCN :: CD : SM, which is the distance required.

It is to facilitate the use of this theorem that in the above table is inserted the logarithm of the minor axis for the principal planets By the property of the ellipse CD, or $\sqrt{SD^2 - CS^2} = \sqrt{CP^2 - CS^2} = \sqrt{CP + CS} \times \sqrt{CP - CS}$; that is, CD is equal to the product of the square roots of the aphelion and perihelion distances.

Example.—The true anomaly being 30° 8′ 40″, the excentric anomaly 32° 56′ 27″.6, it is required to find the radius vector or distance of Mars from the sun. Add together the log. of the aphelion distance and the log. of the perihelion distance, take the half of their sum, which is equal to the log. of the semi-axis - - - - = 0.1810076

Add log. sin. excen. anom. 32° 56′ 27″.6 = 9.7354193

9.9164269

Subt. log. sin. true anom. - - - 9.7008609

Remainder is the log. of the radius vector 0.64273 - - } - 0.2155660

ELLIPTIC *Space*, is the area contained within the circumference, or curve of the ellipsis.

It is demonstrated: 1. That the elliptic space is to a circle described on the transverse axis, as the conjugate diameter is to the transverse axis.

2. That the elliptic space is a mean proportional between two circles described on the transverse and conjugate axes. See ELLIPSIS.

ELLIPTIC *Conoid*, is the same with the spheroid.

ELLIPTIC *Specula*, or *Mirrors*. See MIRROR.

ELLIPTIC *Winding-stairs*. See STAIRS.

ELLIPTIC *Wind-mill*. See WIND-MILL.

ELLIPTIC *Compasses*, an instrument made usually in brass, for the drawing any ellipsis or oval, by one revolution of an index. See ELLIPSIS and COMPASS.

ELLIPTIC *Dial*, is an instrument usually of brass, with a joint or fold together, and the gnomon to fall flat, for the sake of the pocket.

By it are found the meridian, hour of the day, rising and setting of the sun, &c. See DIAL.

ELLIPTICUM FOLIUM, in *Botany*. See LEAF.

ELLIPTOIDES, an infinite ellipsis, *i. e.* an ellipsis defined by the equation $a\,y^{m+n} = b\,x^m \times a - x^n$, wherein $m > 1$ or $n > 1$. See ELLIPSIS.

Of this there are several kinds or degrees; as the cubical elliptoid, wherein $a\,y^3 = b x^2 \times a - x$. A biquadratic or surdesolidal elliptoid, or that of the third order, wherein $a\,y^4 = b\,x^3 \times a - x^2$.

If any other ordinate be called v, and the correspondent abscis z; there will be

$$a\,y^{m+n} = b\,z^m \times a - z^n:$$

Consequently,

$$a\,y^{m+n} : a\,v^{m+n} : : b x^m \times a - x^n : b\,z^m \times a - z^n;$$

That is, $y : v : : x^m \times a - x^n : z^m \times a - z^n$.

ELLIS, JOHN, in *Biography*, an eminent naturalist, the celebrated assertor of the animal nature of Corallines, was born, we believe, in London, about the year 1710, but our opinion is founded chiefly on conjectural evidence. By a book now before us, in his hand-writing when a boy, it appears that he began the study of vulgar fractions Oct. 1. 1723, and pursued it afterwards to a considerable extent. He is presumed to have been engaged in merchandize, and possibly in some public office, or place under government, but of his precise occupation or station in life, we have no exact information. He soon imbibed a general taste for natural history, and having numerous friends and correspondents in various parts of the world, especially America and the West Indies, he was indefatigable in procuring seeds and specimens of plants, as well as insects, shells, corals, and every kind of natural curiosity. He laboured to discover and to teach the best methods of collecting and preserving such objects, as well as to procure receipts for varnishes, cements, colours, or any thing else which might be useful to him as a practical naturalist. Microscopical enquiries soon engaged his attention, and he improved the microscope then in use, so as to render it more convenient for his purpose. He was the friend of Peter Collinson, of the Rev. Dr. Hales, and of Dr. Alexander Garden, with whom he agreed no less in taste for natural science, than in excellence of moral and religious character through life.

The studies and amusements of Ellis have indeed had many votaries, whose numbers, for a century past, have been rapidly encreasing in this and other countries. But how few among these vast numbers have, like him, had the lot of making a grand and original physiological discovery, which removes a numerous and intricate tribe of beings from one kingdom of nature to another, and so clearly elucidates their whole economy that no subsequent doubts can arise, at the same time diffusing collateral light, in various directions, through other ranks of creation! The progress of the discovery of the animal nature of corals and corallines, to which we allude, is well detailed by our author in the introduction to his Natural History of Corallines, published at London in 1755, in quarto, with 37 plates of the various species. The idea appears to have occurred to him in the autumn of 1751, and spring of 1752, when in disposing specimens of various marine productions, hitherto deemed plants, upon paper, he soon learned, by their difference of texture, to discriminate such as he suspected to be more of an animal than vegetable nature. He presented a collection of these new-discovered animals to the Royal Society, of which he was already become a fellow, and his opinions were confirmed by those of several learned naturalists there assembled. This original collection still remains in four glazed frames, over the chimney-piece of an apartment in the British Museum. In August 1752, Mr. Ellis undertook the necessary examination of these productions in a living state in the isle of Shepey, accompanied by a draughtsman. Here he first saw the various living animals, of

of which the corallines were but the ſhells or caſes, and we may eaſily conceive the pleaſure with which he watched their various movements in queſt of food, or in the enjoyment of animal life, all ſo ſtrikingly deciſive of the truth of his preconceived theory. In June 1754, the celebrated botaniſt and artiſt Mr. Ehret accompanied him in an excurſion to the Suſſex coaſt; and the pencil of this able man was well employed in the ſervice of his diſcoveries as they aroſe. The fruits of this excurſion were communicated to the Royal Society, in the 48th volume of whoſe Tranſactions the remarks of Mr. Ellis on the ſubject in queſtion are found, in one letter to the Rev. Dr. Birch, and three others to Mr. Peter Collinſon. A fourth letter to the laſt-mentioned naturaliſt is printed in the 49th volume of the ſame publication, containing an account of a "curious fleſhy coral-like ſubſtance." This is now named *Alcyonium Schloſſeri*. Another excurſion in Auguſt 1754, along the northern coaſt of Kent, in company with Oeder the celebrated Daniſh botaniſt, furniſhed Mr. Ellis with ſeveral new ideas on the ſubject of his reſearches, eſpecially the mode of propagation of theſe animals. He alſo learned to preſerve the polypes in an expanded ſtate, by ſuddenly immerſing the ſpecimens in proof ſpirit, by which the vital principle was extinguiſhed before they could withdraw into their cells. By theſe repeated obſervations upon our Britiſh corallines, and comparing them with ſome of the exotic more ſolid or horny kinds, this acute philoſopher was enabled to prove that even theſe laſt are formed upon the ſame principle. Nothing can be more certain than that their ſtems, however ſolid, are originally congeries of tubes, filled up and obliterated by the ſubſequent depoſition of horny matter, as the polypes advance upwards, and branch off into various new colonies. The ſame may be obſerved of the more ſtony productions properly called corals. Theſe are likewiſe aggregate animals, whoſe ſhells while ſoft cohere laterally into one common maſs; whereas univalve ſhell-fiſh are ſolitary individuals, whoſe ſhells as they encreaſe are convoluted upon themſelves. In the famous Wentletrap, *Turbo ſcalaris*, theſe convolutions do not touch each other, except by the intervention of thin tranſverſe plates; the ſame thing is remarkable in the ſtraight tubes of the coral named *Tubipora muſica*.

The doctrine of Mr. Ellis however did not eſcape controverſy. Dr. Job Baſter, a learned Dutch naturaliſt, communicated to our Royal Society ſome doubts upon the ſubject, which are printed in the 50th volume of the Philoſophical Tranſactions. where alſo Ellis's reply may be ſeen. The great Ruſſian naturaliſt Dr. Pallas was likewiſe among his opponents, as well as that indefatigable writer ſir John Hill; but the ſcruples of the latter were afterwards ſo far removed, that he tried to extend the diſcovery of Ellis to *Fungi*, wanting to prove them alſo of an animal nature; in which he was unqueſtionably as much miſtaken as in his previous diſbelief of the animal nature of corallines. To detail the arguments on either ſide would now be ſuperfluous. We ſhall conclude the ſubject by remarking, that notwithſtanding the diſcoveries of Ellis, Linnæus has, even in the laſt edition of his *Syſtema Naturæ*, retained ſo much of the old error as to define Zoophytes "compound animals, which bear flowers, their vegetating ſtem paſſing by metamorphoſis into a flowering animal." In a note he explains his opinion that the animals do not, like thoſe of ſtony corals, form their caſes or ſhells, but are themſelves formed by thoſe ſhells, which he conceives to be truly of a vegetable nature. He allows indeed the flowers to be real animals, with organs of generation and of motion. This error is corrected by Gmelin, who juſtly unites the *Lithophyta* and *Zoophyta* of Linnæus into one order under the latter denomination, and defines them "compound animals, flowering like plants;" ſuch at leaſt is his meaning, though *animalium* is printed for *plantarum* more.

In botany Ellis diſtinguiſhed himſelf by an account of two new genera, the *Haleſia* and *Gardenia*, printed in the Phil. Tranſ. vol. 51. The former was named after his learned friend the Rev Dr. Hales, and is an American flowering ſhrub or tree of great elegance, which bears our climate well; the latter is a fine Indian ſhrub, well known in our ſtoves, named after Dr. Garden, long reſident in Carolina. He publiſhed alſo a ſeparate pamphlet on the Venus's Fly-trap; ſee DIONÆA *muſcipula*; and was the author of a fourth new genus, *Gordonia*, named after Mr. Gordon of Mile-end. Every genus therefore which he eſtabliſhed has remained unſhaken, and we may venture to predict will ever continue ſo, while botany continues a ſcience. The *Gordonia* was deſcribed in the 60th vol. of the Phil. Tranſ. along with a new ſpecies of *Illicium*, or Starry Aniſe, from Weſt Florida. In the 57th vol. of the Tranſ. Mr. Ellis deſcribes ſome *Confervæ*, hitherto unknown. One of his moſt favourite botanical objects was to aſcertain the true Varniſh-tree of Japan, which he contends, in oppoſition to Miller, to be diſtinct from the American *Toxicodendron*. The controverſy may be ſeen in the 49th and 50th volumes of the Phil. Tranſ. The point ſeems not yet well determined, but the American plant is certainly *Rhus Vernix* of Linnæus. Our author publiſhed ſeparately an hiſtorical account of Coffee, with remarks on its culture and uſe, and a plate of the ſhrub; alſo a deſcription of the Mangoſtan and Bread-fruit, with four plates. Theſe are quarto pamphlets, and the latter contains many uſeful "directions to voyagers, for bringing over theſe and other vegetable productions." This laſt ſubject frequently engaged Mr. Ellis's attention, and makes a ſeparate quarto pamphlet publiſhed in 1770. In the 51ſt and 58th volumes of the Phil. Tranſ. are papers of his, on the preſervation of ſeeds. Nor were theſe all the ſcientific purſuits of his indefatigable mind. He wrote alſo in the Tranſ. various other papers on Corals, Sea Pens, and other animals of the ſame tribe, as well as on the Cochineal Inſect; on the *Coluber Ceraſtes*, or Horned Viper of Egypt; on that ſingular animal, found by his friend Garden in Carolina, the *Siren lacertina* of Linnæus, now eſteemed a *Muræna*; on the ſtructure of the Windpipes in ſeveral birds and in the Land Tortoiſe; and even on the method of making Sal Ammoniac in Egypt. It appears moreover, by many ſpecimens of his collecting, that he was an aſſiduous obſerver of the internal ſtructure or anatomy of vegetables, on which no doubt he had conferred with Dr. Hales, whoſe experiments and obſervations he ſeems often to have had in view.

It would have been extraordinary if the numerous communications of Mr. Ellis to the Royal Society had failed of the peculiar reward, ſo richly merited, which that learned body has in its power to beſtow. Accordingly Sir Godfrey Copley's medal was, on the 30th of Nov. 1768, delivered to him by Sir John Pringle, then Preſident; and it being uſual to ſingle out ſome one or two papers in particular for ſuch a compliment, one "on the animal nature of the genus of Zoophytes called *Corallina*," in a letter to Linnæus, and another "on the *Actinia ſociata*," in a letter to the earl of Hillſborough, both printed in the 57th vol. of the Tranſ. were ſelected for this purpoſe.

Of the private occurrences of the life of this diſtinguiſhed man we have not much information. In a manuſcript letter to

to the Rev. Mr. Borlase dated March 3d, 1764, the following passage is remarkable. "You too greatly over-value my little progress in natural knowledge. Had I been regularly bred to it I might have made some progress in it worth notice, but I assure you the small advance I have made in it was only to amuse a mind distressed by a series of misfortunes, and I thank God it has had that great and good effect, so as to render this part of my life the most happy of the whole, by my being taken notice of by men of worth and honour." Thus modestly wrote a man whose discoveries form an epocha in natural science, and thus felt a Christian philosopher, whose heart expanded to all his fellow-creatures! He was at this time much acquainted with the excellent Dr. Solander, who laboured with him at the study of exotic Zoophytes, as well as of the British Sea-weeds. On the former subject a splendid posthumous work in quarto appeared in 1786, under the direction of the author's daughter, who dedicated it to sir Joseph Banks. This book is illustrated by 63 beautiful engravings, some of them inferior to none in natural history. Whether Mr. Ellis had been unsuccessful in trade, or from any other cause not perfectly at ease in his circumstances, we know not, but he wrote as follows to a friend in Feb. 1764. "I thank God the agency for West Florida, which my lord Chancellor (Northington) has got me, makes me easy and happy, and I hope will prove of use to natural history. My business does not oblige me to leave London." It appears that in 1757 he resided in Laurence-lane; in 1771 in or near Gray's-inn; and that he had occasionally a summer residence at Fulham. In a letter to another friend, dated Gray's-inn, Jan. 2. 1771, is the following passage. "By lord Northington's goodness I have been made agent of West Florida, and lately have got the agency of Dominica. This comfortable income has enabled me to pursue with spirit my favourite study of natural history." After a series of declining health, Mr. Ellis died on the 15th of October 1776, being, as we presume, about 66 years of age, though the time of his birth is not mentioned either in the advertisement prefixed to his posthumous work, or in the Gentleman's Magazine for 1776, where he is said to have died on the 5th of October. His person was tall, his features expressive and strongly marked. Of the time of his marriage, or any particulars concerning his wife, we have no account. One only daughter, named Martha, survived him, to whom he left a handsome competency, and for whom he had the strongest parental affection, which she most abundantly merited and returned. This excellent lady, who inherited her father's taste and character, more especially his piety and sensibility of mind, with a considerable likeness to his person, was he second wife of Alexander Watt, esq. of Northaw, Herts. She bore her husband several sons, now for the most part engaged in the naval service of their country, and one lovely daughter, who survived her mother but a few years. Mrs. Watt died in childbed at Northaw in the spring of 1795. Her will, written entirely in her own hand, and a letter to her husband, found after her decease, are worthy of the pen of a Richardson and the character of a Clarissa. She honored the writer of this article with her friendship, and enriched him with all her father's original scientific correspondence and other papers, as well as some specimens illustrative of his writings. The bulk of Mr. Ellis's museum was however sold by auction in London in June 1791. Ellis's MS. and printed works. S.

ELLIS, in *Geograph.* a river of America, in the state of Maine, being a branch of Great Amerescoggin river.

ELLISIA, in *Botany*, named by Linnæus in honour of John Ellis, esq. F. R. S. author of several botanical dissertations and discoveries. Linn. Gen. 97. Screb. 109. Willd. Sp. Pl. v. 1. 815. Mart. Mill. Dict. v. 2. Juss. 129. Class and order, *Pentandria Monogynia*. Nat. Ord. *Asperifoliæ*, Linn. *Boragineæ*, Juss.

Gen. Ch. *Cal.* Perianth inferior, in five deep, lanceolate, spreading, permanent segments. *Cor.* of one petal, funnel-shaped; tube nearly cylindrical, much smaller than the calyx, marked internally with 15 streaks; limb in five obtuse segments. Nectary two small teeth at the base of each stamen. *Stam.* Filaments five, awl-shaped, short; anthers roundish. *Pist.* Germen superior, roundish, briefly: style thread-shaped, short; stigmas two, oblong, erect. *Peric.* Capsule coriaceous, roundish with a transverse stricture, downy, of two cells and two valves, deciduous. *Seeds* two in each cell, one above the other, globose, dotted. Corrected from the MSS. of Linnæus communicated by Dr. Smith.

Ess. Ch. Corolla funnel-shaped, much narrower than the calyx. Capsule coriaceous, superior, of two cells and two valves. Seeds two in each cell, dotted, one above the other.

E. *Nyctelæa*, Linn. Mant. 336. Nov. Act. Upsal. v. 1. 97. t. 5. f. 5. (Polemonium Nyctelæa; Linn. Sp. Pl. ed. 2. 231. Scorpiurus humilis virginianus, foliis rutaceis; Moris. v. 3. 451. Sect. 11. t. 28. f. 3.) This, the only known species, is a native of Virginia, and is more singular in fructification, than beautiful or remarkable in appearance. It is preserved in some curious botanical gardens, but is hardy enough to bear our climate without any care. *Root* annual. *Stem* decumbent, much branched, leafy, brittle. *Leaves* alternate, stalked, pinnatifid, roughish. *Flowers* small, pale blue, on simple solitary stalks opposite to the leaves.

ELLISVILLE, in *Geography*, a post-town of America, in Cumberland county, Pennsylvania, 156 miles from Washington.

ELLOPIA, in *Ancient Geography*, a name formerly given to the island of Euboea, from Ellops the son of Ion, who settled in this island.—Also, an inland town of this island, which, according to Strabo, stood at the foot of mount Telebrium. The inhabitants of this place were compelled, after the battle of Leuctra, by the tyrant Philistides, to leave their native country, and settle at Istiæa.—Also, a country of Greece, in the vicinity of Dodona.—Also, a town of Greece, toward Dolopia.

ELLOPIUM, a town of Greece, in Ætolia, according to Polybius.

ELLORA. See ELORA.

ELLORE, in *Geography*, one of the northern circars of Hindoostan, N.E. of Condapilly, and N.W. of the bay of Bengal. See CIRCAR.—Also, the capital of this circar, 32 miles N. of Masulipatam. N. lat. 16° 43′. E. long. 81° 11′.

ELLOTIA, Ελλωτια, among the Greeks, a festival in memory of Europa, Agenor's daughter; who was called Ελλωτις by the people of Crete.

ELLSWORTH, in *Geography*, a township of America, in Hancock county and state of Maine, on both sides of Union river; incorporated in 1800.

ELLWOOD, THOMAS, in *Biography*, was born at the village of Crowell, near Thame, in Oxfordshire, in the year 1639, where he received his education, which, owing to the narrow circumstances of his father, was very limited. When he had attained the age of 21, he was accidentally thrown among the quakers, and received indelible impressions, in favour of their sentiments, from the preaching of Edward Burroughs. This alteration in his religious principles gave great offence to his father, who could not brook the change of manners, language, and dress, assumed by his son, and who behaved towards him with an unbecoming severity, often inflicting on him blows, and a kind of domestic imprisonment,

prisonment. At length the young man was permitted to pay a visit to a friend; and, on his return, passed most of his time in the kitchen and among the servants, in order that his father might not be offended with his wearing a hat in his presence. He soon after became a writer, and a zealous preacher among the friends. His first work was entitled, "An Alarm to the Priests, or a Message from Heaven to warn them." In the same year, 1660, when this was published, Ellwood was arrested and imprisoned at Oxford, on account of an intercepted letter, which was interpreted by the government to be of a political and libellous nature. His imprisonment was short, and not attended with any circumstances of peculiar rigour.

Ellwood was now looked up to as a distinguished preacher, and felt the want of more learning than he had acquired in early life, and applied all his leisure time in improving himself. He, by means of his friend Isaac Penington, procured the employment of reader to the great Milton, which obliged him to read many Latin books, so that the language soon became familiar to him; and as Milton easily knew, by the tone of his voice, whether he understood his author, he would, in difficult cases, stop him, and explain those parts which he did not seem to comprehend. This confinement did not agree with his health; and he was in a short time obliged to leave London. In 1665, Ellwood procured apartments for his master at Chalfont, and was the occasion of his writing Paradise Regained, by asking him, what he who had said so much on Paradise Lost, could say of Paradise Found? Ellwood was again imprisoned in Bridewell and Newgate, for being found at a meeting of the friends in London; but was discharged, after a short time, without the form of a trial. He was next selected by his friend Isaac Penington, as the tutor to his children, an employment in which he continued till the year 1669; but, during his residence in this family, both he and his patron were arrested at Amersham, while attending a funeral at the quakers' burying ground, and committed to Aylesbury gaol, where they were kept till the ensuing assizes, when they, with other prisoners of the same description, were ordered to be fined 6*s.* 8*d.* each, and discharged. This sum they refused to pay, and were committed for one month longer. Scarcely had Ellwood escaped from this prison, when he was committed to the house of correction at Wycombe, where he was confined a quarter of a year. At the latter end of the same year he was married, and settled at Hungerhill, near Amersham, Bucks, where he became a zealous adherent to the rising society of the friends; and was extremely useful, after the passing of the "Conventicle Act," in suppressing the infamous trade of spies and informers. In one instance, he was able to prove an alibi with regard to a friend; and then indicted and convicted the informers of perjury.

Ellwood now became an author, and published many works, which were highly esteemed by the friends of his party. For one, *viz.* "A Caution to Constables and others concerned in the Execution of the Conventicle Act," he was cited to appear before the magistrates, who were empowered to commit him to prison till the next assizes, but who took his word for appearing when called on, and never troubled him more on that head. In 1694, he published a posthumous work of George Fox, which contained a voluminous journal of the events of his life; and in 1705, he gave the public the first part of "Sacred History, or the historical Part of the Holy Scriptures of the Old Testament;" which he continued, in the year 1709, by a volume of the history of the New Testament. This was the principal work of our author, who died of the palsy, on the 1st of March, 1713, in his 74th year. He was a man of considerable abilities, possessed much natural wit, and some learning. His integrity was unquestionable; and his zeal in what he thought right could be damped by no obstacles, nor by any sufferings to which he was exposed. Gen. Biog.

ELLYCHNIOTOS, in the medical writings of the *Ancients*, the name of a sort of tent used by the surgeons, and made of cotton or lint, rolled up into the form of the wick of a lamp or candle. See the next article.

ELLYCHNIUM, a name given, by the ancients, to that sort of matter, whatever it was, which served them in common use for the wicks of their lamps, and had, besides this, its use in surgery. Galen expressly directs the use of the softest ellychnium, such as that of Tarsus, instead of sponge, in chirurgical cases. But we are far from being ascertained, at present, of what this ellychnium of Tarsus was. The commentators have guessed differently as to the meaning of the word; and Cornarius supposed it to signify a sort of spongy and light fungus, which, when properly wrought up, might be made to serve for the wicks of lamps, being very inflammable, as we well know many of the fanguses to be, particularly that sort which the people of some countries call spunck, and use instead of tinder, to catch fire from the sparks of flint and steel; and when in its natural lax state, might, by its open spongy texture, be very well suited to imbibe any medicinal fluid, and retain it a long time, while applied to any diseased part. Other have guessed it to be the xylon, or cotton of the ancients; but, from Galen's proposing it to be used instead of sponge, it seems much more probable to have been what Cornarius supposes. Galen, lib. xiii. and xiv. Cornar. Comment. in 3. Κατ. τοπ.

ELLYS, Anthony, in *Biography*, a learned prelate of the church of England, was born about the year 1693. He studied at Clare-hall, Cambridge, where he took his degrees. He obtained several valuable livings; and was, in the year 1728, created doctor of divinity, when king George II. paid a visit to the university of Cambridge. After this he took an active part against the repeal of the test and corporation acts, and wrote one of the ablest works on that side of the question, entitled, "A Plea for the Sacramental Test, as a just Security to the Church established, &c." He next published an answer to Hume's Essay on Miracles. This was published in 4to. in the year 1752; and almost immediately afterwards, Dr. Ellys was promoted to the see of St. David's. He died at Gloucester, in the year 1761, aged 68 years. After his death in 1763, was published the first part of a work entitled, "Tracts on the Liberty, spiritual and temporal, of Protestants in England;" and in 1765, the second part was given to the public. The design of the former is partly to vindicate the establishment of the church of England against the objections of the protestant dissenters; but principally to examine and confute the tenets of the church of Rome. The second part relates to civil liberty, in which the author vindicates the principles of the whigs; and in the discussion he has collected a large fund of historical, constitutional, and legal knowledge. The work was drawn under the patronage of government; and on account of the labour which it cost him, he was rewarded with the bishopric of St. David's, though, for reasons not now known, it was not published till after his death. The bishop likewise published some single sermons. His character is known by the editors of his posthumous works, as not only eminent for his fine parts, extensive knowledge, and solid judgment; but for a heart so overflowing with benevolence and candour, as never even to conceive terms of acrimony towards the opinions or

perſons of thoſe who differed from him: and he always thought a perſon, though on the right ſide of a queſtion, with principles of perſecution, to be a worſe man than he that was on the wrong. Biog. Brit.

ELM, in *Agriculture*, the name of a very common deciduous tree, of which there are different ſpecies and varieties. See ULMUS.

The common or Engliſh elm, and moſt of the other ſorts, ſucceed well in ſoils of a ſtiff, loamy, retentive quality, which are in ſome meaſure inclined to moiſture, growing in ſome caſes to conſiderable height and ſize of bole. They are occaſionally planted both as hedge-row timber and in mixed plantations, though their wide ſpreading branches render them in ſome degree improper for the latter ſituations. In the former caſes, the banks ſhould be well cleaned and wrought over, and the trees be planted out about the latter end of September, being well ſecured by proper ſtakes from the effects of the winds. Their heads ſhould likewiſe be conſiderably reduced before they are ſet out, but without injuring the leading ſhoots, or the branches being too cloſely pruned.

Theſe trees are well ſuited for being planted out in the view of affording ſhelter, or as a ſcreen for breaking off the violence of the winds, as they are capable of being trained up in the form of a hedge, being kept conſtantly cloſely cut in, to make them grow thick and cloſe, as well as to a great height. Near tillage land they are, however, very objectionable, as their roots run very extenſively near the ſurface of the ground, and of courſe obſtruct the operations of the plough.

In the planting of this ſort of trees, great care ſhould be taken not to bury their roots too deep, eſpecially when the ſoil is of the clayey or loamy kinds. The plants ſhould not be too large when planted out, as they do not ſucceed ſo well. The plants may be raiſed by ſuckers, and from ſeeds in ſome of the ſorts.

As timber, the common elm is probably to be preferred to moſt of the other ſorts; but ſome of the other kinds grow equally large in ſoils which ſuit them. This is the caſe with that which is called the witch-elm. The worſt ſort in point of timber is that which is uſually denominated the Dutch elm.

ELM, in *Botany*. See ULMUS.

ELM, in *Geography*, a ſmall town of Switzerland, in the canton of Glaris; 6 miles S. of Glaris.

ELM-*Bark*, in *Pharmacy*. The bark of the elm has been ſtrongly recommended, and is occaſionally uſed in obſtinate cutaneous complaints. It is given in the form of decoction (decoctum corticis ulmi) of moderate ſtrength; that is, about an ounce to a pint of water, and in the doſe of at leaſt a pint daily. This decoction is mucilaginous and ſlightly aſtringent.

ELM-*Wood, Petrified*, in *Natural Hiſtory*. It is related by Mr. Stedel, that he found pieces of elm-wood, which had been left about ſeven years in a fountain near Ulm, and had become petrified or converted into ſtone. (6 Roz. 8vo, 3d part, p. 18.) The alleged converſion of wood into ſilicious ſtony maſſes, in modern times, has been doubted by moſt modern writers: and indeed it appears doubtful, whether any of the numerous ſilicious ſtones, that are found with a ligneous texture, can be identified with any recent or known woods, but like the animal remains which often accompany them in a petrified or altered ſtate, when ſcientifically examined and compared with recent ſpecies, they are found all to belong to a prior race of organized beings now totally extinct. See *Petrified* WOOD.

ELMA, in *Geography*, a town of Ruſſia, in the government of Archangel, at the conflux of the river Elma with the Petchora; 312 miles E. of Archangel.

EL-MACIN, in *Biography*, an Egyptian, who ſucceeded his father as ſecretary to the council of war, under the ſultans of Egypt, in the year 1238, is chiefly known as author of a chronicle of the Mahometan caliphs, written in Arabic, which commences with Mahomet, and goes down to the reign of Moſtader-Billah, who died in the year 1138. He relates year by year, but in few words, what concerns the Saracen empire, intermixing with it a portion of the hiſtory of the Chriſtians of the Eaſt. He is ſuppoſed, from his manner of writing, to have been a Chriſtian; yet enjoyed places of truſt and diſtinction under the Mahometan princes. His hiſtory was tranſlated out of the Arabic into Latin, by Erpenius, and printed in both languages at Leyden, in folio, in the year 1625. Bayle.

ELMAHAD, in *Geography*, a town of Arabia, in the country of Yemen; 8 miles N.N.W. of Zebid.

ELME. SAINT, a ſtrong caſtle of the iſland of Malta, on a rock cloſe to the town of La Valette, which protects the two harbours.—Alſo, an old caſtle of France, near Colioure, in the department of the Eaſtern Pyrenées.

EL-MEDEA, called alſo *Africa* (*Turris Hannibalis*), a ſea-port town of Africa, in that part of the country of Tunis which was the ancient Byzacium or winter circuit, ſituated upon a peninſula, 5 miles to the ſouth of Cape Demaſs. It appears to have been formerly a place of great ſtrength and importance. The port, which was an area nearly of 100 yards ſquare, lies within the walls of the city, with its mouth opening towards Cap ondia; but it is not now capable of receiving the ſmalleſt veſſel. Leo ſays, that it was founded (or poſſibly rebuilt) by Mahdi, the firſt patriarch of Kaerwan, and therefore aſſumed his name; but the delicacy of the ruins afford reaſon for ſuſpecting, that the founder was not an Arabian. Thuanus has miſtaken this place for Aphrodiſium, which Dr. Shaw ſuggeſts, in his "Travels," to have been more probably at Faradeeſe, a ſmall village and port in the plains of Hamam-et.

ELMEDINA, or ALMEDINE, a town of Africa, in the empire of Morocco, on the edge of mount Atlas.—Alſo, another of the ſame name, near the ſea-coaſt.

ELMEN, or ALT SALZA, a town of Germany, in the circle of Lower Saxony, and principality of Magdeburg; 10 miles S.S.E. of Magdeburg.

ELMENAU. See ILMENAU.

ELMHAM, NORTH, once a city, is now an inconſiderable village in the county of Norfolk, England, about 4 miles north of Eaſt Dereham. It was given by the Saxon prince Sigebert to Felix, who converted the Eaſt Anglians to Chriſtianity, and was the firſt biſhop of that part of the heptarchy. At the time the province of Eaſt Anglia was divided into two dioceſes, this place became a ſeat of the biſhop preſiding over the northern portion. During this partition, ten biſhops ſucceſſively reſided here; but in the time of Wybred the 11th, the ſees were again united, and fourteen others ſubſequently ſate, till the ſee was removed from this place to the city of Norwich, by Herbert de Loſſinga, in the time of William Rufus, A.D. 1094. The biſhops of Norwich continued occaſionally to reſide here; and a fine caſtle, moated round, was erected by biſhop Spencer, in the time of Richard II. The ruins of this palace ſtill remain; and the ſite of the ancient cathedral, built by biſhop Herbert, is ſtill viſible. Near it ſubterraneous hollows have been diſcovered, and old wells, which have been filled up. In an encloſure near Broom cloſe, half a mile from the village, the ground was perceived to ſink circularly in three different places; in one of which the hole

was

was 12 feet broad, and 20 feet deep. But vestiges of higher antiquity have been traced: for in this close were found numerous urns, including divers brass instruments, Roman coins, and a silver seal ring or annular signet, ornamented with an eagle holding a thunderbolt. Henry VIII. granted the manor to Thomas lord Cromwell, who was the first lay proprietor. The present possessor is Richard Milles, esq. in right of his mother, the eldest daughter of Richard Warner, esq. who built a handsome mansion here in 1729, which seat is called North Elmham Park.

ELMINA, or La Mina, a town of Africa, in the kingdom of Fetu or Fetou, so called by the Portuguese, but by the natives Oddena, which is very long but narrow; the houses being built of a stone, hewn out of a neighbouring rock. In the year 1684, this town was so populous and so powerful, and the inhabitants so brave, that they were the terror of the whole coast. Since that period it has been depopulated by the ravages of the small-pox, and by the tyrannical government and wars of Commendo. This town is seated on the river Benja, in a low, flat peninsula, formed by the ocean on the south, the river on the north, Commendo on the west, and the famous citadel of St. George d'Elmina on the east. Towards Commendo it is fortified by a strong wall of large stone, a deep ditch, and some pieces of cannon. The wall begins at the sea-side, and stretches along to the banks of the river, which separates the town from the fort on mount St. Jago. The Dutch call this fort Confradbourgh, which they built for the security of Elmina, in a situation that commands both the town and their chief factory. The inhabitants are robust and warlike, but more civilized than other negroes, on account of their familiar acquaintance with the Europeans. Their usual occupations are fishing, trading, and making palm-wine and oil. Their commerce extends along the coast, as far as Whidah. In the town are many artizans, who work in metals in a manner little inferior to that of the best European mechanics. They cast and carve in gold and silver; they make buttons, plain or filligree rings, chains, sword-hilts, and other ornaments; nor are they ignorant of the method of cutting, grinding, and polishing crystal and glass. The town contains about 200 houses, occupied chiefly by mechanics. It is divided into three districts, each of which is governed by a chief, called by the negroes kaffo; with a number of subordinate officers. These three chiefs, with their councils, form the regency and legislative part of this small republic; since the Portuguese rendered it independent of the kings of Fetu and Commendo, who possess the sovereignty of the whole country besides. The inhabitants have thus found means to render themselves formidable to all their neighbours, and to acquire an independence that is not possessed any where else on the Gold Coast. The river Benja, which glides by the walls of the town, furnishes a fine bay salt, produced in the same manner as in different parts of Europe. The citadel of Elmina stands on a rock, bounded on one side by the ocean, defended by strong bastions, and surrounded by a high stone wall, in the centre of the Gold Coast, so as to be commodiously situated for the purposes of trade and the security of the trader. The works of this fort were begun by the Portuguese, and completed by the Dutch; and it is said to be larger, more convenient, and beautiful than Cape Coast, though less pleasant in respect of situation. The fort of Conradsbourgh stands on mount St. Jago, on the frontier of the kingdom of Fetu. Below mount St. Jago the company have a fine garden, inclosed by high stone walls, and beautifully laid out in parterres and rows of orange, lemon, palm, and cocoa-trees; and furnishing all sorts of fruits, roots, and pulse, peculiar to that country, as well as the natural growth of Europe. In the centre stands a magnificent dome or temple, surrounded by lofty trees, which afford the most delightful cooling shade and fragrance.

ELMORE, a township of America, in Orleans county, and state of Vermont, containing 45 inhabitants.

ELMOROSIA, a name given by the Moors to a dish they are very fond of. It is made of pieces of beef, or of camel's flesh, stewed with butter, honey, and water; some add rob of wine to it, and others garlic; but there are always added onions, saffron, and salt. Phil. Transf. No. 253.

ELMSHORN, in *Geography*, a small town of Denmark, in that part of Holstein called the county of Rantzaü, situated on the river Aue, which runs into the Elbe, and by means of which the inhabitants carry on a good trade, chiefly in turf and charcoal. The population does not amount to more than 1000 individuals. It is on the road from Husum to Hamburgh, 26 miles N. of the latter place.

ELNBOGEN, a town of Bohemia, and capital of a circle or district, within the circle of Saatz, called "the circle of Elnbogen," or "Loket;" situated on a rock, surrounded with mountains, near the Egra; 62 miles W. of Prague, and 32 S.W. of Saatz.

ELNE, a small town of France, in the department of the Eastern Pyrenées, on the river Tech, not far from the Mediterranean sea; 6 miles S. of Perpignan.

Elne, a river of England, in the county of Cumberland, which runs into the Irish sea; 4 miles N. of Workington.

ELNIA, a town of Russia, in the government of Smolensk; 32 miles E.S.E of Smolensk. N. lat. 54° 25'. E. long. 33° 19'.

ELOANX, a name given by some writers to auripigmentum, or orpiment.

THE END OF VOL. XII.

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