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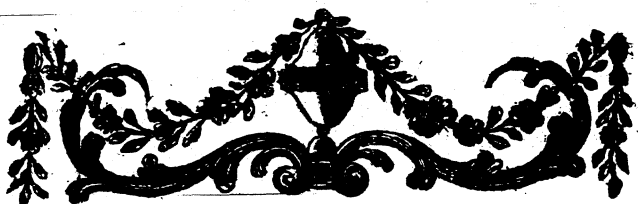
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INTRODUCTION.



OF ASTRONOMICAL GEOGRAPHY.

A COMPLETE knowledge of *Geography* cannot be obtained without some acquaintance with *Astronomy*. This Compendium, therefore, will be introduced with a short account of that science.

Astronomy treats of the heavenly bodies, and explains their motions, times, distances and magnitudes. The regularity and beauty of these, and the harmonious order in which they move, shew that their Creator and Preserver possesses infinite wisdom and power.

Astronomy was first attended to by the Shepherds, on the beautiful plains of Egypt and Babylon. Their employment led them to contemplate the stars. While their flocks, in the silence of the evening, were enjoying sweet repose, the spangled sky would naturally invite the attention of the Shepherds. The observation of the heavenly bodies afforded them amusement, and at the same time assisted them in travelling in the night. A star guided the Shepherds to the manger where our blessed Saviour was born. By the

the aid of a lively imagination, they distributed the stars into a number of constellations or companies, to which they gave the names of the animals which they represented.

Of the Planets.] The sun is the center of the motion of seven spherical, opaque bodies, called *Planets* or wandering stars, whose diameters, distances and periodical revolutions are exhibited in the following TABLE.

Sun and Planets.		Diameters in Eng. mil.	Distance from the Sun.	Annual periods round the Sun.		
				y.	d.	h.
Sun	☉	890,000				
Mercury	☿	3,000	36,841,468	0	87	23
Venus	♀	9,330	68,891,486	0	224	17
Earth	⊕	7,970	95,173,000	1	0	0
Mars	♂	5,400	145,014,148	1	321	17
Jupiter	♃	94,000	494,990,976	11	314	18
Saturn	♄	78,000	907,956,130	29	174	0
Herschel		36,000	1800,000,000	82	34	0

The seven planets mentioned in the table, are called *primary planets*; for besides these there are ten other bodies called *secondary planets*, *moons* or *satellites*, which all revolve round their primaries from west to east, and at the same time are carried along with them round the sun, as follows:

The earth has one satellite, viz. the moon D, which performs her revolution in 29 d. 12 h. 44 m. at the distance of about 60 semidiameters of the earth, or 239,100 miles, and is carried with the earth round the sun once in a year.

Jupiter has four moons, Saturn has five, and is also encompassed with a broad ring.

The motion of the primary planets round the sun, and also the motion of the satellites round their primaries, is called their *annual motion*. Besides this annual motion, they revolve round their own axis from west to east, and this is called their *diurnal motion*.

The

The lately discovered planet *Herschel*, was first observed in 1782, by that celebrated astronomer William Herschel, LL. D. F. R. S. In Great-Britain it is called *Georgium Sidus* ; but in France and America it has obtained the name of *Herschel*, in honour to its learned discoverer.

Comets.] The comets are large, opaque bodies, which move in very elliptical orbits, and in all possible directions. Some revolve from west to east—some from east to west—others from south to north, or from north to south. Some have conjectured that the comets were intended by the all-wise Creator, to connect systems, and that each of their several orbits includes the sun, and one of the fixed stars. The figures of the comets are very different. Some of them emit beams on all sides like hair, and are called hairy comets. Others have a long, fiery, transparent tail, projecting from the part which is opposite to the sun. Their magnitudes also are different. Some appear no bigger than stars of the first magnitude ; others larger than the moon. They are supposed to be solid bodies, and very dense ; for some of them, in their nearest approach to the sun, were heated, according to Sir Isaac Newton's calculation, 2000 times hotter than red hot iron ; a degree of heat which would vetrify, or dissipate any matter known to us.

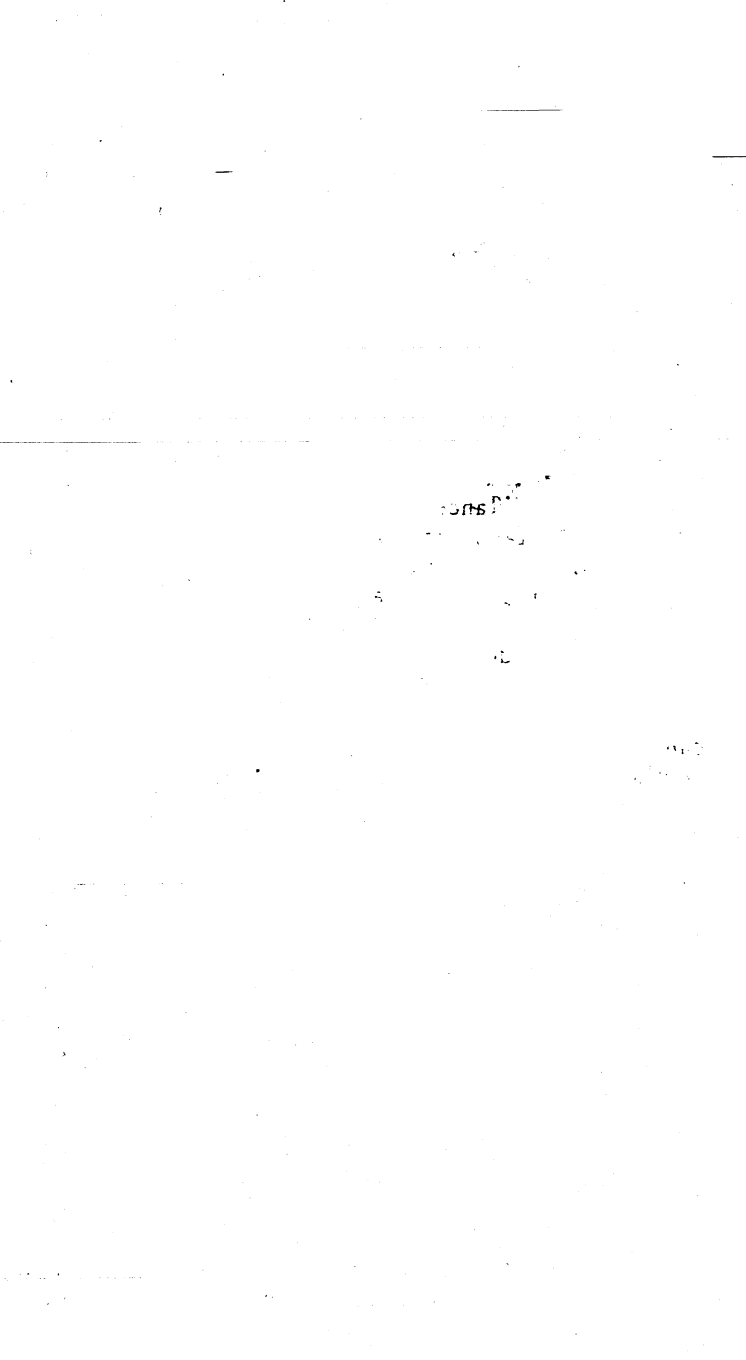
The number of comets belonging to our system is not certainly known. Twenty-one have been seen ; of these, the periods of three only have been ascertained with accuracy. One appeared in the years 1531, 1607, 1682 and 1758 ; its period is 75 years. Another was seen in 1532, 1661, and in 1790 ; its period being 129 years. The third appeared last in 1680, whose period being 575 years cannot be expected to return until the year 2255.

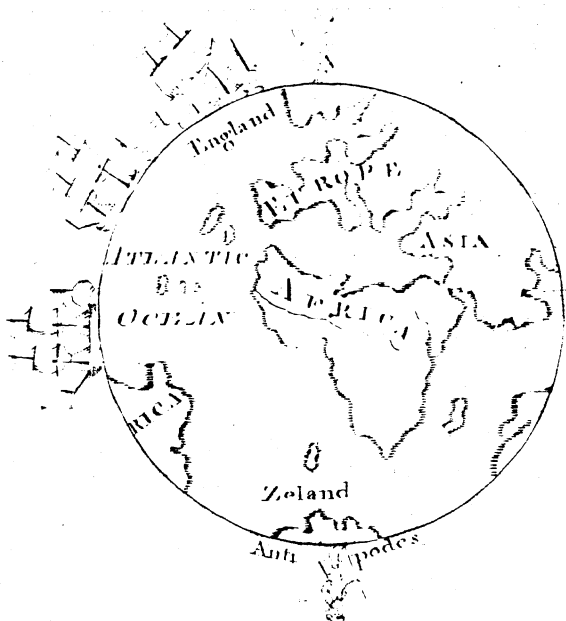
Of the Solar System.] The seven planets, with their ten satellites and the comets, constitute the Solar, or as

it is sometimes called, the Copernican system, in honour of Copernicus, a native of Poland, who adopted the Pythagorean opinion of the heavenly bodies, and published it to the world in 1530. This is now universally approved as the true system. It has received great improvements from Gallileo, Sir Isaac Newton, Dr. Halley, and other philosophers in almost every age.

Of the fixed Stars.] The solar system is surrounded with the fixed stars; so called, because they at all times preserve the same situation in regard to each other. These stars, when viewed with the best telescopes, appear no larger than points, which proves that they are at an immense distance from us. Although their distance is not certainly known, yet it is the general opinion of astronomers, that they are at least 100,000 times farther from us, than we are from the sun; and that our sun viewed from a fixed star, would appear no bigger than a star does to us. A sound would not reach us from *Sirius*, or the dog star, which is nearer to this earth than any of the fixed stars, in 50,000 years. A cannon ball flying at the rate of 480 miles an hour, would not reach us in 700,000 years. Light, which is transmitted from one body to another almost instantaneously, takes up more time in passing from the fixed stars to this earth, than we do in making a voyage to Europe; so that if all the fixed stars were now struck out of existence, they would appear to us to keep their stations for several months yet to come. It is impossible, therefore, that they should borrow their light from the sun, as do the planets.

The number of stars visible to the naked eye at any one time, in the upper hemisphere, is not more than a thousand. A thousand more are supposed to be visible in the lower hemisphere; and by the help of a telescope, a thousand more have been discovered; so that the whole number of stars are reckoned at 3000. They are distinguished from the planets by their twinkling.





To consider these stars as designed merely to decorate the sky, and form a rich and beautiful canopy for this earth, would derogate from the wisdom of the Creator. Astronomers therefore, with much reason, have considered the fixed stars as so many suns, attended with a number of revolving planets, which they illuminate, warm and cherish. If this be true, there are as many systems as there are fixed stars. These may also revolve round one common center, forming one immense system of systems. All these systems, we may conceive, are filled with inhabitants suited to their respective climes; and are so many theatres, on which the Great Creator and Governour of the Universe displays his infinite power, wisdom and goodness. Such a view of the starry heavens must fill the mind of every beholder with sublime, magnificent and glorious ideas of the Creator.

Of the EARTH.

THE Earth, though called a globe, is not perfectly such; its diameter from east to west, being about 30 miles longer than that from north to south. From its motion round its axis, which is performed once in a year, is derived the difference in the length of the days and nights, and the variety of the seasons. The diameter of the path in which it moves, called its orbit, is 190,346,000 miles, and its circumference 597,987,646 miles. Its hourly motion in its orbit is 68,217 miles, which is 142 times greater than that of a cannon ball, which, moving about eight miles in a minute, would be 22 years and 228 days in going from this earth to the sun.

The earth is 25,038 miles in circumference, and by its rotation on its axis once in 24 hours from west to east, causes a continual succession of day and night, and an *apparent* motion of the heavenly bodies from east to west. By this motion on its axis the inhabitants who live on the equator are carried 1040 miles in an hour, and those who live in other parts of the

earth are carried a distance, less, in proportion to their distance from the equator.

That the earth, or planet which we inhabit, is round, is evident : *First*, From the consideration that this shape is best adapted to motion. *Secondly*, From the appearance of its shadow in eclipses of the moon, which is always bounded by a circular line. *Thirdly*, From analogy ; all the other planets being globular : and *Fourthly*, from its having been circumnavigated several times.*

As many find it difficult to conceive how people can stand on the opposite side of the globe without falling off, their conception may be assisted by supposing

* *Magellan* sailed from Seville in Spain, under the auspices of Charles V. 10th of August, 1519 ; and having discovered the Magellanic Straits in South-America, he crossed the Pacifick Ocean, and arrived at the Phillippine islands, where he was poisoned. His ship returned by way of the Cape of Good Hope, 8th September, 1522.

Sir Francis Drake sailed from Plymouth, 13th December, 1577 ; entered the Pacifick Ocean, and steering round America, returned November 3d, 1580. He was a man of great generosity. The booty which he took, and even the wedges of gold given him in return for his presents to Indian chiefs, he divided in just proportional shares with the common sailors.

Thomas Cavendish sailed from Plymouth with two small ships the 1st of August, 1586 ; passed through the Straits of Magellan ; took many rich prizes along the coasts of Chili and Peru ; and near California possessed himself of the St. Ann, an Acapulco ship, with a cargo of immense value. He completed the circumnavigation of the globe the 9th of September, 1588.

Between the years 1598, and 1626, *Oliver de Nort*, of Utrecht, *James Mabu*, *George Spillenberger*, a Fleming, *William Schouter*, a Hollander, and *James the Hermit*, successively sailed round the globe.

Lord Anson sailed in September, 1740 ; doubled Cape Horn in a dangerous season ; lost most of his men by the scurvy, and with only one remaining ship, the Centurion, crossed the great Pacifick Ocean, which is 10,000 miles over ; took a Spanish galleon, on her passage from Acapulco to Manilla, and returned home in June, 1744.

Byron, *Bougainville*, a Frenchman, *Wallis*, and *Carteret*, successively circumnavigated the globe, between the years 1764 and 1769.

Captain Cook, in the ship Endeavour, sailed from Plymouth the 26th of August, 1768, and after a most satisfactory voyage, returned the 12th of June, 1771. He set out on a second voyage, the 14th of February, 1776 ; made many important discoveries, and was killed on the island of Owhyhee by the natives, the 14th of February, 1779. His ships, under the command of Capt. Clark, returned the 16th of October, 1780.

supposing all the various bodies on the earth's surface were of iron, and a very large magnet were placed at the center, then all bodies being attracted towards the center by the magnet, they could not fall off, which way soever the earth should turn. Now the attraction of gravitation operates on *all* bodies as that of magnetism does on iron *only*.

It is now ten o'clock in the morning, and we now think we are standing upright on the upper part of the earth. We shall think the same at ten o'clock this evening, when the earth shall have turned half round, because we shall then perceive no difference of posture. We shall then be exactly in the position of those persons who now stand on the opposite side of the earth. Since they are as strongly attracted towards the center of the earth as we are, they can be in no more danger of falling downward, than we are at present of falling upward.

ARTIFICIAL GLOBE.

AN Artificial Globe is a round body, on which all parts of the earth and water are represented in their natural form and situation.

Axis of the Earth.] The axis of the earth is an imaginary line passing from north to south through its center; the ends of it are called the poles.

Circles.] In order to determine the situation of places on the globe, we suppose it circumscribed by several imaginary circles, each of which is supposed to be divided into 360 equal parts, called degrees, each degree is divided into 60 minutes, each minute into 60 seconds, each second into 60 thirds, &c. A circle whose plane, passing through the center of the globe, divides it into two equal parts, is called a *great circle*. Of these there are six: The equator, the meridian, the horizon, the ecliptick, and two colures.

Circles dividing the globe into unequal parts, are called *small* or *lesser circles*. Of these there are four: The two tropicks, and the two polar circles.

Equator.

Equator.] The Equator, or Equinoctial, encompasses the earth, from east to west, and divides it into the northern and southern hemispheres. From this line latitude is counted towards each pole.

Meridian.] This circle is represented on the globe by a brass ring. It crosses the equator at right angles, passing through the poles of the earth, and the zenith and nadir, and divides the globe into the eastern and western hemispheres. There is an indefinite number of meridians, for any two points or places on the globe, which are not directly north or south of each other, have different meridians. As the meridian passes from pole to pole, through the nadir, it is evident that when the sun comes to this line it is noon, and from the Latin word *meridies*, or noon, it is called meridian. Geographers assume a meridian for the first, from whence longitude is counted east or west.

The meridian of London is used by the English, that of Paris by the French, and that of Philadelphia by the Americans.

Ecliptick.] The ecliptick is that circle in which the sun appears to move round the earth once a year. It is named the ecliptick, because no *eclipse* of the sun or moon can happen, except when the moon is in or near the plane of this circle. It makes an angle with the equator of 23 d. 30 m. and the points of their intersection are called equinoctial points, because when the sun is in either of those points, the days and nights are of equal length in all parts of the globe; viz. on the 21st of March and on the 21st of September, the first of which is called the *vernal*, and the last the *autumnal* equinox.

The ecliptick is divided into twelve signs, each containing 30 degrees. The signs are counted from west to east, beginning at the vernal equinox. The following are the names and characters of the signs, and the months in which the sun enters them.

Latin names of the signs.	English names.	Characters.	Months in which the sun enters them.
1 Aries	The Ram	♈	March
2 Taurus	The Bull	♉	April
3 Gemini	The Twins	♊	May
4 Cancer	The Crab	♋	June
5 Leo	The Lion	♌	July
6 Virgo	The Virgin	♍	August
7 Libra	The Scales	♎	September
8 Scorpio	The Scorpion	♏	October
9 Sagittarius	The Archer	♐	November
10 Capricornus	The Goat	♑	December
11 Aquarius	The Water Bearer	♒	January
12 Pisces	The Fishes	♓	February

Zodiack.] The zodiack is comprehended between two circles drawn parallel to the ecliptick, at the distance of eight degrees on each side of it.

Horizon.] The horizon is represented by a broad wooden circle, dividing the globe into upper and lower hemispheres. The *sensible* horizon is that which bounds our prospect; the *rational* horizon is a great circle, whose plane passes through the center of the earth, dividing it into upper and lower hemispheres. It is divided into four quarters, and the four quartering points, viz. east, west, north, and south, are called *cardinal points*. The poles of the horizon are the zenith and nadir; the former directly over our heads, and the latter directly under our feet.

Colures.] These circles divide the globe into four equal parts. They both pass through the north and south poles. One of them, called the equinoctial colure, passes through the equinoctial points Aries and Libra, and the other, called the solstitial colure, passes through the solstitial points, Cancer and Capricorn.

Tropicks.] The tropicks are two circles, parallel to the equator, at the distance of 23 d. 30 m. on each side of it. The name is derived from the Greek word *τρεπω*, to turn, because when the sun arrives at the northern tropick, he turns to the southward, and when

he arrives at the southern tropick, he turns to the northward. When the sun is in the tropick of Capricorn, which is on the 21st of December, we have the shortest day ; and when he is in the tropick of Cancer, which is on the 21st of June, we have the longest day.

Polar Circles.] The two polar circles are described round the globe at the distance of 23 d. 30 m. from each pole. The northern is called the *Arctic* circle, the southern the *Antarctic*.

Zones.] There are five zones. The *torrid zone* is limited by the two tropicks, and is the hottest, because the sun is always vertical to some part of it. The two *temperate zones* are limited by the tropicks and the polar circles ; in these zones the air is temperate. The two *frigid zones* extend from each polar circle to each pole, and in these zones the air is extremely cold.

Climates.] By a number of other circles, drawn parallel to the equator, the globe is divided into climates. A climate is a tract of the earth's surface comprehended between the equator and a parallel of latitude, or between two parallels of latitude, of such a breadth that the length of the day on one side of the tract be half an hour longer or shorter than on the other. There are 30 climates on each side of the equator, in the first 24 of which the day increases by half hours, and in the other six by months.

Latitude.] The latitude of a place is its distance from the equator north or south. The greatest latitude is at the poles, which are 90 degrees distant from the equator.

Longitude.] The longitude of a place is the distance of its meridian from the meridian of some other place ; and is measured on the equator either east or west. A degree of longitude on the equator is 60 geographical miles, or $69\frac{1}{2}$ English miles, but the length of a degree of longitude diminishes as we approach either pole. At the poles, longitude is nothing, or, the equator being supposed to proceed from its present situation to the poles, will gradually contract till it becomes a mathematical point. In the latitude of Savannah,

Savannah, a degree of longitude is about 52 geographical miles ; in Philadelphia, about 46 ; and in Boston, about 43.

The Atmosphere.] The atmosphere, or air which furrounds the globe, is about 45 miles in height. It is the medium of sound ; by refracting the rays of light, objects are rendered visible, which, without this medium, could not be seen.

Winds.] Wind is air put in motion, and it is called a breeze, a gale, or a storm, according to the rapidity of its motion. The trade winds, in the Atlantick and Pacifick oceans, blow constantly from north-east and south-east towards the equator, from about 33 degrees of latitude north and south.

Tides.] The ebbing and flowing of the sea is caused by the attraction of the sun and moon, but chiefly by that of the latter ; the power of the moon in this case, being to that of the sun, as 5 to 1. The moon in one revolution round the earth, produces two tides, and their motion follows the apparent motion of the moon, viz. from east to west.

Clouds.] Clouds are collections of vapours, exhaled from the earth by the attraction of the sun or other causes.

Eclipses.] An eclipse is a total or partial privation of the light of the sun or moon. When the moon passes between the earth and the sun, the latter is eclipsed ; and when the earth passes between the moon and sun, the former is eclipsed.

