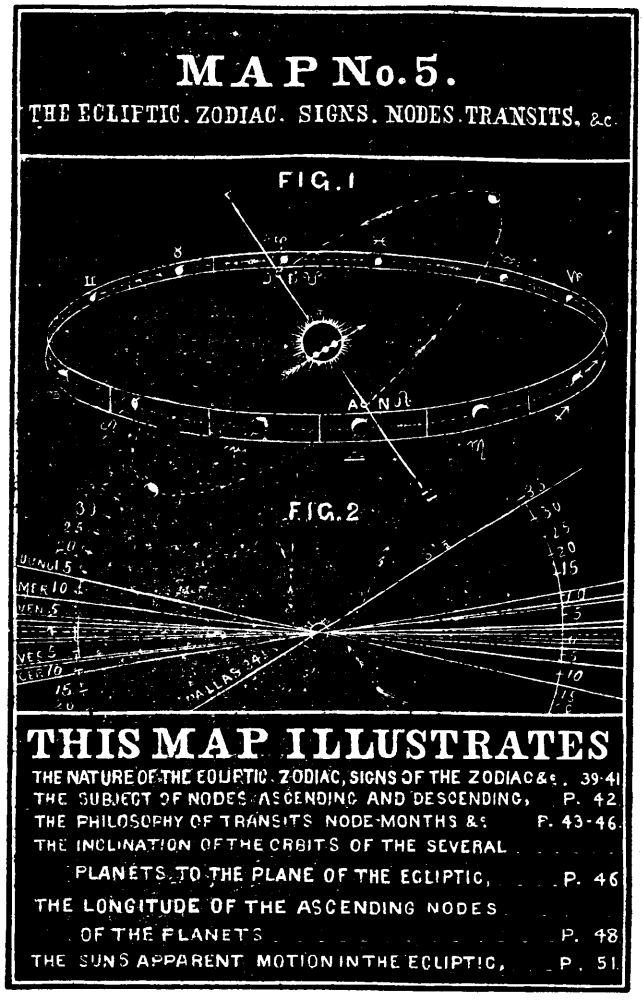

Node—Ascending and Descending.—Fig. 1 represents an interior planet as revolving in an orbit inclined to the ecliptic at an angle of about 45°; and as both planets revolve around the same centre of attraction, the interior planet must pass through the plane of the ecliptic twice at every revolution; once in ascending, and once in descending. These two points, where the orbit of a planet passes through or cuts the plane of the ecliptic, are called the *nodes* of its orbit. One is called the *ascending*, and the other the *descending* node. On the map A. N. is the ascending node, and D. N. the descending node. They are also denoted by the following characters, viz.: ☊ for the ascending, and ☋ for the descending.

A line drawn from one node to the other is called the *line of the nodes*, and may be seen on the map, marked L. N.

In the figure the ascending node is represented as being in the middle of Libra, and the descending in the middle of Taurus. The design is merely to illustrate the subject, without representing the actual line of the nodes of any one of the planets.

Transits.—By consulting Fig. 1 it will be seen that if an interior planet was at her ascending node, and the earth on the *line* of the nodes, on the same side of the ecliptic, the planet would seem to pass over the body of the sun, as shown in the figure. This passage of a planet over the sun's disc, or between the earth and the sun, is called a *Transit.*

Mercury and Venus are the only planets that can make a transit visible to us; as all the rest are exterior to the earth's orbit, and consequently can never come between the earth and the sun. But the earth may make transits visible from Mars, the Asteroids, and Jupiter; and they in turn may make transits for the inhabitants of all exterior worlds. The principle is, that each interior planet may make transits for all those that are exterior.

If the orbits of Mercury and Venus lay in the plane of the ecliptic, they would make transits whenever they were in conjunction with the sun. Even with their present inclination the same phenomenon would take place twice in every revolution, if Venus and the earth, for instance, were to start together from the line of Venus's nodes, and revolve in the same periodic time, Venus would then always make a transit in passing her nodes.

To calculate transits at any one node, we have only to find what number of revolutions of the interior planet are exactly equal to one, or any number of revolutions of the earth; or in other words, when the earth and the planet will again meet on the line of the planet's nodes. In the case of Mercury this ratio is as 87.969 is to 365.256; from which we ascertain that

7	periodical revolutions	of the	Earth	are	equal to	29	of Mercury;
13	"	"	"	"	"	54	"
33	"	"	"	"	"	137	"
46	"	"	"	"	"	191	"

Therefore transits of Mercury, *at the same node*, may happen at intervals of 7, 13, 33, 46, &c., years.

All transits and eclipses are calculated upon these principles.

The transits of Mercury all occur in the months of May and November. The reason for this is, that his ascending node is in the 16th degree of Taurus, and his descending in the 16th degree of Scorpio; the first of which points the earth always passes in November, and the other in May.

Transits of Venus.

8	periodical revolutions	of the	Earth	are	equal to	13	of Venus.
235	"	"	"	"	"	382	"
243	"	"	"	"	"	346	"
251	"	"	"	"	"	408	"
291	"	"	"	"	"	475	"

The line of Venus's nodes lies in the middle of Gemini and Sagittarius; which points are passed by the Earth in December and June. It follows, therefore, that transits of Venus must always happen in one or the other of these months.

Inclination of the Orbits of the Planets to the Plane of the Ecliptic.—Fig. 1 represents the orbit of a planet as inclined to the ecliptic at an angle of about 45°. But none of the planets have so great an inclination; the main object here being to illustrate the subject of nodes.

The inclination of the orbits of the several planets to the plane of the ecliptic, is shown in Fig. 2. In the centre is seen the sun. The dotted line running horizontally across the map, and through the sun's centre, represents the *plane* of the ecliptic. On the right and left are seen arcs of a circle, divided off, and numbered every ten degrees. The plain lines, inclined more or less, and passing through the centre of the sun, represent the plane of the orbits of the planets respectively. On the left, outside the graduated circle, are seen the names of the planets; and just within the circle the amount of the inclination of their orbits. This inclination is as follows:—

Mercury,	7°	Ceres,	10½°
Venus,	3½	Pallas,	34½
Earth,		Jupiter,	1½
Mars,	2	Saturn,	2½
Vesta,	7	Herschel,	¾
Astræa,	7¾	Neptune,	1¾°
Juno,	13		

The wide portion of the graduated circle shows the limits of the Zodiac; extending 8° on each side of the ecliptic.

It will be seen that the orbits of most of the planets lie within the limits of the Zodiac; but Juno, Ceres, and Pallas, extend beyond its bounds. They are therefore sometimes called the *ultra zodiacal* planets. The orbit of Neptune is not inserted in the map.

Near the middle of Fig. 2, are seen two *comets* in their orbits; one coming down from the heights *North* of the ecliptic, passing around the sun and then reäscending; and the other coming up from the depths *South* of the ecliptic. The design is to illustrate the fact that the comets do not revolve in the plane of the ecliptic, or as nearly so as do the planets; but that they approach the sun from all directions, or from every point in the heavens.

Young people and others cannot study much by lamp-light with impunity.

Sleeping rooms should have a fire-place, or some mode of ventilation besides the windows.