

We know, also, that, in its movement of translation, the earth preserves such a position that its axis of rotation is intercepted, at its centre, by the plane of the ecliptic. But in place of being perpendicular, or at right angles with this plane, it crosses it obliquely in such a manner as to form on one side an angle of one-fourth, and on the other an angle of three-fourths of a right angle. This inclination is only altered in an insignificant degree by the movement of *nutation*. I need scarcely add that the earth, in its annual revolution, occupies periodically four principal positions on the ecliptic, which mark the limits of the four seasons. When its centre is at the extremity most remote from the sun, or *aphelion*, it is the summer solstice for the northern hemisphere. When its centre is at the other extremity, or *perihelion*, the same hemisphere is at the winter solstice. The two intermediate points mark the equinoxes of spring and autumn. The great circle of separation of light and shade passes, then, precisely through the poles, the day and night are equal, and the line of intersection of the plane of the equator and that of the ecliptic make part of the vector ray from the centre of the sun to the centre of the earth—what we call the *equinoctial line*.

“Thus placed, it is evident that if the terrestrial axis remained always parallel to itself, the equinoctial line would always pass through the same point on the surface of the globe. But it is not absolutely thus. The parallelism of the axis of the earth is changed slowly, very slowly, by a movement which Arago ingeniously compares to the varying inclination of a top when about to cease spinning. This movement has the effect of making the equinoctial points on the surface of the earth retrograde towards the east from year to year, in such a manner that at the end of 25,800 years according to some astronomers, but 21,000 years according to Adhémar, the equinoctial point has literally made a circuit of the globe, and has returned to the same position which it occupied at the beginning of this immense period, which has been called the ‘*great year*.’ It is this retrograde evolution, in which the terrestrial axis describes round its own centre that revolution round a double conic surface, which is known as the *precession of the equinoxes*. It was observed 2,000 years ago by Hipparchus; its cause was discovered by Newton; and its complete evolution explained by D’Alembert and Laplace.

“Now, we know that the consequence of the inclination of the terrestrial axis with the plane of the ecliptic is—

“1. That the seasons are inverse to the two hemispheres—that is