

Mercury.....	0·2056163	Jupiter.....	0·0481621
Venus.....	0·0068618	Saturn.....	0·0561505
Earth.....	0·0167922	Uranus.....	0·0466108
Mars.....	0·0932166	Neptune.....	0·00871946

The *motion of the major axis (line of apsides)* of the planetary orbits, by which the place of the perihelion is changed, is a motion which goes on perpetually in one direction, and proportionally to the time. It is a change in the *position* of the major axis, which requires more than a hundred thousand years to complete its cycle, and is to be distinguished as essentially different from those alterations which the planetary orbits undergo in their *form*—their ellipticity. The question has been raised as to whether the increasing value of this ellipticity is capable, during thousands of years, of modifying, to any considerable extent, the temperature of the Earth, in reference to the daily and annual *quantity* and *distribution* of heat? Whether a partial solution of the great geological problem of the imbedding of tropical vegetable and animal remains in the now cold zones may not be found, in these *astronomical* causes, proceeding *regularly* in accordance with eternal laws? The same mathematical arguments which excite apprehensions as to the position of the apsides, the form of the elliptical planetary orbits (according as these approach the circular form or a cometary eccentricity), as to the inclination of the planetary axes, changes in the obliquity of the ecliptic, the influence of precession upon the length of the year, also afford, in their higher analytical development, cosmical grounds for reassurance. The *major axes* and the *masses* are constant. *Periodic recurrence* hinders the *unlimited augmentation* of certain perturbations. In consequence of the mutual, and, at the same time, compensating influence of Jupiter and Saturn, the eccentricities of their orbits, in themselves slight, are alternately in a state of increase and decrease, and are also comprised within fixed, and, for the most part, narrow limits.

The point in which the Earth is nearest to the Sun falls in very different periods of the year, in consequence of the alteration in the *position* of the major axis.* If the perihelion falls at the present time on the first day of January, and the

* John Herschel, *on the Astronomical Causes which may influence Geological Phenomena*, in the *Transact. of the Geolog. Soc. of London* 2d series, vol. iii., pl. i., p. 298; the same in his *Treatise on Astronomy* 1833. (*Cab. Cyclop.*, vol. xliii., § 315.)