

brief statement of the phenomena in agreement and disagreement with the theory may be of interest. In agreement:—

1. The planets all revolve nearly in the same plane and in the same direction.

2. Their orbits are all nearly circular.

3. The sun and the planets, so far as known, rotate in the direction in which the planets revolve.

4. The planes of the equators of the planets and of the orbits of their satellites are nearly coincident with the planes of their orbits (Uranus and Neptune excepted).

5. The satellites revolve in the direction that the primaries rotate (9th of Saturn and 8th of Jupiter exceptions).

6. According to the contraction theory of the sun's heat, this body was once vastly larger than at present.

Some facts inconsistent with the Nebular Theory. :—

1. The orbits of the asteroids are contradictory to the theory.

2. The rapid revolution of the inner satellite of Mars and of the particles of the inner ring of Saturn can not be satisfactorily explained.

3. The presence of light elements in the earth is not to be expected.

4. A series of rings could not have been left off.

5. A ring could not have condensed into a planet.

6. The retrograde revolutions of the 9th satellite of Saturn and the 8th of Jupiter contradict the theory.

Various modifications of Laplace's theory to meet these objections have been brought forward by Roche, Faye, Ligoude, Ball and others, the chief of which dispenses with the troublesome process of ring formation and condensation and starts the planets by condensations around accidental nuclei in the parent nebula. The most exhaustive criticism of the nebular theory is that by Moulton and Chamberlin, published in 1900, who, by combining observed facts with dynamical principles show that in its present form it fails to account for many of the phenomena of the Solar System.

An alternative hypothesis has been developed by these writers called the Planetesimal or Spiral Nebula Hypothesis. It probably owes its origin to the fact that the researches of Keeler with the Crossley Reflector at the Lick Observatory showed that the predominant form of nebula was the spiral, and that no known nebula has a form agreeing with Laplace's Ring Hypothesis.

The authors of this theory assume that our system was originally a small spiral nebula and explain the formation of the spiral nebulae by the collision theory already dealt with, or