

(1) Jupiter was formerly surrounded by a series of rings similar to those now surrounding Saturn.

(2) The direction of rotation of these rings was direct like that of the planet.

(3) By some force, whose cause is not explained, they were shattered, their components uniting, but still retaining the same orbit.

(4) Like the original rings, each satellite consists of a swarm of meteorites, their consolidation having been intercepted by the enormous tides produced in them by their primary.

The propositions are inductively established by various observed facts, all of which in turn are entirely consistent with these theories, and therefore it is concluded that the theories are true and scientific. These facts are the small density of the satellites, the retrograde rotation and elongated shape of the first, the small density of the first, as compared with any of the others; the regularly recurring changes of shape of the discs of the other satellites, caused by a rotation about their major axes, and others, which time forbids me to mention. The Jovian system has therefore bodies that appear egg-shaped, and go through at regular intervals changes of shape from elliptic to circular.

Pickering concludes that if the rings had been solid bodies, each moving as one piece, their outer edges would evidently have moved faster than their inner ones, and had they later been shattered by some cause and converted into one or more satellites that each satellite would have had a direct rotation like the ring from which it was framed. If, however, the rings were composed of meteorites, as has been shown is necessarily the case with the rings of Saturn, their inner edges would travel the faster, and upon their breaking up, resultant satellites would all have a retrograde rotation, and so Laplace stands impregnable. Extending the same reasoning to the solar system, Pickering concludes that the earth and all the planets at first had a retrograde rotation, and being thus in a position of unstable equilibrium, the axes of rotation through immense cycles slowly shifted into the present position of stable equilibrium. So, at one time, terrestrial objects now situated to the south of us would have been found under the northern stars, the sun rising in the west and setting in the east, while the stars moved backwards in their nightly courses. This change of rotation from the retrograde to the direct, is exemplified in the curious instrument known as the gyroscope. It is satisfactory to us to know that we are living in an age when there is nothing retrograde about our mother Earth, that she is stable and moving in a satisfactory manner without a jar of continent or swirling spill of ocean, and "direct" in her orbit.

II. As far back as 1891, attention was called to a suspected variation in the latitude of certain places where accurate observations for latitude had been undertaken, and investigation was forthwith commenced, but the honor of the discovery of the way to apply the key and open the lock was kept for 1893, and the discoverer was Mr. S. C. Chandler, of Cambridge, U.S. He has proved the occurrence of periodic changes in latitude and more particularly of a rotation of the geographical round the astronomical pole in 427 days. It had formerly been an accepted dogma that the axis of rotation of the earth revolves

relatively to the axis of figure in a direction from west to east in a period of 306 days. This motion of the axis of rotation would of course reveal itself in a change of latitude as determined by celestial observation, and the phenomenon was generally referred to as the "10 month period in latitude." But now we must speak of the "14 month period in latitude," for so Mr. Chandler has discovered after discussing an immense amount of observations, 33,000, taken in 17 observatories (four of them in the southern hemisphere), with 21 different instruments and by nine distinct methods of observation. Prof. Newcombe turned his attention to it, and he found that a very plausible assumption as to the elasticity of the earth would account for a 14 month period. The old 306 day period was based upon the hypothesis that the earth is an absolutely rigid body; but, as a matter of fact, the fluidity of the ocean plays an important part in the phenomenon as does also the elasticity of the earth, and it is very satisfactory to find that theory and observation can thus be made to harmonize with what is, at all events from the theoretical point of view, a very important matter. The expression, then, "as solid as the earth," may be a misnomer; we may, after all, live and move and have our being on an immense rubber ball, so to speak, that changes its shape. However that may be, we may write Q.E.D. after the proposition that the axis of rotation of the earth revolves round the axis of figure from west to east in about 427 days, the distance between the axes being about a quarter of a second of arc, or 25 feet on the earth's surface.

How marvellous is the skill, patience and ingenuity of man to detect such an infinitesimal irregularity as a motion of a globe 24,000 miles in circumference round an axis that, if it could be located physically, would jut out through the surface only 25 feet from what we call the North Pole, giving our earth a very slight sort of wobbling motion, or, as she is our mother and therefore a lady, we should better say undulating motion, and watched as she floats through space in her graceful swing, on one side by the fiery god of War and on the other by the goddess of Beauty. It is of course needless to remark that this erratic twist is entirely different from the nutation of the earth's axis, which completes its stately nod in nineteen years or thereabouts.

For this discovery Mr. Chandler was awarded a gold medal.

III. The roll call of the asteroids still continues to increase. Since Bode's law showed a gap between Mars and Jupiter and observation in that belt of the sky commenced, 346 have been discovered, and in 1893, 50 of this number have been catalogued, and thirty-eight of these fifty are credited to one astronomer, Mr. M. Charlois, of Nice. These pigmy children of the sun are so numerous that the stock of distinctive names has been exhausted, and only one of these new strangers has been named, and he is Dembowska, which name indicates surely that the brain has grown weary of inventing names. Only one of these asteroids in 1893 was discovered without the aid of photography.

IV. The year 1893 has its share of new comets. Rordame comet, discovered on 8th July simultaneously at two places, Alta, Iowa, and Salt Lake City, Utah. Rordame was the Salt Lake City observer. Telegraphic announcements were made

from both places simultaneously. It appeared in the twilight of the N.W. sky as a hazy third magnitude star with a tail of about 1°. Its motion was very rapid owing to its proximity to the earth, and its direction to the S.E. soon carried it out of sight. Photography showed the tail to have four distinct branches, with an outward spiral motion.

Finlay's comet of 1886, revolving in an ellipse with a periodic time of nearly six and three-quarter years, was searched for on the morning of 17th May by its original discoverer at the Cape observatory; and, true to its covenant to observe its law and period, it crossed the field of view of his telescope on time.

Holmes' comet belongs to 1892, but it chose 16th Jan. 1893 for a display of unusual behavior. Instead of proceeding in its course, minding its own business, as a well-trained comet ought to do, at 8.10 o'clock that evening, right before Prof. Barnard's eye, it commenced to grow and grow until at 10.45, puffed up with pride and self-importance, it became nearly twice its original size. It first registered 29m. 4s. in the micrometer wire, and ended with a registry of 47m. 9s. Barnard says, "This is certainly the most remarkable comet I have ever seen." In explanation of the genesis and growth of this comet, S. J. Corrigan, of St. Paul, Minn., offers a theory of a collision between two asteroids. The first effects of such a collision would be to expand the volume of the resultant body, some of the matter whereof would be thrown entirely beyond the sphere of attraction due to the mass of said body. This matter thus diffusing in space appeared as a rapidly expanding nebulous envelope seen shortly after the discovery of the comet. But probably the greater part of the matter did not pass beyond the sphere of attraction, and, if so, it must have fallen back towards the centre of gravitation of the mass. As expansion and separation of the matter diminishes the brightness of the nucleus, so must the attraction above described have increased the brilliancy thereof, producing the effect observed. The fall of this matter must have generated heat, and so the nucleus became truly a flower in the sky, generated by heat, and growing from bud to blossom by heat.

Holmes' comet is within the belt of asteroids, and it yet is a question whether Holmes discovered a comet or a new asteroid. If a group of asteroids could separate from common origins, may not re-unions or collisions be also possible?

V. The total solar eclipse of April 16th last, excited the greatest interest. Two British expeditions went forth, one to West Africa and the other to Brazil; two French expeditions were stationed on the West African coast. The American discoverers, under Prof. Pickering, were located in Chili. The study of the solar corona made a substantial advance. Whether the corona is subject to rapid changes of form or not will no doubt be answered from comparison of the photographic plates taken by the observer. One result is already obtained, viz., that the corona shares in the general rotation of the sun's disk. Photography here asserts her claims as the most wonderful weapon of discovery, since the inventions of the telescope and spectro-scope, with which astronomy has been equipped. The corona has never been photographed without the accompanying eclipse, and if there was no camera, we should yet know little; for all we know of