

which masks the other causes of inequality, by determining the direction of the motions of the *perijove* and node of each satellite.

Sect. 5.—Application of the Newtonian Theory to the New Planets.

WE are now so accustomed to consider the Newtonian theory as true, that we can hardly imagine to ourselves the possibility that those planets which were not discovered when the theory was founded, should contradict its doctrines. We can scarcely conceive it possible that Uranus or Ceres should have been found to violate Kepler's laws, or to move without suffering perturbations from Jupiter and Saturn. Yet if we can suppose men to have had any doubt of the exact and universal truth of the doctrine of universal gravitation, at the period of these discoveries, they must have scrutinized the motions of these new bodies with an interest far more lively than that with which we now look for the predicted return of a comet. The solid establishment of the Newtonian theory is thus shown by the manner in which we take it for granted not only in our reasonings, but in our feelings. But though this is so, a short notice of the process by which the new planets were brought within the domain of the theory may properly find a place here.

William Herschel, a man of great energy and ingenuity, who had made material improvements in reflecting telescopes, observing at Bath on the 13th of March, 1781, discovered, in the constellation Gemini, a star larger and less luminous than the fixed stars. On the application of a more powerful telescope, it was seen magnified, and two days afterwards he perceived that it had changed its place. The attention of the astronomical world was directed to this new object, and the best astronomers in every part of Europe employed themselves in following it along the sky.³¹

The admission of an eighth planet into the long-established list, was a notion so foreign to men's thoughts at that time, that other suppositions were first tried. The orbit of the new body was at first calculated as if it had been a comet running in a parabolic path. But in a few days the star deviated from the course thus assigned it: and it was in vain that in order to represent the observations, the perihelion distance of the parabola was increased from fourteen to eighteen times the earth's distance from the sun. Saron, of the Academy of Sciences of Paris, is said³² to have been the first person who perceived that the

³¹ Voiron, *Hist. Ast.* p. 12.

³² *Ibid.*