

to me, that Professor Airy's treatise entitled *Gravitation*, published at Cambridge in 1834, is of great value in supplying similar modes of conception with regard to the mechanical origin of many of the principal inequalities of the solar system.

Bessel in 1824, and Hansen in 1828, published works which are considered as belonging, along with those of Gauss, to a new era in physical astronomy.⁹ Gauss's *Theoria Motuum Corporum Celestium*, which had Lalande's medal assigned to it by the French Institute, had already (1810) resolved all problems concerning the determination of the place of a planet or comet in its orbit in function of the elements. The value of Hansen's labors respecting the Perturbations of the Planets was recognized by the Astronomical Society of London, which awarded to them its gold medal.

The investigations of M. Damoiseau, and of MM. Plana and Carlini, on the Problem of the Lunar Theory, followed nearly the same course as those of their predecessors. In these, as in the *Mécanique Céleste*, and in preceding works on the same subject, the Moon's co-ordinates (time, radius vector, and latitude) were expressed in function of her true longitude. The integrations were effected in series, and then by reversion of the series, the longitude was expressed in function of the time; and then in the same manner the other two co-ordinates. But Sir John Lubbock and M. Pontécoulant have made the *mean* longitude of the moon, that is, the time, the independent variable, and have expressed the moon's co-ordinates in terms of sines and cosines of angles increasing proportionally to the time. And this method has been adopted by M. Poisson (*Mem. Inst.* xiii. 1835, p. 212). M. Damoiseau, like Laplace and Clairaut, had deduced the successive coefficients of the lunar inequalities by numerical equations. But M. Plana expresses explicitly each coefficient in general terms of the letters expressing the constants of the problem, arranging them according to the order of the quantities, and substituting numbers at the end of the operation only. By attending to this arrangement, MM. Lubbock and Pontécoulant have verified or corrected a large portion of the terms contained in the investigations of MM. Damoiseau and Plana. Sir John Lubbock has calculated the polar co-ordinates of the Moon directly; M. Poisson, on the other hand, has obtained the variable elliptical elements; M. Pontécoulant conceives that the method of variation or arbitrary con-

⁹ *Abhand. der Akad. d. Wissensch. zu Berlin.* 1824; and *Disquisitiones circa Theoriam Perturbationum.* See Jahn. *Gesch. der Astron.* p. 84.