each; and every new action to a new configuration. Accordingly, the mathematical investigation of such questions as the above was too difficult to be attempted in the earlier periods of the progress of Physical Astronomy. Newton did not undertake to demonstrate either the stability or the instability of the system. The decision of this point required a great number of preparatory steps and simplifications, and such progress in the invention and improvement of mathematical methods, as occupied the best mathematicians of Europe for the greater part of last century. But, towards the end of that time, it was shown by Lagrange and Laplace that the arrangements of the solar system are stable: that in the long run, the orbits and motions remain unchanged; and that the changes in the orbits, which take place in shorter periods, never transgress certain very moderate limits. Each orbit undergoes deviations on this side and on that of its average state; but these deviations are never very great, and it finally recovers from them, so that the average is preserved. The planets produce perpetual perturbations in each other's motions, but these perturbations are not indefinitely progressive, they are periodical: they reach a *maximum* value and then diminish. The periods which this restoration requires are, for the most part, enormous; not less than thousands, and, in some instances, millions of years; and hence it is, that some of these apparent derangements have been going on in the same direction since the beginning of the history of the world. But the restoration is in the sequel as complete as the derangement; and in the meantime the disturbance never attains a sufficient amount seriously to alter the adaptations of the system.*

The same examination of the subject by which this is proved, points out also the conditions on which this stability depends. "I have succeeded in de-

* Laplace Expos. du Syst. du Monde. p. 441.