that the principles expounded in this work will afford some light, either to this mode of philosophizing, or to some mode which is more true."

Before we pursue this subject further, we must trace the remainder of the history of the Third Law.

Sect. 2.—*Generalization of the Third Law of Motion.—Centre of Oscillation.—Huyghens.*

The Third Law of Motion, whether expressed according to Newton's formula (by the equality of Action and Reaction), or in any other of the ways employed about the same time, easily gave the solution of mechanical problems in all cases of *direct* action; that is, when each body acted directly on others. But there still remained the problems in which the action is *indirect*;—when bodies, in motion, act on each other by the intervention of levers, or in any other way. If a rigid rod, passing through two weights, be made to swing about its upper point, so as to form a pendulum, each weight will act and react on the other by means of the rod, considered as a lever turning about the point of suspension. What, in this case, will be the effect of this action and reaction? In what time will the pendulum oscillate by the force of gravity? Where is the point at which a single weight must be placed to oscillate in the same time? in other words, where is the *Centre of Oscillation?*

Such was the problem—an example only of the general problem of indirect action—which mathematicians had to solve. That it was by no means easy to see in what manner the law of the communication of motion was to be extended from simpler cases to those where rotatory motion was produced, is shown by this;—that Newton, in attempting to solve the mechanical problem of the Precession of the Equinoxes, fell into a serious error on this very subject. He assumed that, when a part has to communicate rotatory movement to the whole (as the protuberant portion of the terrestrial spheroid, attracted by the sun and moon, communicates a small movement to the whole mass of the earth), the quantity of the *motion*, "motus," will not be altered by being communicated. This principle is true, if, by *motion*, we understand what is called *moment of inertia*, a quantity in which both the velocity of each particle and its distance from the axis of rotation are taken into account: but Newton, in his calculations of its amount, considered the velocity only; thus making *motion*, in this case, identical with the *momentum* which he introduces in treating of the simpler case