

round by the motion of the earth; and obtained an erroneous result. Kepler and Fermat attempted the same problem, and obtained solutions different from that of Galileo, but not more correct.

Even Newton, at an early period of his speculations, had an erroneous opinion respecting this curve, which he imagined to be a kind of spiral. Hooke animadverted upon this opinion when it was laid before the Royal Society of London in 1679, and stated, more truly, that, supposing no resistance, it would be "an eccentric ellipsoid," that is, a figure resembling an ellipse. But though he had made out the approximate form of the curve, in some unexplained way, we have no reason to believe that he possessed any means of determining the mathematical properties of the curve described in such a case. The perpetual composition of a central force with the previous motion of the body, could not be successfully treated without the consideration of the Doctrine of Limits, or something equivalent to that doctrine. The first example which we have of the right solution of such a problem occurs, so far as I know, in the Theorems of Huyghens concerning Circular Motion, which were published, without demonstration, at the end of his *Horologium Oscillatorium*, in 1673. It was there asserted that when equal bodies describe circles, if the times are equal, the centrifugal forces will be as the diameters of the circles; if the volocities are equal, the forces will be reciprocally as the diameters, and so on. In order to arrive at these propositions, Huyghens must, virtually at least, have applied the Second Law of Motion to the limiting elements of the curve, according to the way in which Newton, a few years later, gave the demonstration of the theorems of Huyghens in the *Principia*.

The growing persuasion that the motions of the heavenly bodies about the sun might be explained by the action of central forces, gave a peculiar interest to these mechanical speculations, at the period now under review. Indeed, it is not easy to state separately, as our present object requires us to do, the progress of Mechanics, and the progress of Astronomy. Yet the distinction which we have to make is, in its nature, sufficiently marked. It is, in fact, no less marked than the distinction between speaking logically and speaking truly. The framers of the science of motion were employed in establishing those notions, names, and rules, in conformity to which *all* mechanical truth must be expressed; but *what was the truth* with regard to the mechanism of the universe remained to be determined by other means. Physical Astronomy, at the period of which we speak, eclipsed and overlaid theo-