CHAPTER IV.

SEQUEL TO THE EPOCH OF NEWTON, CONTINUED.—VERIFICATION AND COMPLETION OF THE NEWTONIAN THEORY.

Sect. 1.—*Division of the Subject.*

THE verification of the Law of Universal Gravitation as the governing principle of all cosmical phenomena, led, as we have already stated, to a number of different lines of research, all long and difficult. Of these we may treat successively, the motions of the Moon, of the Sun, of the Planets, of the Satellites, of Comets; we may also consider separately the Secular Inequalities, which at first sight appear to follow a different law from the other changes; we may then speak of the results of the principle as they affect this Earth, in its Figure, in the amount of Gravity at different places, and in the phenomena of the Tides. Each of these subjects has lent its aid to confirm the general law: but in each the confirmation has had its peculiar difficulties, and has its separate history. Our sketch of this history must be very rapid, for our aim is only to show what is the kind and course of the confirmation which such a theory demands and receives.

For the same reason we pass over many events of this period which are highly important in the history of astronomy. They have lost much of their interest for us, and even for common readers, because they are of a class with which we are already familiar, truths included in more general truths to which our eyes now most readily turn. Thus, the discovery of new satellites and planets is but a repetition of what was done by Galileo: the determination of their nodes and apses, the reduction of their motions to the law of the ellipse, is but a fresh exemplification of the discoveries of Kepler. Otherwise, the formation of Tables of the satellites of Jupiter and Saturn, the discovery of the eccentricities of the orbits, and of the motions of the nodes and apses, by Cassini, Halley, and others, would rank with the great achievements in astronomy. Newton's peculiar advance in the *Tables* of the celestial motions is the introduction of Perturbations. To these motions, so affected, we now proceed.