CHAPTER IV.

THE TIDES.

THE *tides* are periodical movements of the sea provoked by the attractive action of the moon and the sun—an action which is exercised over the entire mass of the earth, and manifested by the swelling motion of the waters. The force of the moon is about threefold that of the sun, because "Dian's bright sphere" is infinitely nearer the earth than the "radiant orb of day."

In discussing the theory of the tides, we shall first consider the *lunar tides*, ignoring, for the present, the solar influence.

The attraction which the moon exercises on any point of the earth is in the inverse ratio of the square of her distance. If we draw a right line from the moon passing through the centre of our globe, that line will strike the surface of the waters at two diametrically opposite points, Z and N; one of these points will have the moon at the *zenith*, the other at the *nadir*. The points of the sea which have the moon at the zenith—that is to say, those which the moon illuminates perpendicularly—will be nearer that planet, and, consequently, more strongly attracted than the centre of the globe; and the points diametrically opposite, those which have the moon at the nadir, will be more distant and less strongly attracted than the centre of the globe. Consequently, the waters situated directly under the moon will rise towards that sphere, and form a bulging—so to speak—or a swelling on the surface of the ocean; the waters situated at the antipodes being less strongly attracted towards the moon than the centre of the globe, will remain in arrear, and thus form a second promontory on the surface of the sea. Hence results a *double high tide*, under the moon, and on the opposite side of our earth. Throughout all the intermediate extent, where the waters are not subjected