

*ponding* to those which the equilibrium theory gives, could be considered only as a conjecture, till the comparison with observation was made. It was, however, a natural conjecture; since the waters of the ocean are at every moment *tending* to acquire the form assumed in the equilibrium theory: and it may be considered likely that the causes which prevent their assuming this form produce an effect nearly constant for each place. Whatever be thought of this reasoning, the conjecture is confirmed by observation with curious exactness. The laws of a great number of the tidal phenomena—namely, of the Semi-mensual Inequality of the Heights, of the Semi-mensual Inequality of the Times, of the Diurnal Inequality, of the effect of the Moon's Declination, of the effect of the Moon's Parallax—are represented very closely by formulæ derived from the equilibrium theory. The hydrodynamical mode of treating the subject has not added any thing to the knowledge of the laws of the phenomena to which the other view had conducted us.

We may add, that Laplace's assumption, that in the moving fluid the motions must have a *periodicity* corresponding to that of the forces, is also a conjecture. And though this conjecture may, in some cases of the problem, be verified, by substituting the resulting expressions in the equations of motion, this cannot be done in the actual case, where the revolving motion of the ocean is prevented by the intrusion of tracts of land running nearly from pole to pole.

Yet in Mr. Airy's *Treatise On Tides and Waves* (in the *Encyclopædia Metropolitana*) much has been done to bring the hydrodynamical theory of oceanic tides into agreement with observation. In this admirable work, Mr. Airy has, by peculiar artifices, solved problems which come so near the actual cases that they may represent them. He has, in this way, deduced the laws of the semi-diurnal and the diurnal tide, and the other features of the tides which the equilibrium theory in some degree imitates; but he has also, taking into account the effect of friction, shown that the actual tide may be represented as the tide of an earlier epoch;—that the relative mass of the moon and sun, as inferred from the tides, would depend upon the depth of the ocean (Art. 455);—with many other results remarkably explaining the observed phenomena. He has also shown that the relation of the cotidal lines to the tide waves really propagated is, in complex cases, very obscure, because different waves of different magnitudes, travelling in different directions, may coexist, and the cotidal line is the compound result of all these.