is very great: but these calculations are performed by means of empirical formulæ, which do not connect the facts with their causes, and still leave a wide space to be traversed, in order to complete the science.

In the mean time, all the other portions of Mechanics were reduced to general laws, and analytical processes; and means were found of including Hydrodynamics, notwithstanding the difficulties which attend its special problems, in this common improvement of form. This progress we must relate.

[2d Ed.] [The hydrodynamical problems referred to above are, the laws of a fluid issuing from a vessel, the laws of the motion of water in pipes, canals, and rivers, and the laws of the resistance of fluids. To these may be added, as an hydrodynamical problem important in theory, in experiment, and in the comparison of the two, the laws of waves. Newton gave, in the *Principia*, an explanation of the waves of water (Lib. ii. Prop. 44), which appears to proceed upon an erroneous view of the nature of the motion of the fluid: but in his solution of the problem of sound, appeared, for the first time, a correct view of the propagation of an undulation in a fluid. The history of this subject, as bearing upon the theory of sound, is given in Book viii.: but I may here remark, that the laws of the motion of waves have been pursued experimentally by various persons, as Bremontier (*Recherches sur le Mouvement des Ondes*, 1809), Emy (*Du Mouvement des Ondes*, 1831), the Webers (*Wellenlehre*, 1825); and by Mr. Scott Russell (*Reports of the British Association*, 1844). The analytical theory has been carried on by Poisson, Cauchy, and, among ourselves, by Prof. Kelland (*Edin. Trans.*), and Mr. Airy (in the article *Tides*, in the *Encyclopædia Metropolitana*). And though theory and experiment have not yet been brought into complete accordance, great progress has been made in that work, and the remaining chasm between the two is manifestly due only to the incompleteness of both.]

Perhaps the most remarkable case of fluid motion recently discussed, is one which Mr. Scott Russell has presented experimentally; and which, though novel, is easily seen to follow from known principles; namely, the *Great Solitary Wave*. A wave may be produced, which shall move along a canal unaccompanied by any other wave: and the simplicity of this case makes the mathematical conditions and consequences more simple than they are in most other problems of Hydrodynamics.