In the able article by Mr Lubbock, we have the first accurate comparison of Bernoulli’s theory of the tides, with the results of observation as deduced from a period of nineteen years in the port of London. The results are important, not merely as furnishing materials and general rules for constructing tide-tables, but also for their gene­ral accordance with the theory in question, particularly as regards the semimenstrual inequality. This agreement was the more important, as affording the indication of a sort of physical connection between that theory and observation, and consequently as justifying such a further examination of its consequences as might lead to the discovery or sug­gestion of such modifications as would conduce to its gene­ral accordance with the laws of all the facts observed. In a Subsequent discussion of the tides of Liverpool, in the Phil. Trans. for 1835 and 1836, Mr Lubbock found further evidence in favour of the sort of law to which we have al­ready alluded, and which had indeed been previously sug­gested by Mr Whewell in his papers on the tides of Lon­don and Liverpool ; that by referring the tide, not to the lunar transit immediately preceding, but to a transit anterior to the tide by one, two, or more days, the formulæ furnish­ed by the equilibrium theory of Bernoulli would be brought into a very near accordance with the observed inequali­ties in the heights and times of the tides which are due to the changes in the moon’s parallax. This was in some re­spects an important step, particularly as affording conve­nient expressions for the corrections, since it has been found to apply to a considerable extent to all the periodical ine­qualities, and seems to be in conformity with the idea that the tides are primarily generated in the Southern Ocean, and thence reach our coasts in the derivative form only. But in one respect it is not satisfactory ; for even at the same place very different anterior epochs are required for the se­veral inequalities. Thus, though each formula furnished by the theory can be separately adjusted by trial to repre­sent generally the results of observation for one particular correction at any assigned station, yet since, in the seve­ral expressions, the same symbol requires a different value for almost every different correction, such formulæ cannot consistently represent the laws of nature ; so that Bernoulli’s theory, even when thus modified, is quite incompetent to assign any physico-mathematical reasons for the adjustments in question. The complete solution of the problem would therefore probably require a far more thorough knowledge of the laws of hydrodynamics.

Mr Whewell's researches, on which he has now publish­ed a dozen papers, have been chiefly directed to the three following points ; first, the motion of the tide-wave at dif­ferent parts of the ocean ; secondly, the comparison of the observed laws at certain places with the theory ; and, last­ly, the laws of the diurnal inequality of the tide, which seem the most intricate of ali. His first memoir, entitled an “ Essay towards a first Approximation to a Map of Coti- dal Lines,” appeared in the Phil. Trans. for 1833. By a co- tidal line is meant such as may be drawn through all those points of the ocean which have high water simultaneously. The cotidal line for any hour may be considered as repre­senting the summit or ridge of the tide-wave at that time ; meaning by the tide-wave, that protuberance of water upon the surface of the ocean which moves along the seas, and by its motion brings high water and low water to any place at the time when the elevated and the depressed parts of the watery surface reach that place. The cotidal lines for successive hours represent the successive positions of the summit of this wave ; so that if a spectator were detached from the earth to perceive the summit of the wave, he would see it travelling round the earth in the Southern Ocean once in twenty-four hours, accompanied by another at twelve hours distance from it, and both sending branches into the narrower seas ; and the manner and velocity of all these motions will be assigned by means of a map of co- tidal lines. By analysing the movements of the tides ac­cording to the most simple considerations of the laws of fluid motion in open seas and in channels, and by explain­ing the circumstances of their convergence or divergence, their interference with each other, their retardation in shal­low water, and their consequent tendency to sweep around the coasts, and to approach them almost perpendicularly; and further, by discussing very carefully all the materials with which nautical surveys and books of navigation could furnish him, Mr Whewell was enabled to construct a map, which not only represented the general circumstances of the tides of the coasts of Britain, but likewise, as he sup­posed, of the movement of the great tidal wave from the Southern Ocean to the coasts of Europe through the At­lantic ; as also its progress in the Indian Seas, and on the coasts of New Zealand.

In order to correct his first approximation to a map of cotidal lines, the British Association, at the instance of Mr Whewell, procured a very extensive series of observations to be made on the coasts of Britain and Ireland, at 537 stations of the coast-guard, in June 1834. These were not only repeated in June 1835, but simultaneous observa­tions were also made, at the request of our government, by the other great maritime powers of Europe and North America. The chain of places of observation extended along the coast of North America, from the mouth of the Mississippi, round the keys of Florida, and northward as far as Nova Scotia ; and along the shores of Europe, from the Straits of Gibraltar to the North Cape of Norway. The number of stations was, twenty-eight in America, seven in Spain, seven in Portugal, sixteen in France, five in Bel­gium, eighteen in the Netherlands, twenty-four in Den­mark, and twenty-four in Norway; and observations were made by the coast-guard of this country at 318 places in Britain, and at 219 in Ireland. The observers were direct­ed to record the times of high and of low water, and the height of the surface at each of these times, measured from a fixed point. At each place, the differences between the time of high water, and the time of a preceding transit of the moon, which differences Mr Whewell calls the luni- tidal intervals, were taken for the whole series of observa­tions. The immense mass of observations thus furnished was reduced under Mr Whewell's directions ; and some of the results, which are extremely important and interesting, have been published in the Phil. Trans. for 1835 and 1836. The last of these publications is accompanied by a second map of the cotidal lines of the coasts of Europe, and by a chart, which shews, by means of a peculiar notation, the range, in yards, of the spring tides at the different stations of observation.

Among other remarkable conclusions which have re­sulted from these observations, may be mentioned the rota­tory motion of the tide-wave, which, entering the German Ocean between the Orkneys and Norway, sends a southerly detachment along the coasts of Britain, which is reflected from the projecting coast of Norfolk upon the north coast of Germany, and meets the tide-wave again on the coast of Denmark. Owing to this interference of different tide-waves, the tides are almost entirely obliterated on the coast of Jutland, where their place is supplied by nearly perpetual high water. Indeed this must always be the case wherever one tide-wave continually arrives about six hours later than another, or where more tide-waves successively arrive at still shorter intervals.

Mr Whewell’s second object was to compare the observ­ed laws of the tides with the theory, or to propose such modifications of the forms of the theory as would reconcile it with observations. In his very ingenious memoir “ On the Empirical Laws of the Port of London,” he attempts to deduce from observation, and from very simple considera-