June 7), the tide which follows the moon’s transit will fol­low the sun’s transit also as soon as the moon is north of the equator ; that is, if the diurnal inequality were rcgu- lated by the moon’s place on the same day, the afternoon tide would be greatest, and so it would continue till the moon was seven hours after the sun, and the tide follow­ing the moon would become the morning tide : but at the same time the moon would pass to the south of the equator, and so the tide following the moon would be the smaller. In this situation, therefore, the evening tide would be the greater during the whole lunation.

It was only of late that the diurnal inequality of the tides began to be attended to as it deserves; for however imper­fectly understood, it is no doubt a regular change, consi­derable in its amount, and almost universal in its preva­lence. It would be easy to adduce many cases in which the safety or loss of a ship has been determined by it. Though the existence of such an inequality in particular places has long been known, its laws have been sadly mis­understood. For example, it has been supposed always to affect the morning and evening tides in opposite ways, which is only an accidental and local expression of its rule. In the Phil. Trans, for 1836, p. 57, Mr Lubbock has de­scribed how he obtained it for Liverpool ; while Mr By­water, who has introduced it into his tide-tables for that port, and Mr Bunt into those for Bristol, have also col­lected it from observations. But the connection of this inequality, as it exists in different parts of the world, was never brought into view till Mr Whewell discussed together the European and American observations of June J835. The laws which the inequality follows, when thus considered on an extensive scale, appear to be very curious, though they are still but very imperfectly known.

In some cases this inequality is most clearly seen in the heights of high water, in others in the low water, and in some cases it greatly affects the times of both. Mr Whe­well exhibited the results of June 1835 in curves, by erect­ing a series of equidistant ordinates to represent the heights of the successive tides above a fixed point at each place ; and these curves generally showed a series of parallel zig­zags (the tides being alternately higher and lower) ; and they were so regular and similar as to prove both the good­ness of the observations and the existence of the diurnal inequality. This was so remarkable on the coast of Ame­rica, that scarcely any exception occurred. Next to this, it was conspicuous, especially during a portion of the ob­servations, in Spain and Portugal ; then on the west of France, the coast of Cornwall, and parts of the west of Ire­land. In the German Ocean this inequality was obvious, but, owing to the mixture of different tides, it was less steady and regular.

Although the diurnal inequality is generally believed to depend upon the sun or moon’s being north or south of the equator, yet, as we shall afterwards see, there are cases which it seems very difficult to explain on this principle. Nor docs the sign of this inequality, as was long supposed, depend on the place being north or south of the equator. Its maximum corresponds to, but is not necessarily simul­taneous with, the moon's greatest declination ; nor does the period of its vanishing everywhere coincide with the time of the moon’s passing the equator, but more generally is somewhat later. Between periods corres∣ponding to, or rather at equal intervals after, two such passages, the in­equality increases from 0 to a maximum, and decreases to 0 again, alternately. The curves which represent the heights really exhibit such alternate increase and diminution ; and the inquiry naturally occurs, after how long a time does the moon’s position show its effect in the diurnal inequality ? ln the case of Liverpool, Mr Whewell has endeavoured to show that this inequality expresses the effect of the forces upon the equilibrium spheroid, as they existed six days pre­viously. But this interval is very different at other places, and its range is curious.

From the general tide observations made in Europe and America in June 1835, the results of which have been given by Mr Whewell (Phil. Trans. for 1836, p. 302), it appear­ed that the diurnal inequality on the east coast of Scotland was, during that semilunation, irregular, passing over a tide in the middle of the series. This and others of its anoma­lies on the coasts of the German Ocean, appear to show that the waters in that region are affected by the mixture of different tides. On the east coast of America, the changes of this inequality seem contemporaneous with those of the moon’s declination ; so that the epoch there is zero. On the coasts of Spain, Portugal, and France, it is successively two and three days, which is quite consistent with this epoch, being four days on the coast of Cornwall and Devonshire.

A circumstance not less remarkable in the progress of the diurnal inequality is, that it is seen much more distinctly and steadily at some places, than at others which are near them ; nor does it seem easy to assign any rule which it fol­lows in this respect. It is very marked, and almost univer­sal, on the coast of the United States, and was conspicuous in the observations of June 1835 in Spain and Portugal, the west of France, and part of the west of Ireland ; yet at intermediate places it could not be detected. It is large on the east coast of New Holland, as we know from Cook’s getting his ship off a reef by means of it ; and the north and south coasts of Australia appear to exhibit the extreme case of it. We might suppose it to affect the whole of the Indian Ocean ; yet at Keeling Island, in the middle of that ocean, it did not decidedly show itself in Captain Fitzroy’s obser­vations from the 2d to the 8th April 1836.

The epoch of the diurnal inequality being different in different parts of the world, is a very curious fact, and not easily reconcileable with the notion of a tide-wave travelling to all shores in succession. In accordance with this view, the tide on the shores of America had been considered as identical with the almost contemporaneous tide on the coasts of Spain and Portugal ; nor does it seem easy to imagine the form of the tide-waves, so that this shall not be the case. Yet we find that the tides on these two sides of the Atlantic cannot be identical in all respects; for on the 9th, 10th, and 11th of June 1835, when the diurnal inequality was great in America, it was nothing in the west of Europe ; and on the 18th and l9th, when this inequality had vanished in America, it was great in Europe. It would seem as if the tidal phenomena on this side the Atlantic corresponded to an epoch of the equilibrium theory, two or three days later than the same phenomena in America ; and different kinds of phenomena do not seem to travel at the same rate. Thus the equilibrium theory, though it may explain the general form of the inequalities, cannot give their epochs and amounts by any possible adjustment of constants. The notion of the progress of the tide-wave from south to north in the Atlan­tic is still further involved in difficulties by its appearing, from the observations of Sir John Herschel, that at the Cape of Good Hope the diurnal inequality showed itself most clearly on the 17th, 18th, and 19th of June, that is, as late as in Spain and Portugal. The diurnal inequality appears also, but not so generally, in the curves which represent the times ; nor is this difference always in the same direction. Thus on the coast of America, at some places, the afternoon tides were later than the mean, and those of the forenoon earlier than the mean, for a great part of June 1835, while at other places the reverse was the case.

From certain title observations made in the Indian Seas, and examined by Mr Whewell, we select the following as striking features in those of Surat Roads in the Gulf of Cambay, Gogah on the opposite side of the same gulf, and Bassadore in the Island of Kismis at the entrance of the Persian Gulf. In the first two places there is an enormous diurnal inequality of