

THE RIVERS OF WALES.

SIR,—May I be permitted to assure Mr. Strahan that it is not his criticisms to which I object, even though he still finds the second part of my paper too great a tax upon his credulity. What really concerns me, as a worker in the Principality, is, that the Quarterly Journal of the Geological Society should be open to speculation about the rivers of South Wales and closed to speculation about those of North Wales.

PHILIP LAKE.

August 8, 1902.

LITTORAL DRIFT.

SIR,—My friend Mr. W. H. Wheeler's new book on the Sea-Coast has been reviewed with such universal commendation that it may seem invidious to offer any word of criticism. But, as my own work in the same direction was reviewed in the *GEOLOGICAL MAGAZINE* some years ago, and as if Mr. Wheeler is right I am most undoubtedly wrong, it may be as well to point out briefly my reasons for divergence, leaving it to experts to decide the questions at issue.

Mr. Wheeler's conclusions are based, explicitly or implicitly, on some six hypotheses, viz. :—

- (1) That the tidal wave is a wave of translation.
- (2) That the flood-tide current generally, as a current, is a stronger current than the ebb-tide current.
- (3) That the flood-tide current generates tidal wavelets of translation.
- (4) That sea waves on approaching the shore become waves of translation.
- (5) That sea waves approaching the shore raise the mean level of the water, with the effect of adding temporarily to the volume of water above mean level, as compared with the volume below that level.
- (6) That the proportion of height to length of wave may be as much as 1 to 3.

Mr. Wheeler incidentally discusses a wave with the assumed proportions of 30 feet long and 10 feet high.

It would be scarcely possible to discuss the evidence, mathematical, observational, and experimental, on these six points, under some two or three hundred pages.

In this as in many other cases controversialists do not use the same terms with the same meanings, so that the nomenclature must first be cleared, e.g. :—

- (1) The tidal wave, due to the attraction of moon and sun, gives rise to two currents, an ebb and a flood; but, when the flood runs up a channel such as the Severn, and creates a 'bore,' observers are apt to speak of such bore as the tidal wave itself, instead of as a subsidiary wave due to the retardation of the tidal flow-current in the river.
- (2) As the flood-tide current at sea runs, as a rule, three or more hours after high-water, the term 'flood tide' is ambiguous.

Sir George Airy observes that, "in the tide wave and every other wave which travels along a channel . . . this law is universal, that the water is travelling forward with its greatest speed at the time of high water, or at the top of the wave" ("Tides and Waves," art. 183). The flood-tide current usually flows from 'half flood' to 'half ebb'; and the ebb current ebbs from half ebb to half flood. Thus, when Mr. Wheeler discusses the effect of the flood-tide current it is most important to know exactly what is meant; for the water does not turn in direction until the tide has been rising some three hours, unless affected by special circumstances.

(3) Then there is another important source of confusion of ideas among writers generally. The great tidal wave is often spoken of as though a wave which, crossing the Atlantic, impinges on the coasts of Europe; whereas of course the motion of the great tidal wave is away from the British shores, travelling from east to west. Thus no little confusion arises between the ideas of the great tidal wave and the tidal currents which run in and out of our British waterways. The generation of tidal wavelets of translation by the flood-tide current, or any tidal current, is not in accordance with my own experience at the seaside during the past fifty years.

(4 and 5) These hypotheses are not confirmed either by my own observations or experiments.

(6) A proportion of wave length to height of only 3 to 1 is to myself inconceivable. My boat was 26 feet long with a freeboard of about 2 feet. I should not be writing this letter if one were liable to encounter such waves or anything approaching them in the English Channel. I should say that a length to height of 20 to 1 would be very excessive; and that 40 to 1 would be much nearer the mark. My friend Mr. Howard Fox, F.G.S., has himself observed waves with a period of twenty seconds at the Lizard Signal Station. These waves would be just over 2,000 feet long. Sir G. G. Stokes records waves with a period of 17 seconds.

It is true that Littoral Drift has a limited interest for geologists; but the action of waves on the coast, and on sea-bottoms to at least a depth of 100 fathoms, affords geological and palæontological problems of very great interest indeed, so that it is advisable to see that the foundations are securely laid.

If any mathematician who can speak with authority would write a little primer on wave-action, similar to Sir Archibald Geikie's shilling Primer of Geology, it would be invaluable. For my own instruction, when working and experimenting, I was entirely dependent on the kindness of Lord Rayleigh, who was ever ready to explain what I failed to understand; and of Sir G. G. Stokes, who worked out a special case for me, since published in the Transactions of the Devonshire Association.¹ But, so far as my experience goes, the information generally accessible to non-mathematicians is, on this subject, worse than useless, being almost invariably misleading.

¹ Trans. Devonshire Assoc., 1887, p. 512.

Of course, I accept implicitly all Mr. Wheeler's own observations; but, as I demur to the aforesaid six hypotheses, I am unable to accept his explanations.

A. R. HUNT.

SOUTHWOOD, TORQUAY.

July 17, 1902.

LAKES OF SNOWDONIA.

SIR.—In the *GEOLOGICAL MAGAZINE* for 1900 (Dec. IV, Vol. VII, p. 58) Mr. Dakyns criticizes a paper published in a previous volume of the Magazine, in which Mr. Adie and I treat of the Lakes of Snowdonia. Mr. Dakyns has convicted me of two mistakes, one in a matter of observation, the other in the manner of expression of a statement. For each of these mistakes I am alone responsible.

I had hoped to accept Mr. Dakyns' polite invitation to go over the ground with him, but various circumstances have prevented me from doing so, and I have therefore awaited the publication of Mr. Jehu's paper upon the Lakes of Snowdonia (*Trans. Roy. Soc. Edinb.*, vol. ix, p. 419) before making my confession of error.

Mr. Jehu informs me that I undoubtedly mistook an artificial diversion of the stream issuing from Glaslyn for a natural one. As he has not corrected this serious error in a prominent manner in his paper, I feel bound to do so. I can only plead in mitigation of my offence that the outlet was examined towards dusk on a sunny day in the Easter vacation; nevertheless, as our paper was partly occupied with criticism of the views of others, I feel that I ought to have revisited the lake before making my statement.

The other matter refers to the bed of the Colwyn, which I said "runs over drift." I should have said that drift extends along the lower part of the valley beneath or near the bed of the river.

Concerning other parts of Mr. Dakyns' paper I may have something to say in the future, but I feel that no further time should be allowed to elapse before acknowledging mistakes to which attention has been drawn in so straightforward a manner. JOHN E. MARR.

CAMBRIDGE, August, 1902.

OBITUARY.

PHILIP JAMES RUFFORD, F.G.S.,

OF THE HASTINGS AND ST. LEONARDS MUSEUM ASSOCIATION.

BORN JANUARY 26, 1852.

DIED JUNE 19, 1902.

It is with deep regret we record the death of Mr. Philip Rufford, F.G.S., of 37, Magdalen Road, St. Leonards-on-Sea, a most ardent geologist and enthusiastic naturalist, who had for some years devoted himself very earnestly to the advancement of the Hastings and St. Leonards Museum forming a part of the Brassey Institute, Hastings, in which he spent a considerable portion of his time.

Philip James Rufford, the only son of the late Rev. Philip Rufford, M.A., Rector of Thorne-Coffin, Somerset, was born at Great Alne,