

force of current to act as a powerful denuding agent. I am strongly inclined to think that some fallacy lurks beneath this ingenious theory in a geological point of view. In the first place, the moon's action creates no currents in the open sea, the open tide being merely a wave (or elevation) of translation. The water in the wave does not follow the moon at all, but as soon as the moon has passed that spot, falls down again. 2nd. The tidal flows and ebbs in inclosed channels and seas do not denude the bounding lands into valleys and gorges, but level it flat, into sand banks and mud banks. 3rd. The awful rise and fall of tides of 648 feet up and down should throw further doubt upon the theory, as such could only take place in the open ocean far away from land. It would be quite impossible in our narrow seas, where the water would not be deep enough for it. 4th. A wave of water cannot be conceived to travel over land like a gale or hurricane, as it would collapse at once when brought into shallows of its own depth from the open sea. 5th. As these waves of translation must have corresponding troughs of water to draw upon, where could they get them, except in the open oceans, certainly not in coast seas? 6th. Therefore the disruptive and denuding agency expected from such tides on the dry land of continents, I beg to suggest would be illusory, and impossible of achievement. The student of Geology will do better to adhere to the principles of Geology taught by Sir C. Lyell, than put faith in Professor Ball's theory of tidal deluges repeated every day and tearing up diurnally the surface of the globe.

FESTINALENTE.

#### THE BRIDLINGTON CRAG.

SIR,—As my paper on the Bridlington and Dimlington shell-beds was meant to be descriptive, I did not think it necessary to lay particular stress on the evidence which caused me to doubt Mr. S. V. Wood's assertion that "the Bridlington shells unquestionably lived where they occur," and I contented myself with showing that "the most perfect preservation" of the shells, on which it seemed to me that Mr. Wood had mainly relied, was not certain evidence; and I thought the general account given of the beds would have proved the rest. Since, however, Mr. Wood has drawn attention to the matter, it will perhaps be as well to group the facts which caused me to differ from him.

My reasons for thinking that the shelly patches in the Basement Boulder-clay are not in place, but have been transported, are briefly as follows:—1. Neither at Bridlington nor at Dimlington do they show any signs of extension or regularity; at both places they exhibit the same mixture of remnants; and the patches—composed of many kinds of sand, gravel, silt and clay, some with shells of one kind, some of another, many with none—all, so far as I have seen, occur at random in the clay, like boulders. 2. Most of the patches are made up of material which I do not think could have been obtained on this coast at that time. Coarse grains of greenish quartz form much of the sand, whilst the fine blue clays have, I think, been made up, in great part, of the waste of soft Neocomian beds. There

are indeed some masses of drift-gravel and chalk wash at and near the top of the Boulder-clay, which seem to have been formed on the spot; but these contain no shells. 3. Fragments of Secondary deposits occur in the clay in the same way as these shelly patches. See Prof. Phillips's description of a large mass of Lias with fossils (which did not live where they occur) on the beach at Bridlington; (Geol. of Yorkshire, 3rd ed. p. 85); Mr. Mortimer's, of a mass of chalk with lines of black flint, at Easington (Proc. Yorkshire Geol. Soc. 1881, p. 375); and my own, of Neocomians at Flambro (Proc. Yorks. Geol. Soc. 1880, p. 245), and at Dimlington (GEOL. MAG. Dec. 1881, p. 541). 4. The whole aspect of the clay shows that the drift has *not* been *from* the land. The proportion of chalk in it is not great, the flints are nearly always black or red, and not grey like those in the Yorkshire Chalk, strange igneous rocks are plentiful, and Lias and Neocomian remains are relatively far too abundant to have been carried over from the opposite side of the Wolds.

The evidence is also against the view that the confusion in the beds may be attributed to the passage of later ice; for though there are signs that this has had its local effect, yet as the Basement Clay retains its peculiar features where beds of sand, gravel, or laminated clay come between it and the overlying Boulder-clay, its character cannot have been greatly altered.

The sands and gravels connected with the *Purple Clay*, to which Mr. Wood at first referred these shells, have evidently in most cases been deposited where they now lie, and formed from the same materials as the clay. But if Mr. Wood has not seen the shelly beds I described, and has had his impression that they are in place confirmed by my paper, I fear my descriptions must be misleading, and I beg leave now to correct them on this point.

It must always be remembered that at Dimlington there is a great space between the Shelly Boulder-clay and the Chalk which is as yet entirely unaccounted for, and it is very probable that traces of undisturbed shell-beds may some time be found lower down in the section.

G. W. LAMPLUGH.

BRIDLINGTON QUAY.

#### HIGH-LEVEL DRIFTS IN NORTH AMERICA.

SIR,—In answer to Mr. Lesley's important letter on high-level drifts, I would beg to state that those I discovered on Minera mountain, North Wales, contained marine shells up to about 1280 feet above the present sea-level, while shells had previously been found on Moel Tryfan up to 1370 feet. I have not yet heard of shell-bearing sand and gravel in North America at a higher level than 700 feet. Is this their extreme altitude?

D. MACKINTOSH.

ERATUM.—On page 320, in the fourth column, the first three lines should not read as printed with the brace, but as follows:—

Overlying Zone of *Ammonites planorbis*.

(Kössener Schichten and Dachstein Series.

'Hauptdolomit' of Tyrol, and 'Plattenkalk.'