

the Forest Marble reposes. The quarries have been excavated about 15 feet below the surface, and are composed of 4 feet soil and moved rock; then one bed, 3 to 4 feet thick, of exceedingly hard stone, the surface of which is flat, and on it large oyster-shells; next, three beds of stone; and lastly, a coral bed of about 4 feet in thickness. The coral bed has been disturbed, but in its recent state must have been a beautiful sight, from the number, variety, and beauty of forms and colours. I have already had upwards of 40 species brought me, and such as might supply materials for a complete local coral history. After the depression of the reef below the warm surf of the Oolitic Sea, it was flooded with Oolitic matter, and the corals have to be extracted from the mass, and much work required to clean them, and specimen after specimen examined, before the characteristic form of the species can be determined. I have already *sixteen* species whose growth was by stems, varying from 3 to 60 on an inch square of surface; the calices on which number from 40 to 140 on an inch; *ten* that are superficial corals, and once formed the coats of mollusks, the body of which has been decomposed, and a cavity left, more or less filled with crystals of carbonate of lime; I have *also twelve* corals which formed a solid mass of coral marble, on which life existed only on the surface; and *four* that show a growth in bands of coral marble; one of these retains its purple colour. The reef formed by these corals must have extended many miles; upon it was drifted fruits, as nuts and stems, and after its depression a great variety of univalves, bivalves, saurian vertebræ, and eggs, and teeth, and teeth of fish, and portions of crabs. Although I have known one of the quarries for many years, yet at most I only obtained three or four corals from it; but now that I depend on workmen who break up the bed, it is impossible to say how many more new species may be brought to me.

THOS. C. BROWN.

FURTHER BARTON, CIRENCESTER,
6th January, 1873.

THE OLDEST KNOWN BRITISH TRIGONIA.¹

SIR,—Having read some time ago, Mr. Ralph Tate's notice about the oldest known species of *Trigonia*, in the GEOLOGICAL MAGAZINE for July last (see p. 306), and the reference to a specimen from Marske (not *Maroke*, as there printed in error), in the York Museum, I desire to say that the latter is not from the Marlstone at all, but is an undoubted Inferior Oolite Fossil, the matrix being in all respects similar lithologically to the Dogger of the Peak, near Scarborough.

This leads me to doubt the whole affair, and to contend for the ancestral honour so long awarded to *Trigonia literata* (or *littorata*?) of the Upper Lias.

JOHN LECKENBY.

SCARBOROUGH, January 18, 1872.

PRINCIPAL DAWSON AND OTHERS ON MORAINES.

SIR,—As the reviewer of Dr. Dawson's *Post-Pliocene Geology of Canada* in your January Number scarcely did justice to the author on some points, you would oblige by finding space for a few remarks.

¹ This letter was accidentally omitted last month.—EDIT. GEOL. MAG.

Passing by the inconsistency attributed to Dr. Dawson in connexion with the scooping out and partial filling up of the Canadian lake-basins (an inconsistency, I believe, not to be found in the work), I would confine attention to the question of marine drift *versus* moraines.

Dr. Dawson evidently refers to sea-beaches and sea-beds as they existed during a period of floating ice, when many of the resultant phenomena were very different from those with which we are now familiar around the coasts of the British Isles. Few men, I should suppose, are better acquainted with the forms of the accumulations now produced by marine-glacial action along the coasts of British North America, and therefore he must be well qualified to trace the origin of similar accumulations in more or less inland districts. Neither ought we to forget that in referring drift phenomena to causes now operating in the neighbourhood, instead of invoking a catastrophic order of nature, Dr. Dawson is illustrating the great Lyellian principle on which the progress of geology during the last forty years has mainly depended. Dr. Dawson admits the former southerly extension of Greenlandic conditions, but he does not forget that even around Greenland the sea and floating ice are now giving rise to phenomena similar to many of those associated with Canadian drift-deposits.

When the accumulation of the Boulder-clay of Canada was first attributed to land-ice, geologists were ignorant of many facts revealed by extensive railway cuttings which would seem to point to deposition under water.

Most of the so-called moraines of Canada occupy positions in which they could never have been left by glaciers, while in form and structure they differ from any *actual* moraine with which we are acquainted; and as the tendency to call every drift mound a moraine still lingers among many of our younger geologists, the following statement of facts may not prove altogether useless.

Principal Forbes (as I have already noticed in this MAGAZINE) asserted that the actual Swiss moraines never contain smoothed or polished stones like those characterizing what in his day was called *diluvium*.

Sir Charles Lyell, in his *Antiquity of Man*, states that in the present moraine of the Rhone only one stone in several thousand is glacially polished and scratched, and that in the case of fragments of serpentine and limestone in the moraines of Zermatt, etc., only one in several hundred is glaciated.

Professor Ramsay has repeatedly observed that it is sometimes impossible to distinguish moraine matter left on the land from moraine matter deposited in the sea.

According to Professor Nordenskiöld (see recent articles in the *GEOL. MAG.*), moraines are scarcely ever met with in Greenland; and it has been stated by eminent Scandinavian geologists that extinct moraines are rare in Sweden.

The Rev. M. H. Close and Mr. Kinahan, in their most elaborate pamphlet on the *Glaciation of Iar-Connaught*, believe that the rarity of traces of local glaciers in Ireland is an indication that the move-

ments of the general ice-cap were somewhat quickly brought to an end by the submergence of the still ice-covered country in the sea. I have made a similar suggestion as explanatory of the wonderfully little moraine matter (distinct from pinnel or possible iceberg droppings) to be met with in the Lake District (*Geol. Mag.*, Sept. 1872).

Nothing perhaps is more calculated to teach young geologists to hesitate before pronouncing a drift-mound to be a moraine, than the fact that the "practised eye" of a very great Glacialist, many years ago, led him to regard the intensely marine-bedded sand and gravel knolls around Carnforth as moraines.

In the above remarks the term moraine is used in its customary or Swiss acceptation, and not as including deposits of Boulder-clay, Till, or Pinnel.

D. MACKINTOSH.

AMERICAN LAKE BASINS AND ARCTIC CURRENTS.

SIR,—While I am much gratified by the not unfriendly review of my Post-Pliocene Geology of Canada in your January Number, I may perhaps be permitted to explain briefly one point of some geological importance which I appear not to have stated with sufficient clearness. I refer to the apparently contradictory statements that the basins of the great American Lakes were cleaned out by cold Arctic currents, and that these basins are parts of old valleys communicating with the sea, and which may have been excavated by subaerial denudation. There is really no contradiction; and as the nature of our lake-basins is often misunderstood abroad, it may be well to put the facts of the case plainly.

It is well known, and may be seen by a mere glance at Sir William Logan's beautiful Geological Map of Canada, that the basins of the Great Lakes of the St. Lawrence are hollows of denudation, excavated in the softer members of the Silurian and Devonian rocks. But until attention was directed to the matter by Newberry and Hunt, it was not so generally known that they are connected with each other and with the sea by deep valleys, now filled up with Post-pliocene deposits, and which have not been re-opened by the modern rivers. Nor has sufficient attention been directed to the fact that the old Post-pliocene filling remains on the "lee" or south-west side of the Adirondacks and Laurentide ridge, while it has been cleaned out, if ever deposited to the same extent, opposite the gap of the St. Lawrence valley, and the depression north of the Laurentides, leaving the basins of the five great lakes in their present form.

These facts imply that the original rock excavation is of "pre-glacial" date, and in part at least referable to the epoch of continental elevation in the Tertiary period; and that the subsequent partial cleaning out of the sediment or preservation of the basins in an unfilled state, was due to oceanic currents flowing from the north-east, and having the same powers of erosion and deposition now possessed by the Arctic currents off the American coast.

In short the original rock excavation may have been a process of atmospheric denudation, finished in the Pliocene period. The subsequent filling and cleaning out belong to that action of the northern