erosive power? I have shown (Quart. Journ. Geol. Soc. xxvii. 312; xxix. 382; xxx. 479) that in several districts of the Alps there is evidence that the glaciers have descended important valleys, filling them almost down to the level of the present torrents, yet have been incompetent to modify their principal features, which are most characteristically those of fluviatile erosion. This argument, I venture to assert, has never been met. Every year that I travel gives me fresh instances, and during the present summer I have met with one or two other curious facts bearing on the subject of glacier erosion, which I hope to be permitted to lay before the readers of this MAGAZINE in a month or two.

I have thus ventured to indicate some of the reasons why Mr. Goodchild's arguments fail to convince me. If they seem rather curtly stated, I must ask him to believe it is because I am trying to discuss in a letter a subject which requires a lengthy article.

T. G. BONNEY.

ST. JOHN'S COLLEGE, CAMBRIDGE, *Aug. 9th*, 1875.

THE POST-PLIOCENE FORMATIONS OF THE ISLE OF MAN.

SIR,—Will you kindly allow me space for a brief rejoinder to the articles by Mr. Horne and Mr. Kinahan in the July Number of the GEOLOGICAL MAGAZINE?

1. Allowing, as Mr. Horne says, that intercalated beds of sand, gravel, etc., are of common occurrence in the Lower Boulder-clay, still I cannot see that this entirely destroys the force of the argument *à priori*, that they would probably be of more frequent occurrence in a deposit like the Upper Boulder-clay, which was formed when the cold was less severe, and warm seasons oftener to be expected; and therefore that the highest beds in the Isle of Man, which Mr. Horne considers Lower, are, so far, more likely to be Upper Boulder-clay.

2. Although it may be true that the glaciers of the post-submergence period were confined mainly to the upland valleys, and therefore that moraines *might* be all the memorials to be expected of them, still the *sea*, both before and after the second continental period, must have contained ice in sufficient quantity to produce a thick deposit of clay, such as in Lancashire, for example, is found extending from an elevation of above 1000 feet to the cliffs on the sea-coast (see Geol. Survey Map 91); and it was principally to marine coast-ice, and not to glaciers, that I attributed the Upper Boulder-clay in the Isle of Man.

3. No doubt Mr. Horne is right as to the general characteristics of Lower Boulder-clay in South Scotland, viz. that it is a tough clay with an abundance of ice-marked stones, without stratification, and without shells. But even this true Lower Boulder-clay, or Till, varies according to the nature of the rocks from which it is derived, and it was with the Lower Boulder-clay as it appears in the cliffs at Blackpool, and not in Scotland, that I compared the deposits which I have taken to be such around the point of Ayre. If, however, they should prove not to be Lower Boulder-clay properly so called, nor

one of the intercalated beds with sand and gravel, they might at least easily be a portion, probably a lower portion, of the Middle sands and gravels, and so still the lowest Post-Pliocene formations in the island.

It seems, from what I have learnt from Mr. Horne's and Mr. Kinahan's papers, as if there was a different division of the glacial series recognized by some geologists in Scotland and Ireland, from that adopted by the Geological Survey for the north-west of England; the former consisting of

1. Lower Boulder-clay.
2. Upper or Moraine Boulder-drift.
3. Kame or Esker Drift.[1]

the latter of

1. Lower Boulder-clay.
2. Middle Sands and Gravels.
3. Upper Boulder-clay.

and it would certainly be a point of some interest to determine to which order, or if to either, the Post-Pliocene deposits of the Isle of Man conform. But I think this must be decided by stronger evidence than that of the section at the southern end of the island to which Mr. Horne refers, and with regard to which his words admit of a double doubt—first, whether the underlying formation is really an Upper Boulder-clay, and not a Lower; and secondly, whether the clay with shells there is certainly identical with the shelly clay in the north. It must be decided, if not by direct evidence of superposition, at least by further probable evidence of such superposition, and also, as far as possible, by that of Molluscan contents. Do the shells of the Isle of Man deposits resemble more those of the Blackpool Middle sands and gravels, or those of the Clyde and Forth basins (of a more Arctic[2] character), with which Mr. Horne identifies these beds? With regard to Mr. Horne's lithographed section, it seemed to me, though on slight evidence, when on the spot, rather as if the red clay of the north of the island, in the bed of the Ballure stream, passed *under* the clays and gravels which the lithograph represents as Lower Glacial.

In answer to Mr. Kinahan, I need only say that I have used the term "Glacial Drift" in the sense in which I find it used (or at least language which implies such a use of it), by the highest authorities from Forbes till now, that is, of Drift formed whether by ice alone, or by ice and sea together (*i.e.* Marine Glacial Drift), *during the Glacial Epoch*. No doubt much glacial drift in all ages, including that of its first formation, has been reconstructed in the manner explained by Mr. Kinahan, but, with deference to him, it is difficult to believe that extensive deposits like the Middle sands and gravels, and the Upper Boulder-clay (in Lancashire and Cheshire), have altogether or chiefly, been formed in this way. These would still seem

[1] Mr. Kinahan and Mr. Horne identify these with the Middle or "Marine" (Irish) gravels, though I had been led to believe that the difference between them was sufficiently marked by the presence of shells and chalk-flints in the latter, and their almost entire absence in the former. (See. GEOL. MAG. Dec. 1869, p. 544.)

[2] See GEOL. MAG. Dec. 1869, p. 548.

to be attributable rather to icefloes and icebergs and to coast-ice and glaciers depositing their moraines in the sea; and therefore would properly come under the description of Marine Glacial Drift.

Drift, however, which has been reconstructed *since* the Glacial Epoch could not of course be considered glacial, but would perhaps be appropriately distinguished as "glacialoid."

The question, however, of the nomenclature of Glacial Drift is quite beside that of the *order* of the deposits at present understood by that term.

I regret that I should seem to have misquoted Mr. Kinahan's letter; but I think, for I have not the Numbers of the GEOL. MAG. at hand, he must have misunderstood me, as I was quite aware that he admitted an Upper Boulder-clay in Ireland, but not one *above* the Middle gravels, which was the only one to which I referred.

J. A. BIRDS.

TENBY, *Aug. 3rd*, 1875.

OBITUARY.

PROFESSOR G. P. DESHAYES,

FOR. MEMB. GEOL. SOC. LOND.

GERARD PAUL DESHAYES was born at Nancy, 13th May, 1797, his father being at the time Professor in the Central School of that city. He was educated at Strasbourg, and came to reside in Paris in 1819, where he commenced the study of fossil shells, for which in after years he became so justly celebrated.

Among other foreign explorations, he visited Algeria, and subsequently published the results of his expedition in a work remarkable alike for the beauty of its illustrations, as well as for its high scientific value.

A careful study of his extensive collections of Tertiary shells (greatly facilitated by his intimate acquaintance with recent species) had suggested to Deshayes the propriety of dividing them chronologically into three great groups, according to their relative ages. These groups were found to agree, in the main, with the divisions arrived at by Lyell, and to which he subsequently gave the names of Eocene, Miocene, and Pliocene. To give weight to this classification, Lyell induced Deshayes to prepare a series of tables, which appeared in the third volume of the first edition of the "Principles," in 1830.

Deshayes' collections served as the basis of his great work, "On the Fossil Shells of the Environs of Paris" (published from 1824–37, and the subsequent supplement extending from 1856 up to 1867), forming eight great quarto volumes. He published an Elementary Treatise on Conchology; and he revised, with Professor H. Milne-Edwards, Lamarck's Histoire des Animaux sans Vertebres, and Ferussac's Histoire des Mollusques Terrestres et Fluviatile. He prepared the Catalogue of the *Veneridæ* for the British Museum. He also published numerous Memoirs, both separately and in various scientific journals.