

As I do not intend to reply to any further statement on this subject, I hope the correspondence may now be considered as closed.

GEOLOGICAL SURVEY OFFICE,
DUBLIN, 9 January, 1882.

EDWARD HULL.

THE GLACIATION OF THE SHETLAND ISLANDS.

SIR,—With your permission, I should like to say a few words regarding the discussion which has been carried on during the last year in various numbers of the *GEOL. MAG.*, as I visited part of Shetland in the summer of 1880, and although I went there chiefly for mineralogical purposes, I also noted some of the glacial phenomena.

The unequal distribution of the Boulder-clay on the sides of Dales Voe is a striking fact, for while the northern slope is covered with a considerable thickness of clay and has a smooth grassy surface half-way up the ridge, the southern slope is bare, and presents mammillated hummocks of rock. Northwards from this point the whole tract of country has a peculiar ice-worn aspect; but on account of the rocks being mostly of a schistose nature, they do not afford so striking evidence as to the direction of the ice-flow. However, I noted a few striæ pointing nearly N.E. and S.W.

Near Busta Voe a tract of diorite occurs, and on this tract numerous erratics occur, similar, so far as I could determine, to the micaceous and gneissose rocks which lie to the north-east. Further north, in the neighbourhood of Isleburgh and Sulem Voe, the rocks have been very much worn, and in many places show bare hillocks of rock moulded off into flowing outlines and covered with scratches. Near Pondswater Loch the striæ on an average point W. to W. 10 S., and in the same locality boulders of gneiss, schist, and granite are common. Further north, but still on the diorite area, there are numerous boulders of gneiss and schist, but I was unable to discover any of granite. If we assume that the ice-sheet came from the eastward, the fact is accounted for, because there would be no granite in the track of the ice. On the small patch of metamorphic schists at Hillswick I saw several boulders of diorite, and as there is no diorite known to exist on the west side of Hillswick Bay, there is every probability that these boulders were carried across the Bay, but the most conclusive proof that such has been the case is afforded by a fine section of Boulder-clay lying in a hollow to the west of Hillswick. The lower part of this is entirely composed of the *débris* of the schists on which the clay rests, while the upper part is largely composed of blocks of diorite and a few of the other rocks which lay in the path of the ice-sheet.

The areas south of Ronas Voe and west of Hillswick show that blocks of schist have invaded the felsitic area, while blocks of these have in their turn invaded the porphyrite area. I looked for porphyrites to the east of the fault which cuts them off from the felsitic granite, but found none.

Mr. Milne Home seems to have misapprehended a great deal of Messrs. Peach and Horne's evidence regarding the dispersal of the stones in the Boulder-clay in the northern part of the mainland, for

while he asserts that their conclusions are wrong, he ignores the evidence they produce, such as the invasion of one area by boulders from another, and the gradual decrease in the number of the boulders as they recede from their parent source.

I had not sufficient time to search for numerous instances of striæ; but so far as the disposal of the stones are concerned, I can corroborate Messrs. Peach and Horne's observations in the greater part of Northmavine; and see no escape from the conclusion that, to the north-west of Hillswick, the ice-sheet flowed from the S.E. to N.W., while further south, and on the east side of the island, the direction was from north-east to south-west.

THOMAS STEWART.

WATER WORKS, GLASGOW, 14th Dec. 1881.

MR. HOWORTH'S REPLY TO MR. REID.

SIR,—In his former note Mr. Reid spoke of the theory of violent changes as extinct. To this I replied that in calling it extinct he must have overlooked the weighty opinion of Continental geologists. Mr. Reid now confesses that he did so, and that he was merely speaking of geologists on this side of the Channel, and he proceeds to justify his limitation by a sweeping depreciation of recent Continental writers on Post-Glacial geology. It certainly seems extraordinary that such an experienced and deservedly widely-known observer as Mr. Reid should permit himself to write thus in your widely-circulated pages. I hope I have as great a respect for the magnificent work done by Mr. Prestwich and those who have succeeded him as any one; but I must confess, and others will assuredly echo my words, that, judged by the abundance of its facts, the careful sifting of its evidence, and the brilliant character of its induction, no work produced on this side of the Channel, in recent years, dealing with Post-Glacial geology, can compare with M. Belgrand's *magnum opus* on the Seine Valley; while it is literally incredible how any one who has read any considerable number of the memoirs which have seen the light in recent years in France, Belgium and Italy, dealing with this very difficult period, can speak of them as in any way inferior to the contemporary writings of English geologists. They far exceed in number and in minuteness of treatment similar memoirs written here, for the very good reason that the people whose interest in these deposits has been excited by the discovery of remains of Palæolithic man in them is very much in excess there of what it is here. Leaving, however, this debateable land, where rival national reputations are necessarily weighed in a very uncertain balance, what is to be said of what follows? Mr. Reid tells us that "In most parts of the Continent the Pleistocene deposits appear to be represented by one tolerably uniform mass, like the Loess of the Rhine, or the Tundras of Siberia." Is this so? I was under the impression that the number and variety of the so-called Pleistocene beds in France and Southern Russia should be described by any adjective rather than *uniform*. Having postulated this, Mr. Reid contrasts the deposits on the Continent with the wonderful variety of the beds in Britain, their fossiliferous character,