the Survey Memoir on the district in question, I naturally inferred that he was also responsible for the Map. He informs me, however, that the Map issued to me by the agents of the Irish Survey is an obsolete edition with which he had nothing to do. I am happy to vindicate Mr. Kinahan's consistency, but I cannot think that geologists will be greatly benefited by being supplied with Maps which a prominent member of the Survey declares to be superseded.

WELLINGTON, SALOP, *Dec.* 22, 1881. C. CALLAWAY.

LAURENTIAN ROCKS IN DONEGAL.

SIR,—It is with great reluctance that I feel obliged to reply to the letter of Mr. Kinahan which appears in the current Number of the GEOLOGICAL MAGAZINE, as it might be supposed by some who may have read this letter that I have been endeavouring to take from my late friend and preceptor, Professor Jukes, the credit of having first made the discovery of Laurentian rocks in Donegal, and in other parts of Ireland—a charge which I unequivocally deny.

On seeing Mr. Kinahan's letter in the December Number of the GEOL. MAG. in which he states (p. 575), "While in reality the question" (of the existence of Laurentian rocks in Donegal) "has not been worked out since Jukes first suggested they were Laurentian rocks," I wrote to Mr. Kinahan to ask for his authority for this statement, inasmuch as I had, when reading over papers on the Geology of Donegal, been unable to find anything to support it. The following is a copy of my letter and of Mr. Kinahan's reply :—

"DUBLIN, 6 *Dec.* 1881.

"SIR,—In the current number of the GEOLOGICAL MAGAZINE there appears a letter in which you state that 'In Donegal we are now told that undoubtedly there are Laurentian rocks, while in reality the question there has not been worked out since Jukes first suggested they were Laurentian rocks.' As I have been unable to discover any suggestion to the above effect in the writings of Professor Jukes, I would be obliged to you to inform me on what authority you have made the above statement.—I am, Sir, your obedient servant,

"To G. H. Kinahan, Esq. EDWARD HULL."

The following is Mr. Kinahan's reply (by post-card) :—

"Letters like that about the Geol. Mag. have no official bearing. I may however tell you to read the first chapter of the Geol. of Ireland written and in print in my book before the Laurentian craze set in.

"7. xii. 81. G. H. KINAHAN."

On referring to the passage in Mr. Kinahan's book, all I can find bearing on the subject is as follows :—"Rocks older than the Cambrian formation are not known in Ireland; but Jukes suggested that some of the highly metamorphosed rocks of the North of Ireland might possibly be Pre-Cambrian."

It would appear, therefore, that in making the statement contained in the GEOL. MAG. for December, Mr. Kinahan quotes from himself, but there is no reference to any published expression of Mr. Jukes' views here or elsewhere.

It would appear, however, from Mr. Kinahan's second letter, that the whole statement rests on his recollection of conversations on the

"probability" of Laurentian rocks existing in Donegal and elsewhere in Ireland. But if so, Mr. Kinahan must excuse me if I decline to accept colloquial speculations as scientific demonstrations. *Litera scripta manent.* Conversations are evanescent. As a matter of fact, although Professor Jukes visited Donegal in company with the Rev. Dr. Haughton, and Mr. R. H. Scott, he never hazarded *an opinion in print* (as far as I am able to discover), and by such evidence alone am I to be guided, that any portion of the Donegal rocks are of Laurentian age. When recently I read my paper *in extenso* before the Natural History Section of the Royal Dublin Society, at which both Dr. Haughton and Mr. Kinahan were present, the former disclaimed, on his own part at least, any priority in the determination of the Laurentian age of the gneissose series of Donegal.

As I stated in my original communication, which appeared in *Nature* (26th May, 1881), Dr. Sterry Hunt was the first who, from an examination of specimens from Donegal, recorded an opinion of the Laurentian age of the older series of metamorphosed beds.

Now, Sir, as regards the credit of this discovery, I beg to say that I claim no particular credit either for myself or for any one else. As the Director of the Irish Branch of the Geological Survey, I feel a certain gratification that the determination of the age of the old gneiss of Donegal, and its associated schistose rocks, has been made by officers of the Survey; for in my preliminary survey of that district I was assisted by two senior officers of the Survey, Mr. R. G. Symes, F.G.S., and Mr. F. G. Wilkinson. They can testify as to the care with which we examined an extensive district—and as to the satisfactory nature of the determination of the unconformity between the older and newer groups of metamorphosed beds. The details themselves will appear in my paper now in course of publication. The determination was made not by voluntary effort, but in accordance with official duty, and as the outcome of a previous visit to the Northern Highlands of Scotland, under the guidance of Professor Geikie, in the spring of 1880. I have not the least doubt that if Professor Jukes had had the same opportunities of observation as myself, he would have arrived at the same conclusions with regard to the age of the older series, as Harkness did with regard to the age of the newer; but, as a matter of fact, the determination of the question had not been made till the spring of last year.

I have now only to add that nothing can be more distasteful to myself than to have my name brought as it were into competition with that of my late friend and predecessor. Public duty has obliged me to deal with questions which he ably handled, and sometimes I have arrived at different conclusions regarding them. But I defy any one to point out any occasion in which I have failed to quote his published opinions when required, or to have knowingly misrepresented them. It is, therefore, quite unnecessary for Mr. Kinahan to assume the *rôle* of apologist or expositor of his former chief; and I venture to think that he is not the person whom Professor Jukes would have selected to undertake this office, had it been required.

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 halfway 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