

bed, no wonder we do not know them elsewhere in the great Bala (or Caradoc) series. Besides that, in all probability, the north end of the hill is made up of the Llandovery rocks. I will gage almost anything I have (and that is not much), that the Llandovery conglomerates and shales occupy the hill of Pentre, and the slopes above Tal-y-Garth. Beyond this I will not suggest, for the neighbouring ground looks terribly faulted; and no one knows what is the actual base of the Upper Silurian series in the valley,—seeing that the pale “Tarannon” shales are not traced there, nor are the Denbighshire grits: indeed the latter never were there at all.

I know no place within *easy* reach, (for that is something in the matter,) where a Club-meeting might do more good; but then they must make up their minds to *walk the hill across from north to south, and in several directions*; and not disperse their energies over a long section, or go in search of the picturesque. The geology is very simple in the hill itself; but outside of it, faults and unconformable junctions obscure everything.

1. Slates under the lower limestone.
2. Lower limestone (Bala).
3. Slates between the limestones (Upper Bala).
4. Hirnant limestone?
5. Soft slates—which may be Llandovery?
6. Llandovery conglomerates?

Will anybody set to work on it?

J. W. SALTER.

GENERAL GLACIATION OF IRELAND.

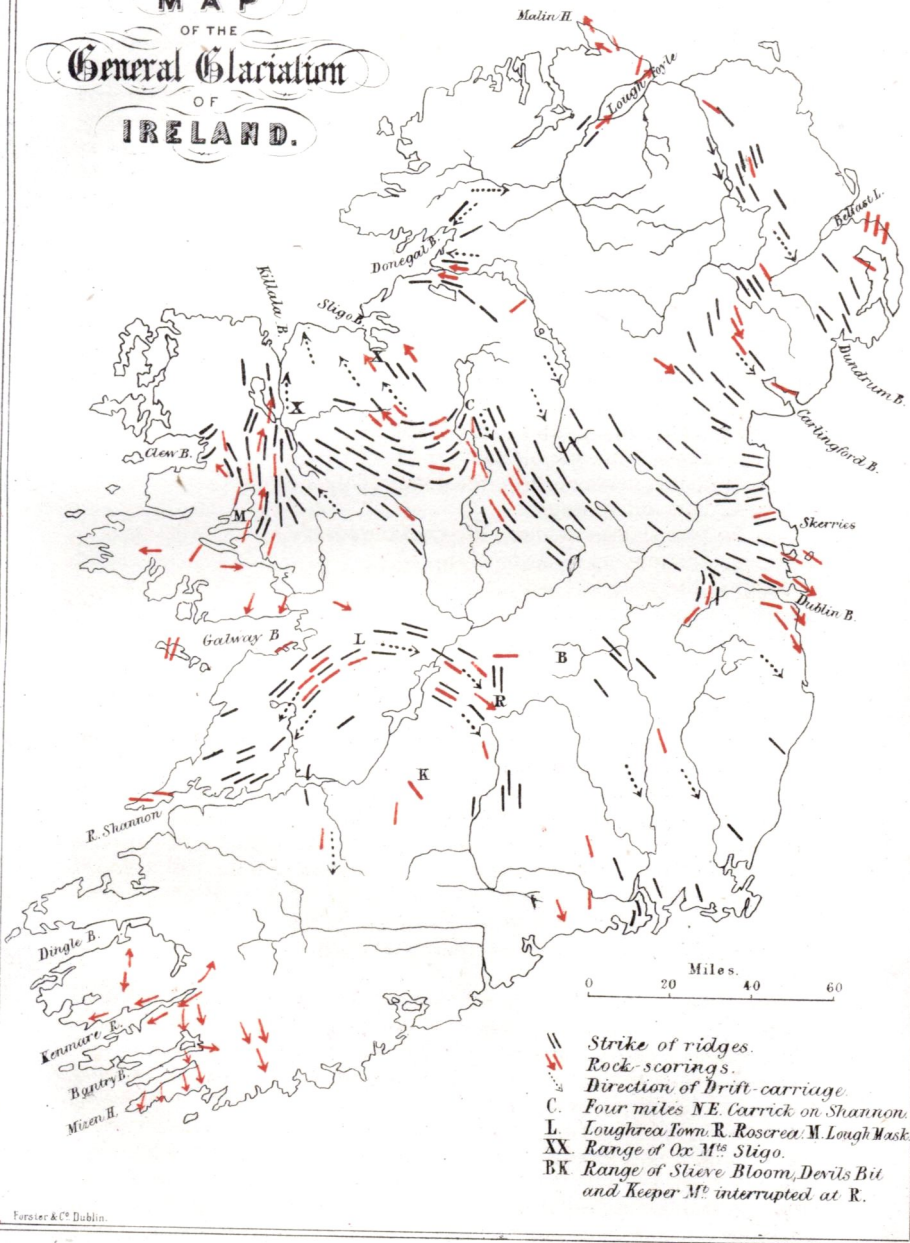
(WITH A MAP.)

To the Editor of the GEOLOGICAL MAGAZINE.

SIR,—A number of copies of the accompanying map having been cast adrift by the unforeseen discontinuation of the Dublin Quarterly Journal of Science, for which they had been prepared, you have charitably consented to afford them harbour in the GEOLOGICAL MAGAZINE. At your desire I give an explanation of the map, and a concise account of the paper which it illustrates (noticed by yourself in your April number, and to be contained in the forthcoming part of the Journal of the Royal Geological Society of Ireland). The facts have been derived from a variety of sources, including my own observation.

The black strokes give the direction of the parallel ridging, which is so well developed over much of the low ground in this country. The ridges usually consist of Boulder-clay with well scratched and blunted (not rolled) stones; but sometimes the parallel shaping seems to be partially wrought in the rock. The Boulder-clay ridges are totally distinct from Eskers (or Kames); their average length is about three quarters of a mile; they sometimes exceed one hundred feet in height. The red strokes represent parallel rock-scorings. When the scorings show clearly, of themselves, which way the grinding agent went along the line of its motion, the strokes representing them are made into arrows. Cross striations, later than the

MAP
OF THE
General Glaciation
OF
IRELAND.



To illustrate M^r Close's paper on the General Glaciation of Ireland.

principal ones, are omitted; as also are the traces of the strictly *local* glaciation among the mountains. The dotted arrows indicate the direction of the drift transportation; in most cases, certainly, and in the rest most probably, it is the movement of the Boulder-clay which is given. Since the three kinds of phenomena always agree so remarkably as to direction, they must be effects of a common cause; and, therefore, they may be used jointly or separately, as opportunity occurs, in tracking the courses of the streams by which they have been produced.

Those streams must have consisted of *glacier* ice; because various considerations shew that no other agent is capable of doing *everything* that has been done, and of moving as the streams have moved. The universal glacier was, probably, not less than 3,000 feet in depth. It was, at its greatest development, but little dependent on the mountains, as sources of supply; it was sometimes inconvenienced by them as obstructions to its movement. Its tendency was to spread outwards in every direction, without much regard to the general slopes of the open ground. As a result of its great depth and magnitude, its mobility must have been vastly greater than might be supposed possible on first thoughts, and sufficient to enable its different flows to move as shewn on the map. Those flows formed a connected, though not single, system—their mutual interference has sometimes affected their movements quite as much as the resistance of the masses of elevated ground. Thus, the stream which flowed southward, near Carrick-on-Shannon (c), has divided, without having been compelled to do so by anything in the shape of ground thereabouts. The right branch of that stream has turned sharply away from the wide plain before it, and flowed directly towards, and then across, the (not very elevated) range of the Ox mountains, Sligo (xx). The stream, which flowed eastward from near Loughrea (L), has behaved in a somewhat similar manner. There were, however, radiating *district* ice-systems, belonging to some of the mountain groups; of which the most remarkable was that of Kerry and W. Cork. These may have existed during the height of the glacial development, or they may not have been established until afterwards. They were older than the submergence in the glacial sea; and older still than the *local* corry glaciers, of which we have evidence in so many places. To explain fully the movements of the flows of the general ice-envelope, it seems necessary to suppose that the west side of Ireland was formerly higher, relatively to the east, than it now is. Some independent considerations confirm this supposition. It is most probable that the ground near the head of what is now Galway Bay occupied a somewhat central inland position during the period of the general glaciation.—Faithfully yours,

M. H. CLOSE.

NEWTOWN PARK, BLACK ROCK,
DUBLIN, April 9th, 1867.