

CORRESPONDENCE.

MR. BIRDS ON THE IRISH GLACIAL DRIFT.

SIR,—In a paper in the *GEOLOGICAL MAGAZINE* for February, on "the Post-Pliocene Formations of the Isle of Man," the author, Mr. J. A. Birds, intimates that an Upper Glacial Drift with underlying "Middle Gravels" has been proved to exist in the east of Ireland. If, however, this observer had read all the evidence on the subject, he would know that if such divisions exist, they have never yet been found.¹ If such drifts exist, they ought to be found in some of the cuttings for the numerous lines of railway that traverse Ireland; but as yet no section showing them has been exposed. In the east of the Island they might be expected to be found, in the cuttings for the railways between Dublin, Belfast and Larne, or Belfast and Newcastle, or Dublin and Wexford; yet they have not been exposed; and if they did exist, they could scarcely have been passed over in the cuttings between Drogheda and Belfast. In the Dublin and Wexford railway, north of Killiney hill, and both N. and S. of Bray Head, there are indeed Boulder-clays, that a casual observer might suspect to be normal Glacial Drift; but a very slight examination ought to satisfy him that these suspected Upper Glacial Drifts were members of the Gravel Drifts; having been either talus, due to the weathering of a Glacial Drift cliff, or slips from the latter, that had covered sands and gravels, which had accumulated at the base of the cliff. In the east of Ireland the only place where there seems to be drifts at all likely to be Upper Glacial Drift and Middle Gravels, is at the Mourne mountains, on the west coast of Dundrum Bay, and in the Mourne Demesne; but in both places a very brief examination will show that the upper member of the sections cannot be normal Glacial Drift. The writer of the paper to which I allude has evidently fallen into the mistake made by so many writers of the present day on Drift,—that is, of including in Glacial Drift all Boulder-clays, if glacialoid, and also the associated gravels and the like; while it is evident that all stratified Boulder-clays cannot be *normal* Glacial Drift; for since the materials were imbedded in ice, they must have been re-arranged by water; while many unstratified Boulder-clays cannot be normal Glacial Drift, as their present position is due to the slipping or weathering of cliffs. All gravels, sands and the like, cannot possibly be called Glacial Drift, as they have been not only re-arranged, but also sorted, sifted, and transported, since they came out of the ice.

If the age of the Glacial Drift is allowed to be proved by such loose evidence as that which is now so commonly in vogue, proofs might be adduced that it is in course of formation, even up to the present moment. In numerous places cliffs of Glacial Drift exist, at the base of which sands, gravels, alluvium, and peat are accumulating, or human works are being constructed. These cliffs in time must form slopes, either by weathering or slipping: and thereby cover up what

¹ See Middle Gravels (?), Ireland, *GEOL. MAG.*, 1872, Vol. IX. p. 265, and Glacialoid or Re-arranged Glacial Drift, *GEOL. MAG.*, March and April, 1874.

is at their base. This will prove, if the line of argument at present in use be allowed, that all their recent accumulations, and even the railways, are pre-glacial. I have seen from ten to twenty feet of as good Glacial Drift as that from which the existence of the Middle Gravels have been proved (?), covering a recent railway, or some other modern structure; and I have heard such covering pronounced "good typical Glacial Drift" by an eminent geologist before he was pointed out what was beneath it.

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G. HENRY KINAHAN,
Irish Branch, H.M. Geol. Survey.

GEOLOGICAL SURVEY OF YESSO.

SIR,—While thanking you for the kindly notice (in the last received number of your *MAGAZINE*, October, 1874) of my little report of a year ago on the first season's field-work of the Geological Survey of Yesso, I beg to make a correction in the criticism on the topographical-geological method of Prof. Lesley (chief of the new Pennsylvania Geological Survey). He should not be blamed for the "confusion and unsightliness" of the lines on a map that shows the contours of the principal beds of rock as well as of the surface; for his maps are models of clearness and taste, and even on a large scale commonly show for the rocks only the outcrop and the lowest natural drainage level of the beds of chief mining importance, and the topography is often reinforced by shading, besides the contour-lines. The addition of contour-lines for such beds above water-level, and to a certain depth below, is my own idea, and what I fondly imagined to be an improvement, especially in mapping limited tracts of land where the owners wish to see at a glance as by a sort of cross-hatching on the map what portion of the ground is underlain by workable beds. In many regions, perhaps most, it is possible to draw such underground contour-lines with a degree of accuracy very useful for practical mining purposes (one coal-bed, for example, was shown by a map to be at 180 feet below the surface of the ground at a point three-quarters of a mile from the nearest exposures of the bed, and on sinking a pit proved to be at 182 feet). The rocks are not in every country tied up in double bow-knots, as they sometimes seem to be in the Himalayas. Of course it is difficult to trace out such contortions, or to represent them on a map in any way; for even every small irregularity in the surface-contours cannot be given on maps of small scale.

It must be admitted that to draw two sets of contour-lines on the same map, especially if both are black for photographing, necessarily takes away somewhat from the good appearance of either alone; but is there not some compensation in the additional information conveyed, and in the display of the relation of the surface-contours to the underground contours at every point? It must also be acknowledged that "observations made at the surface can only be taken for what they are worth," and the underground contours of a bed of rock must always be somewhat less certain than those of the surface. Still, is it not worth while for the observer to give precisely what,