CORRESPONDENCE.

GLACIAL EROSION OF SNOWDON.

SIR,—Professor Gregory's article on "The Pre-Glacial Valleys of Arran and Snowdon" in your April number does not give, as far as Snowdon is concerned, sufficient evidence for the form that he assumes for the Preglacial valleys. The question is, as he says, "merely how far the glaciers enlarged and deepened these pre-existing valleys." He quotes Ramsay as to the local glaciers "escaping from the high bounding-walls of the upper parts of their valleys", and infers from this that Ramsay thought "the valleys [that is the valleys in their existing form] were pre-Glacial". That was very likely Ramsay's opinion, but as he thought that the Snowdon glaciers merely scoured the pre-existing cwms and valleys, and as he gave practically no consideration to their possible excavation by glacial erosion, his views on the mooted question count for little.

Professor Gregory goes on to say: "The uplift of Snowdonia led to the erosion of canyons along the floors of the old valleys, the width of which indicates that they had been worn down to base-level and their walls cut backward before the Glacial period." It is here implied that the width of the Preglacial "canyons" is known; but as a matter of fact, their width as well as their depth is in question. The question cannot be satisfactorily solved simply by assuming, as Professor Gregory seems to do, that the canyons had some such width as the valleys possess to-day; for in that case the branch valleys would have established accordant junctions with them, and the present hanging relation of the branch valleys would remain unexplained. This difficulty Professor Gregory proposes to remove by assuming that "if the major valleys be regarded as a reticular system formed along fractures which gaped open at the uplift of the country . . . the [greater] depths of the main valleys as compared with some of their tributaries is a natural consequence of the more rapid denudation along the tectonic ruptures". But no evidence whatever is given to prove that the main valleys of Preglacial time were formed in this highly hypothetical manner, nor is any reticular valley system of such origin known elsewhere, for the newly deepened valleys of other broadly uplifted regions lie, in the vast majority of cases, along essentially the same courses that they followed before uplift. Indeed, until a reticular system of valleys occupying gaping fractures is shown to exist in some recently elevated region, the gratuitous supposition that the main valleys around Snowdon are of that extraordinary origin has no value.

A profile from Snowdon across the valley of Lake Cwellyn to Mynydd Mawr is introduced to illustrate the contrast between the theories of strong and of slight glacial erosion. "The areas in solid black represent the amount of solid rock removed on the alternative hypothesis that the valley had been excavated approximately to its

present depth [and width] by pre-Glacial streams." Nothing is easier than to draw such a diagram; the difficulty comes in proving that the Preglacial valley truly had the width and depth there assigned to it. If it had any such width, its branch valley must have had an accordant junction with it, but as a matter of fact the branch hangs over the main valley. An additional difficulty would be found in justifying the assumption that the profile given for the Snowdon crest and for a cwm beneath it correctly represents the result of normal erosion in Preglacial time; yet such an assumption is made, for no " solid black" is added to indicate that the mountain profile has been perceptibly modified by glacial erosion.

It is then concluded that " according to this interpretation the topography of Snowdon at the beginning of the glaciation was essentially the same as it is now ", and therefore that glacial erosion has been of small measure. Like the reticular system of fracture valleys this conclusion can have little value until a never-glaciated mountain district of altitude similar to that of North Wales is found, in which the effect of a sub-recent uplift in reviving normal erosion has been to produce huge cwms under sharp-edged mountain crests, and half-mile-wide side valleys hanging over still wider main valleys, with vigorous streams plunging down narrow clefts between the two. Mountains and valleys of such forms do not exist outside of deglaciated regions, and a great body of excellent evidence indicates that their peculiar forms are the product of glacial erosion.

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Recent Sinking of Ocean Level.

Sir,—Professor Daly's speculation in the June number of this Magazine regarding the possibility of a recent worldwide sinking of sea-level calls for exposition of the facts as regards the British Isles. The writer feels somewhat at fault in the matter as he has made a statement of results without evidence and expected it to be accepted. Under the circumstances Professor Daly can hardly be blamed for setting one statement against another, and considering that perhaps the facts may be as required by his theory. It should be pointed out, however, that there is not really, as Professor Daly has implied, any conflict between the writer's account of the so-called 25 ft. beach and those of Sir A. Geikie [1] and Hull. As regards Kinahan's discussion of the raised beaches of Ireland, it can confidently be said that what is not absolute error in it is so indefinite as to have little meaning. To him anything served as evidence of a shoreline, from a glacial corrie or a drift-bank to a limestone escarpment. The lowest of his horizontal shorelines is by his own statement only 4 feet above mean tide level, so that it is not clear

[1] Anniversary Address to the Geological Society, 1904.