

In regard to the line (*g*) in my sketch (the basement bed, according to Mr. Brydone, of the grey chalk) and my missing it on the opposite side, I can only plead the difficulty of seeing what one believes to be non-existent, but must confess that I did not understand him to mean that the *O. lunata* chalk had such a curiously irregular surface as he assigns to it in his last letter; that, however, in my opinion, only increases the difficulties in his hypothesis of an intra-Cretaceous unconformity. As this hypothesis appeared to me (as it still does) a fundamental one, and the other evidence insufficient to overcome its inherent improbability, I considered myself justified in limiting my criticism to the questions which lay within my more special field of work, and am now content to await further developments as the sea continues its inroads.

T. G. BONNEY.

9, SCROOPE TERRACE, CAMBRIDGE.

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#### THICKNESS OF LAND-ICE.

SIR,—I have just sufficient acquaintance with your reviewer of Chamberlin & Salisbury's Text-book, vol. i, to be able to discuss what was in his mind in penning the sentence to which Professor Schwarz takes exception in your November number, though I shall not venture to defend his gratuitous interjection of a reference to Professor Schwarz's views on the occasion in question.

Professor Schwarz claims that certain physicists have proved by calculation that ice cannot attain a greater thickness on the earth's surface than 1,400 to 1,600 feet, and with implicit faith in this calculation he seeks to reconcile the result with the geological evidence. The reviewer, however, probably lacking sufficient knowledge of physics to criticize the calculation, and being also doubtful whether the result is one on which all physicists are agreed, has fallen back upon the available geographical and geological evidence, and on this evidence alone has felt no hesitation in rejecting the postulated limits. He has, no doubt, considered that the Greenland ice-sheet, as described by Peary, must at its maximum far exceed the thickness allowed by these physicists; and he probably also still believes that the Antarctic ice in the valleys of the interior surpasses this limit, in spite of the ingenious argument of Professor Schwarz as to the progressive deepening of such valleys.

Then, as regards bygone glaciation, the reviewer perhaps remembered the glacial phenomena in British Columbia, where there is every indication that ice-sheets have filled pre-existing valleys to a much greater depth than 2,000 feet; and he may have recalled the conditions in the north-eastern portion of the United States, where the uplift of boulders in the Adirondacks, if due, as usually believed, to land-ice, must imply a thickness of ice on the Canadian lowland far exceeding the supposed limit.

Or without going so far afield, he may have had in mind the

conditions of glaciation in the Isle of Man, where the highest summit, over 2,000 feet above present sea-level, has been striated transversely to the direction of the hill-range by ice which must have risen considerably above the summit, while there is strong evidence that the same ice-sheet filled up the adjacent basin, now occupied by the Irish Sea, which was certainly in existence before the glaciation. And indeed, since I know that this reviewer accepts the 'land-ice theory' for our glacial drifts he would find no dearth of instances where the geological evidence is incompatible with the restriction supported by Professor Schwarz.

Furthermore, I have reason to believe that the reviewer gathered from at least one physicist that the calculation in question would not be trustworthy under the conditions of a moving ice-sheet. In short, this reviewer and I are at one in concluding that the evidence for the past and present existence of ice of greater thickness than 1,600 feet is so strong that the physicists who wish to apply this limitation may be advised, in their own interest, to revise their calculations.

G. W. LAMPLUGH.

NOTTINGHAM.

November 7th, 1906.

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#### THE KEISLEY LIMESTONE.

SIR,—While welcoming Dr. Marr's paper on the Keisley limestone, in your November issue, as a most important addition to our knowledge of that rock, I should like to point out a slight inaccuracy repeated from his and Nicholson's previous paper on the Cross Fell inlier—a mistake discovered several years ago while accompanying Professor P. F. Kendall's field class in Westmorland.

Dr. Marr says (quoting from the previous paper)—“at a point where a tributary stream (Rundale Beck) enters Swindale from the east,” etc. This should be *Small Burn*, and not Rundale Beck.

His description of the *Staurocephalus* limestone applies to the beds below the junction of Small Burn and Swindale Beck, while around the junction of Rundale (or Great Rundale) Beck and Swindale Beck, about 220 yards further south, the Stockdale shales are developed, into which a lamprophyre dyke is intruded, as shown in the section on the map accompanying the paper on the Cross Fell inlier.

The streams are correctly named in the description of this area in the Survey Memoir on “The Geology of Appleby, Ullswater, and Haweswater” (pp. 36 and 41).

The names of the streams are taken from the 6-inch Ordnance Map, and I take this opportunity of pointing out the mistake, so that strangers to the district may not be misled by the wrong naming of the stream, if they should ever wish to make a closer acquaintance with this interesting bed in the field.

E. J. EDWARDS.

12, NORWOOD TERRACE, LEEDS.

November 8th, 1906.

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