

GLACIATION OF WEST SOMERSET.

SIR,—In the article under the above heading in your last Number, Mr. Lucy does not seem to be aware that the grooves on the banks of the Exe, supposed by Professor Jukes to be ice-marks, were afterwards clearly shown by Mr. Whitley to be a development of rock-structure by weathering (Quart. Journ. Geol. Soc., vol. xxiv. p. 3). In West Somerset there is a greater display of curved-back slaty laminae than anywhere else in South Britain; and in endeavouring to account for the phenomena, I mentioned land-ice as one of several competing agencies in an article in the above Journal for November, 1867. The direction of the curvature is from about N.N.W. to S.S.E., and great blocks of quartz imbedded in angular drift have been transported in the same direction. The curvature may be well seen on the flat summit of Brendon Hill, and must have been produced by some cause assailing the high ground of West Somerset from the N.N.W., and not moving down the hill-slopes towards the north. Though not in any way doubting the validity of Mr. Lucy's discovery of ice-marks near Ashley Lodge, I may state that during several years' successive residences in different parts of the south-west of England, I never once saw any *certain* trace of the action of land-ice, nor have I seen such trace anywhere in England to the S.E. of a line drawn from about the mouth of the Tees, by Ilkley, to Hope Mountain (on the east side of which there is an extensively rounded and strikingly striated rock-surface), near Wrexham. Mr. Croll, in your last Number, does not seem to be aware of the existence of a beautifully-planed, polished, and striated rock-surface on the north cliff-line of Rombald's Moor, west of the headland called the Calf, near Ilkley. When I saw it in course of being exposed by the quarrymen, I was under the impression that it had been produced by an iceberg (see Proc. of Geol. Soc. of West Riding for 1870); but I now believe that it was caused by land-ice, and that it approximately marks the S.E. boundary or sea-wall of an ice-sheet which never extended any farther. Professor Ramsay believes that the apparent ice-marks on the Bloody Stone near Matlock (discovered by me, and afterwards described by Mr. A. H. Green, and the Rev. J. M. Mello), are not reliable.

Mr. Lucy refers to Boulder-clay and Gravel in West Somerset. For several years I devoted attention to the drifts of many parts of the South and South-west of England, but refrained from publishing much on the subject¹ until I had examined the Glacial drifts of the North-west of England and North Wales. I now believe that comparatively little progress will be made in arriving at certainty concerning the sequence of events during the Glacial period in South Britain, until some geologist has given several years' undivided attention to the task of correlating the Glacial drifts of the North with the non-Glacial drifts of the South, that is, the drifts which contain truly glaciated stones in a matrix ground up by ice, with the drifts in which no certain trace of either the one or the other can be detected. The task could only be accomplished by one person

¹ See GEOL. MAG. Vol. IV. p. 390.

making a detailed survey of all the superficial accumulations lying in a line (say) from Plymouth to Carlisle, and the ground would have to be traversed to-and-fro, as the drifts of one district have been found to throw much light on those of another. One great and fundamental question to be solved would be the age of the "Head" relatively to that of the Pinnel of the Lake District. The former overlies the raised beaches of the South-west of England.

D. MACKINTOSH.

GLACIATION OF THE SOUTH-WEST OF ENGLAND.

SIR,—The subject of the Glaciation of the South of England is gaining more and more attention, and Mr. Lucy's observations in West Somerset, as recorded in the June Number of your *MAGAZINE*, will be read with interest, particularly in reference to the identification of glacial striæ on a mass of sandstone near Porlock. In regard to the gravelly deposits in the lowlands near Minehead, I was led, during a short excursion to the neighbourhood in the Spring, to assign to them an alluvial, or possibly estuarine, origin; at the same time it is not unlikely that the gravels on the high grounds, as those in the neighbourhood of Tiverton, may be of glacial derivation. Mr. Poole has recorded the occurrence of tusks and teeth of the Mammoth in a deposit of clay and gravel at St. Audries, and he remarked that "originally the whole skull was there."

On my return a few days since from a short holiday trip in Norfolk to the Black Down hills in Devonshire, I was conducted by my colleague, Mr. Ussher, F.G.S., to see some "rum stuff" on the high ground between Little Down and Manning's Common, about two miles N.N.E. of Yarcombe, and between Honiton and Chard. Here the surface of the ground is of a clayey nature, and the formation beneath is the Greensand. Mr. Ussher pointed out one or two places where pits had been sunk for marl, and the presumption was that there was a trace of chalk not noticed in the previous survey of the district. On careful examination we found traces of chalky and chloritic marl and true chalk (one piece contained a small fish tooth), but the whole deposit was interbedded with clay. The clayey and sandy deposit, which covered the surface of the ground adjoining to the depth of eight or ten feet, contained numerous large and well-worn boulders of Greensand chert, large pebbles of quartz (one to three inches in diameter), numerous small pebbles of quartz, rolled flints, and a few smooth and good-sized boulders of quartzite. There were also a few pellets of Chalk, besides traces of Fuller's Earth, and nodules of "Race." A pit recently opened showed about seven feet of greenish-yellow carbonaceous clay with a seam of gravel, resting upon an irregular surface of coarse reddish-brown and pale-coloured sand. The nature of these deposits led me to class them as Boulder-clay, and as such they seemed to possess more than merely local significance.

The great deposits of flint and chert found on the summits of the Greensand hills of Dorset and Devon have been noticed by De la