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ORIGINAL ARTICLES.

I.—NOTE ON THE DISCOVERY OF *Bos PRIMIGENIUS* IN THE LOWER
BOULDER-CLAY OF SCOTLAND.

By JAMES GEIKIE, F.G.S., ETC.

IT will interest some of your readers to hear that remains of *Bos primigenius* have recently been obtained from the true till or lower Boulder-clay of Scotland. The specimens hitherto found appear to have come either from the fine Glacial brick-clays, which are posterior in date to the larger portion of our Boulder-clay, or from deposits of still later age. A few days ago I heard that the navvies employed in making the new "Crofthead and Kilmarnock Extension Railway" had come upon what was described to me as a "wonderful big bull's head." I lost no time in visiting the locality, and saw the fossil in the possession of Mr. John Strain, C.E., who allowed me to examine it, and was afterwards kind enough to accompany me to the railway cutting in order to point out the exact spot from which the relic was taken. The skull is in rather an imperfect state, and only one of the horn-cores remains, the other having been broken off near the base. The perfect core measures 31 inches in length along the outer curve, and gives at its base a circumference of 14 inches. The breadth of the forehead between the horns is 10 inches. From the character of the flat forehead, from the origin of the cores, and from the direction and curvature of the remaining one, there can be no doubt that the skull is that of *Bos primigenius*. The fossil was imbedded some few feet deep in a soft clay or mud, interlaminated with lines and beds of sand, and occasional layers of fine gravel. In some of the layers of clay, I detected a little vegetable matter, but in such a state of decay, that I could not be certain as to the character of the plant. It appeared to resemble the fibres of some heath. These beds occupy a basin-shaped depression, and rest partly on Boulder-clay and partly on rock. I do not know how thick they may be towards the centre of the trough, for the cutting has not been carried down to the rock or Boulder-clay; but, at least, from 10 to 15 feet of stratified materials are there exposed, and the total thickness is probably as much again. The strata are overlaid by Boulder-clay in such a way as to leave no doubt on the mind that they form an intercalated series. I was particularly careful to ascer-

tain whether a slip from the hill-side might not explain their interstratified position; but after a minute examination, I was satisfied that no such land-slip had taken place, but that, as I have shown in the sketch-sections, the laminated clay and sand are distinctly interbedded with the till. This till is a stiff, hard, dark-brown clay, full of scratched stones, and rests on a much grooved and well-polished surface of porphyrite,—the striæ running parallel with and *up* the valley, *i.e.* to the south-west. The stones have travelled no great distance, but here and there, one may detect a fragment of mica schist, gneiss, quartz-rock, and Old Red Sandstone—showing that the moraine matter has been amassed during the passage of the glacier from north to south. I noticed no material difference between the till which overlies and that which is overlaid by the stratified deposits. The former contains a few lenticular nests of earthy sand and gravel, which I did not observe in the latter; but there is not so much of this last exposed; and, moreover, as geologists know, the occurrence of such “nests” is common enough in the Scottish lower Boulder-clay.

The valley in which these deposits are met with is a remarkable one in its way. The denuding forces which scooped it out have acted along the line of a large fault bearing S.W. to N.E., and consequently the narrow hollow extends in a nearly straight direction from the neighbourhood of Caldwell-house to Barrhead, a manufacturing place, about eight miles south-west from Glasgow. The southern end of the hollow is partly occupied by a small lake (Loch Libo), now much reduced in size as may be seen from the extent of the surrounding alluvium, and the water drains towards the south into the Lugton. But from Shillford (a toll-bar about half-way between Caldwell and Crofthead) the water drains to the north. It was in this northern division of the hollow, in the valley of the Cowdon Burn, near the farm-steading of Millthird, at a height of nearly 500 feet above the sea, where the remains of the *Bos primigenius* were found.

Fig. 1. Sketch-section exposed in the new railway-cutting near Crofthead, S.W. Renfrewshire. N.E.

- a1. Stiff hard dark brown till full of scratched stones, and resting on striated surface of porphyrite.
- a2. Till of much the same character, but containing a few “nests” of sand and gravel.
- b. Soft clay, interlaminated with sand, and containing occasional beds of sand and fine gravel.
- p. Ice-worn mass of rock (porphyrite) against which the beds b have been deposited.
- X. Position of the skull of *Bos primigenius*.
- r. Present level of railway cutting.

The sketch-section (Fig. 1) is that which was laid bare at the time I visited the cutting; of course it runs parallel with the valley. The succession of events, as I read it, is as follows:—First, a glacier ascends the valley, polishing and striating the underlying rocks, and eventually covering them over with its moraine profonde. I need

scarcely add that this glacier formed only a portion of the great sea of ice which mantled the land during the early stages of the Glacial period. The glacier then disappears, and behind a large ice-worn mass of rock (*p*) which rises in the centre of the valley, a little lake is formed. Into this lake the *Bos primigenius* is floated by stream or freshet. As the till further up the valley towards Shillford continues to exhibit intercalated beds of sand, clay, and gravel, I am led to infer that either one large lake with a very uneven bottom, or more probably a series of small lakes, may once have occupied the area between Caldwell and the spot where the fossil remains of the great ox were obtained. When the glacier again ascended the valley, it spread its moraine profonde over the surface of the deposits which had accumulated in the lake or lakes. The slight twisting and confusion of the bedding observable in some places is perhaps due to the pressure exercised by the moving ice. The junction of the stratified beds with the overlying till is very regular, however, and forms nearly a straight line, as shown in the woodcut. But anomalies such as this are not of unfrequent occurrence in the lower Boulder-clay.

Fig. 2. Diagrammatic section across the Cowdon valley, near Crofthead.

I give here a diagrammatic section across the valley, showing the position of the drifts, as they were to be seen at the time of my visit; but as the navvies are busily digging away at the deposit, the section will not long remain in the same condition, and in due time will no doubt be rendered as illegible as orthodox railway-cuttings usually are.

II.—NOTES ON MODERN CHEMISTRY AND PHYSICS.

By BERNARD H. WOODWARD.

IF any apology be needed for the introduction of these notes in the pages of the GEOLOGICAL MAGAZINE, the excuse we would give is that geologists are, at the present time, being reproached, and perhaps deservedly, for attempting to generalize in cases which, to a great extent, depend upon chemical and physical actions, without having given these sciences that amount of study and consideration which their vast importance merits.

Our object is, therefore, to endeavour to attract the attention of the readers of this Journal to what is going on in these departments