EXCURSION TO WHETSTONE AND FINCHLEY.

SATURDAY, APRIL 23RD, 1887.

Directors : H. B. WOODWARD, F.G.S., AND J. G. GOODCHILD, F.G.S.*(Report by THE DIRECTORS).*

On arriving at Totteridge Station the party was conducted to a pit south of Whetstone where a small outlying mass of Boulder Clay was seen resting on the "Middle Glacial Sands and Gravels."

Mr. H. B. Woodward pointed out that this Boulder Clay was a portion of the chalky Boulder Clay that covers a large area in the eastern counties. It was composed mainly of Chalk and Flint, and also of the Jurassic Clays (Lias, Oxford and Kimeridge Clays). Fragments of oolitic limestone were comparatively rare, but it must be remembered that over a considerable tract to the north-west the Oxford and Kimeridge Clays come together without the intervention of the Corallian limestones. The late Mr. N. T. Wetherell, of Highgate, made a large collection of British fossils from the Boulder Clay of the neighbourhood, especially from a pit at Muswell Hill; and the greater part of this collection is preserved in the Museum of Practical Geology.

The Boulder Clay in Mr. Woodward's opinion was a product of land-ice, and he observed (speaking from experience in the eastern counties) that the accumulation rarely exhibited any appearances of stratification. In many places there was a streaky structure that simulated stratification, but this was evidently due to pressure. As observed by Mr. Clement Reid in the Holderness region,* shells are sometimes found in Boulder Clay, crushed, but with the fragments only separated by a small interval, and these may frequently be fitted together. As a rule the beds beneath the chalky Boulder Clay in the eastern counties are more or less contorted, and in the pit now visited there was evidence of some disturbance in the underlying beds.†

The party then walked, through Finchley, to the pit in Somers Lane, where the Boulder Clay is being worked into bricks. On the north side of the pit the cutting had lately been newly bared for a length of thirty yards or so, and a continuous face of rock,

* 'Geology of Holderness' (Geol. Survey, p. 16).

† See H. B. Woodward, 'Proc. Geol. Assoc.,' Vol. ix, p. 111; and 'Geology of England and Wales,' Ed. 2, p. 506.

about six feet in height, was exposed. In the middle of the section the upper four feet consisted of the ordinary Boulder Clay of the district; but beneath that, for a length of twenty yards or more, the section showed bands of striped loams, loamy clays, and sands, alternating with, and passing horizontally into, Boulder Clay like that above. In another face of the same pit the local base of the Boulder Clay was seen lying upon the sands and gravels that here usually occur beneath. In this case there were signs of gradation from the one type to the other. From the Boulder Clay *in situ* the party obtained many specimens, including representatives of the Red Chalk, Carstone, various Jurassic rocks, New Red Sandstone and breccias, various rocks of Carboniferous age, rocks from Charley (or Charnwood) Forest, and a few representatives of granite and metamorphic rocks, apparently foreign to the British Isles. From some heaps of stones got out of the Boulder Clay by the workmen larger blocks of some of these same rocks were obtained, and amongst them were some basic rocks, undistinguishable, macroscopically, from the Whin Sill of the North of England. There were also some other basic rocks regarded as of Scandinavian origin.

After the party had concluded their search Mr. Goodchild spread out a map of the British Isles and laid upon it, each in its relative position, fragments of the various erratics gathered from the drift there. After calling attention to the remarkable radial dispersion of the boulders originating at each of the centres represented, and to the resulting convergence, at any given spot, of boulders primarily derived from sources widely separated, he went on to make some observations upon the origin of the Finchley Boulder Clay. Its present extension he regarded as marking, very nearly, the southernmost limit of the ice sheet—the rate of melting of the ice-fringe hereabouts having exactly balanced the supply. He considered the Finchley Boulder Clay as being approximately of the same age as that originating when the Shap Granite, &c., was transported inland and uphill over Stainmoor—that is to say, as being contemporaneous with the period of maximum glaciation, when Scandinavian land-ice on the one side, and the North Atlantic ice on the other, reinforced our glaciers and hemmed in our local ice so that it was compelled to flow southward beyond the limits it would otherwise have attained. In every essential point, down to minor points of detail, the Finchley Boulder Clay agreed with the Boulder

Clays of this age in the North of England, and he considered it had probably originated in the same manner. He regarded it, and all the various stratified beds associated with it, as the sediment, representing the mud and stones that had worked up into the ice from various parts of the areas its feeders had traversed, and that had been liberated, in its present various forms, by the melting of the ice, under subaerial conditions, immediately after the climax of the Glacial Period. This view would serve to account for the otherwise puzzling association of Boulder Clays devoid of bedding with other strata obviously arranged by the action of water, as in the present case. It would also serve to account for the presence of marine organisms in high-level deposits of glacial origin.

In explanation of the occurrence of erratic blocks from Scandinavia, Mr. Woodward remarked that while the Lower Boulder Clay of Norfolk was characterized by fragments of eruptive rocks, many of which were probably derived from areas situated to the north-east, the Upper, or Chalky, Boulder Clay was for the most part made up of detritus from the north-west. At the same time the newer deposit may have been, in part, formed from the older drift; hence erratics from distinct areas would be commingled in this deposit.

Among the fossils observed were :—*Gryphæa dilatata*, *Belemnites abbreviatus*, *Lima gigantea*, *Discina latissima*.

Mr. Rudler, in returning thanks, drew attention to the labours of Mr. Henry Walker, and remarked on the presence at this excursion of one of the founders of the Association, Mr. George Potter.

A few Members subsequently visited the Highgate Literary and Scientific Institution, where a number of fossils, collected principally by the late Mr. N. T. Wetherell, from the London Clay and the Drift of Highgate, Muswell Hill, and Finchley, are preserved.

REFERENCES.

- Geological Survey Maps, 7 (Drift Edition), and 'London and its Environs.'
 PROF. MORRIS.—"Note on the Gravel Beds of Finchley." 'Geol. Mag.,' v (1868), p. 411.
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