EXCURSION TO DOWN.

SATURDAY, JUNE 18TH, 1892.

Directors: W. E. DARWIN, F.G.S., and W. WHITAKER, F.R.S.

THE party from London arrived at Orpington station at 2.25. Near here is the pumping-station of the Kent Waterworks, which derives its water supply from the Chalk. The engineer of the works, Mr. W. Morris, was kind enough to show the party round the works and to explain the main points of interest.

Ascending the dry upper part of the valley of the Cray to Green Street Green, the members had an opportunity of inspecting the gravel-pit whence the mammalian remains and shells, now in the possession of Sir John Lubbock, were obtained. In a gravelly field near here, at the side of the lane leading from the high road up to Snag Farm, numerous palæolithic implements of the "Hill" type had been obtained by Mr. De B. Crawshay. A few implements were also found by him at Green Street Green.

From here a pleasant walk led the party through High Elms Park to Down. Here the Clay-with-Flints, that caps the higher grounds of the Chalk, was described by Mr. Whitaker, and the following extracts from Charles Darwin's work on Vegetable Mould and Earth worms were read:—

(P. 137.) "The chalk formation extends all round my house in Kent; and its surface, from having been exposed during an immense period to the dissolving action of rain-water, is extremely irregular, being abruptly festooned and penetrated by many deep well-like cavities. During the dissolution of the chalk, the insoluble matter, including a vast number of unrolled flints of all sizes, has been left on the surface and forms a bed of stiff red clay, full of flints, . . ."

(Footnote, p. 137.) "These pits or pipes are still in process of formation. During the last forty years I have seen or heard of five cases, in which a circular space, several feet in diameter, suddenly fell in, leaving on the field an open hole with perpendicular sides, some feet in depth. This occurred in one of my own fields, whilst it was being rolled, and the hinder quarters of the shaft horse fell in; two or three cart-loads of rubbish were required to fill up the hole. The subsidence occurred where there was a broad depression, as if the surface had fallen in at several former periods. I heard of a hole which must have been suddenly formed at the bottom of a small shallow pool, where sheep had been washed during many years, and into which a man thus occupied fell to his great terror. The rain-water over this whole district sinks perpendicularly into the ground, but the chalk is more porous in certain places than in others. Thus the drainage from the overlying clay is directed to certain points,

where a greater amount of calcareous matter is dissolved than elsewhere. Even narrow open channels are sometimes formed in the solid chalk. As the chalk is slowly dissolved over the whole country, but more in some parts than in others, the undissolved residue—that is the overlying mass of red clay with flints,—likewise sinks slowly down, and tends to fill up the pipes or cavities. But the upper part of the red clay holds together, aided probably by the roots of plants, for a longer time than the lower parts, and thus forms a roof which sooner or later falls in, as in the above mentioned five cases. The downward movement of the clay may be compared with that of a glacier, but is incomparably slower; and this movement accounts for a singular fact, namely, that the much elongated flints which are imbedded in the chalk in a nearly horizontal position are commonly found standing nearly or quite upright in the red clay. . . . These elongated flints must get placed in their upright position, on the same principle that the trunk of a tree left on a glacier assumes a position parallel to the line of motion. The flints in the clay, which form almost half its bulk, are very often broken, though not rolled or abraded; and this may be accounted for by their mutual pressure, whilst the whole mass is subsiding. I may add that the chalk here appears to have been originally covered in parts by a thin bed of fine sand with some perfectly rounded flint pebbles, probably of Tertiary age; for such sand often fills up the deeper pits or cavities in the chalk."

(P.298.) "In many districts where the land is nearly level, a bed several feet in thickness of red clay full of unworn flints overlies the Upper Chalk." . . . "Why a thick mass of residue has not been left on the Chalk, wherever the land is nearly level, may perhaps be accounted for by the percolation of the fine particles into the fissures, which are often present in the chalk . . . or into the solid chalk itself." . . . "the Upper Chalk . . . contains . . . only from 1 to 2 per cent. of earthy matter; and two samples from pits near my house contained 1·3 and 0·6 per cent. . . . The cause of the residue accumulating more in some places than in others may be attributed to a layer of argillaceous matter having been left at an early period on the chalk, and this would check the subsequent percolation of earthy matter into it."

In a letter of 1854, published in his 'Life,' Darwin referred to this view as having been put forward by Lyell and Prestwich, before the Geological Society; but there is no record in the publications of the Society of anything of the kind. Mr. Whitaker suggested that it might have occurred in the discussion on the paper on Pipes by Professor Prestwich, although the author had informed him that he could only remember having dealt with the unworn flints.

Having referred to other deposits of like nature, the Director

then described the general geology of the district, and drew especial attention to the marked features caused by this clayey covering of the Chalk, by the escarpment of the Lower London Tertiaries, and by the hills of London Clay beyond.

Through the kindness of Mrs. Darwin, members were allowed to visit Down House, the residence of Charles Darwin, and to walk through its grounds. Here specimens of the flint implements found in the neighbourhood were exhibited by Mr. De B. Crawshay and the Messrs. Allen, and tea was kindly provided by Mr. W. E. Darwin for the very large number of members (over 120) who attended the excursion.

A walk of four miles then took the party across the Tertiary escarpment at Holwood Park, and then down the dip-slope of the Blackheath Beds, over Hayes Common, to Hayes, two halts being made on the way, when Mr. Whitaker described the above-mentioned features. From Hayes members returned to town by the 8.20 train.

REFERENCES.

- Geological Survey Map, Sheet 6 (Drift edition).
 1887. DARWIN, F.—“The Life and Letters of Charles Darwin.” *London*.
 1889. WHITAKER, W.—“The Geology of London.” *Mem. Geol. Survey*.
 1891. PRESTWICH, J.—“On the Age, Formation, and successive Drift-
 Stages of the Valley of the Darent, &c.” *Quart. Journ. Geol. Soc.*,
 vol. xlvii, p. 126.
 1892. PRESTWICH, J.—“On the . . . Flint Implements of the Chalk
 Plateau of Kent.” *Journ. Anthropol. Inst.*, vol. xxi.

EXCURSION TO WOBURN SANDS AND SANDY.

SATURDAY, JUNE 25TH, 1892.

Director: A. C. G. CAMERON, H. M. Geol. Survey.

(*Report by THE DIRECTOR.*)

The members left London (Euston) at 9 a.m., arriving at 10.30 at Woburn Sands, where they were met by the Director, and joined later on by a number of ladies and gentlemen from Bedford interested in the local geology. The morning was spent viewing the works and mines of fullers' earth; the recently-erected works adjoining Woburn Sands Station being visited first. Here the “Niagara” Mill for pulverizing, and other machinery used in the preparation of the earth, were explained by the patentee and Mr. A. J. G. Swinney, the proprietor. The Director had placed in the office of these works the Geological Survey maps (drift editions) on the new Ordnance sheets.

The greatest expanse of the Lower Greensand in the Midland Counties occurs between Leighton Buzzard through Woburn
 NOVEMBER, 1892.]