irregular order, and once more reached the railway. The dip was now a distinct southerly one, and the Melbourn Rock, which marks the division between the Lower and Middle Chalk, was seen. Further on, attention was directed to some tumuli, known as the Seven Barrows, and Mr. Bennett made some remarks as to the cause of their erection here, suggesting that it was owing to the fact that the Bourne rises at this spot, which led to a discussion on the origin of Bournes, which were said by the Director to be caused by the rising of the underground water until it reaches the surface and overflows, causing an overground stream. In the next cutting the Chalk Rock was again seen, and several fossils, especially some fine Gastropods, which are not common in the Chalk, were obtained. This brought the party to Litchfield Station, where they took the 2.45 train to Winchester, and repaired to the Black Swan. Later in the afternoon the Dean kindly conducted them over the Cathedral, and on the following day the old Hospital of St. Cross was visited, as well as some of the chalk-pits in the neighbourhood. On Monday morning the party joined the main body at Southampton.

EXCURSION TO SOUTHAMPTON.

EASTER MONDAY AND TUESDAY, APRIL 2ND AND 3RD, 1888.

(In conjunction with the Hampshire Field Club.)

Director : W. WHITAKER, F.R.S., F.G.S., assisted by J. STARKIE GARDNER, F.G.S.

(*Report by* R. S. HERRIES, F.G.S.)

Members left London on Monday, April 2nd, by the 8.5 train and at Winchester were joined by those who had taken part in the preliminary Excursion. At Southampton they deposited their luggage, and, being reinforced by a contingent of the Hampshire Field Club, continued their journey to Milton, a station on the new direct line to Bournemouth. Attention was called to the great difficulty the Company had met with in constructing this railway, owing to the remarkable spread of the embankments, by which field after field had been absorbed.

The party walked southwards about three miles to the coast

near Hordle House. Before descending to the shore the Director gave a short general account of the configuration of the district and pointed out the corresponding beds on the mainland and the Isle of Wight, on the one side compressed owing to the almost vertical dip into the small space of Alum Bay, on the other extending through the whole of Christchurch Bay, as far as the Chalk of the Isle of Purbeck. The party then descended, and after a halt for luncheon, walked westwards as far as the ravine known as Becton Bunny, Mr. Starkie Gardner explaining the beds and their various sub-divisions as they occurred, in accordance with the classification proposed and set out in detail in the paper, which he, in conjunction with Mr. H. Keeping and Mr. H. W. Monckton, had read on the previous Wednesday, before the Geological Society ('Q. J. G. S.,' Vol. xlv, p. 578).

The beds dip slightly to the east, and were therefore examined in descending order. The Lower Headon beds, which were first met with, are of fresh-water origin, and contain much lignite; also crocodilian and mammalian remains, *Paludina*, *Limnea*, etc. In one place Mr. Gardner called attention to a singular interruption of the bedding where the "Leaf bed" and "Crocodile bed" are cut through, and replaced by a confused mass of clay and sand with drift wood, some of which is seen anchored vertically in the mud, being evidently snags in the channel of an old river. There is a similar old estuary-channel between Colwell and Totland Bays in the Isle of Wight. Below the Lower Headon are the Long Mead End beds, or Headon Hill Sands, which have unfortunately also been called Upper Bagshot Sands, a circumstance which has given rise to great confusion, owing to the fact that the same name has been given to a different bed in the London Basin. Mr. Gardner explained that the Upper Bagshot of the London Basin was probably the equivalent of the Lower Barton and upper part of the Bracklesham, while these Long Mead End beds were the very highest beds of the Barton, being classed, indeed, by many people with the Lower Headon. They were entirely unrepresented in the London Basin. They consist of about 20 feet of white sands with a layer of fossils in the upper part, a careful examination of which led the late Mr. Tawney ('Proc. Cambr. Phil. Soc.,' Vol. iv, Part III, p. 140), to class the sands rather with the Barton beds below than with the Headon beds above, an opinion in which Mr. Gardner concurred. The next beds

below are the Becton Bunny beds, and in them the fauna is entirely marine. Over the whole of these beds, and resting on each in turn, is a thick deposit of old river gravel which forms the upper part of the cliff nearly as far as Christchurch, when the whole of the beds are entirely cut off by the Avon river gravel. This old gravel contains flint weapons of the Palæolithic type, a series of which were exhibited by the Rev. H. Vandoorne.

The party made their way back from Becton Bunny to Milton Station, whence they returned about 6.30 to Southampton, the train being specially stopped for them through the kindness of the officials of the South Western Railway. At Southampton they fixed their headquarters at the South Western Hotel. While waiting for the train at Milton, the party inspected the collection of Barton fossils made by Mr. Daniel Flynn, of the coastguard station at Barton, who had accompanied the party, and most of the members enriched their collections by purchases more or less large from the beautiful selection of specimens which he exhibited.

On Tuesday, the 3rd, the party left Southampton by the 9.15 train for Milton, and, walking to the coast, resumed their examination of the beds at the point where they left off the day before. Below the Becton Bunny beds are the very fossiliferous Chama beds, so called from the great abundance of that curiously-shaped bivalve. Below, and forming the upper bed of the Middle Barton is a bed of hard stony slabs, made up mostly of comminuted fragments of shells, and called the Shell bed. These slabs are much sought after and carried away for building purposes, and to their removal the rapid erosion of the coast hereabouts is, no doubt, largely due, for by their resistance to the waves, these hard slabs would do much to retard the wasting process which is continually going on.

Below the Shell bed are the Middle Barton beds, which consist of 50 feet of drab sandy clay, with occasional bands of septaria. They occupy the broken slopes of the cliff as far as Chewton Bunny and yield a rich harvest of the most beautiful fossils to the collector, and the party were soon scattered over these slopes and busy filling their pockets as fast as they could. The Lower Barton beds, consisting of the Highcliff sands and underlying clays, occupy Highcliff, as the portion of the cliff west of Chewton Bunny is called, but they are so overgrown,

and covered by fallen material, that it is very difficult to examine them. At their base is a zone in which *Nummulites elegans* occurs, and a little below are the Bracklesham beds.

The remarkable change in the outlet of the Avon was pointed out. The natural mouth of this river is at Christchurch Harbour, just east of Hengistbury Head, but a bar of shingle having formed across it, the mouth was gradually driven further and further eastward, till the river flowing along the shore parallel with the cliff reached the sea under Highcliff House, about two miles off. Then in 1883, during a great storm this barrier was broken through, and now once more it flows out at Christchurch Harbour. The old course under the cliff is marked by a series of lagoons inside the great shingle bar.

The party were now met by Mr. Bellairs, who, by the kind permission of Lady Waterford, showed them over Highcliff House and grounds, both of which were much admired. After a vote of thanks to Mr. Bellairs, the party walked to Hinton Station, where the Company again kindly stopped the train, and the Members returned, some to Southampton, but most to their respective homes.

On Wednesday, the 4th, the Director accompanied a small party to Hinton, and the examination of the coast was resumed at Highcliff House. A search was made without success for the Nummulite bed. The Bracklesham beds form an escarpment 45 feet thick of compact white sand with carbonaceous matter, and in them occur two well-marked layers of pebbles, one at the top and the other eight feet from the base of the exposure. Soon afterwards the Tertiary beds are cut off vertically by a mass of gravel belonging to the Avon Valley, which occupies the coast as far as Christchurch Harbour. Here the river was crossed, and the walk was continued round Hengistbury Head, where the Bracklesham clays contain concretionary masses of ironstone and sandstone, the former of which was not very long ago worked for the sake of its iron. Further on, and underlying these clays, are white sands with a pebble-bed, and then darker, almost black, sands. After rounding the head, the party made its way to Christchurch and returned thence to Southampton.

While at Southampton an opportunity was given to the Members to visit the new dock works, and the Hartley Institute was visited under the able guidance of Mr. Shore, to whom the best thanks of the Association are due.

WORKS REFERRING TO THE HAMPSHIRE CLIFF-SECTIONS.

Geological Survey Map, Sheet 16.

WEBSTER.—“On a Freshwater Formation in Hordwell Cliff.” ‘Trans. Geol. Soc.,’ ser. 2, Vol. i, pp. 90-94, pl. xii. (1822.)

LYELL.—“On the Freshwater Strata of Hordwell . . . and Barton Cliff.” ‘Trans. Geol. Soc.,’ ser. 2, Vol. ii, pp. 287-292, pl. xxx. (1827.)

WOOD.—“ . . . Hordwell Cliff; with Observations upon the Geological Phenomena.” ‘Lond. Geol. Journ.,’ pp. 1-7, 117-122. (1846, 1847.)

PRESTWICH.—‘Quart. Journ. Geol. Soc.,’ Vol. v. Refers to Barton, etc., pp. 43, 44. (1849.)

WRIGHT.—“A Stratigraphical Account of the Section at Hordwell, Beacon, and Barton Cliffs.” ‘Ann. Nat. Hist.,’ ser. 2, Vol. vii, p. 433; reprinted in ‘Proc. Cotteswold Club,’ Vol. i, p. 120. (1851.)

MARCHIONESS OF HASTINGS.—“On the Tertiary Beds of Hordwell.” ‘Phil. Mag.,’ ser. 4, Vol. vi, p. 1. (1853.)

PRESTWICH.—“On the Correlation of the Eocene Tertiaries of England, France, and Belgium.” ‘Quart. Journ. Geol. Soc.,’ Vol. xiii. Earton pp. 107-110, 118-126. (1857.)

CODRINGTON.—“On the Superficial Deposits of the South of Hampshire.” ‘Quart. Journ. Geol. Soc.,’ Vol. xxvi, p. 528. (1870.)

GARDNER.—‘Quart. Journ. Geol. Soc.,’ Vol. xxxv. Refers to Highcliff, etc., pp. 210-212. (1879.)

JUDD.—“On the Oligocene Strata of the Hampshire Basin.” ‘Quart. Journ. Geol. Soc.,’ Vol. xxxvi, p. 137. Refers to Hordle, etc., pp. 170, 171. (1880.)

KEEPING and TAWNEY.—‘Quart. Journ. Geol. Soc.,’ Vol. xxxvii. Refer to Hordle, p. 107. (1881.) See also ‘Proc. Camb. Phil. Soc.,’ Vol. iv.

JUDD.—“On the . . . Eocene and Oligocene Strata in the Hampshire Basin.” ‘Quart. Journ. Geol. Soc.,’ Vol. xxxviii, p. 461. Hordle, pp. 472-475. (1882.)

TAWNEY and KEEPING.—“On the Section at Hordwell Cliffs.” ‘Quart. Journ. Geol. Soc.,’ Vol. xxxix, pp. 566-574. (1883.)

See also KEEPING, ELWES, WOOD.—‘Geol. Mag.,’ 1883, pp. 428, 493, 527, 573.

For Newbury, etc.. Sheet 12 of the Geological Survey Map (and the edge of Sheet 13).

ORDINARY MEETING.

FRIDAY, MARCH 1ST, 1889.

T. V. HOLMES, Esq., F.G.S., President, in the Chair.

The donations to the Library since the previous meeting were announced, and the thanks of the Association accorded to the various donors.

The following gentleman was elected a Member of the Association:—W. H. Wesley.

The following paper was then read:—‘The Geological History of Iron-Ores,’ by W. H. HUDLESTON, F.R.S., Sec. G.S.

The paper was illustrated by lantern-slides and specimens.