

the occurrence of the Bill lay in the fact that in the Bracklesham Beds, which were laid bare at low tide, there is a thin bed of foraminiferal limestone, forming an extensive ledge, and hard enough to break the onslaughts of the sea. Specimens of this bed had been found plentifully on the Pagham beach earlier in the day.

On the return, along the coast of Selsea, the shingly gravel beneath the brickearth was seen, and the Director remarked that this gravel, which contained marine shells in places, seemed to be continuous with the gravel of Portsmouth, etc., which was a river-gravel; and he suggested that they had here reached the tract where the former river had joined the sea. The height of the tide prevented any examination of the Bracklesham Beds, but the great amount of glauconite grains, derived therefrom, in the sand of the beach, was noticed.

EXCURSION TO BRIGHTON AND NEWHAVEN.

EASTER MONDAY AND TUESDAY, APRIL 11TH AND 12TH, 1887.

Directors : H. WILLETT, F.G.S., AND W. TOPLEY, F.G.S.

(Report by W. TOPLEY.)

The party met at the Free Library and Museum on Monday morning, and were received by Mr. E. Crane, Chairman of the Museum Committee, Mr. Lomax, the Curator, and by Mr. Pankhurst, Hon. Sec. of the Brighton Nat. Hist. Soc. After a short time spent in examining the Museum, and in enjoying the luncheon, kindly provided by Mr. Willett, the party started along the cliff eastwards, making its first halt at the large groyne at the east end of the town. Descending to the shore an examination was made of the ancient beach and overlying "Elephant Bed" or Coombe Rock. The beach (composed of rounded flint shingle, and exactly resembling the modern beach) lies eight or ten feet above the present high-water mark. The old beach was formerly exposed at many places along the shore, but west of this point it has been built over by the sea-wall, and to the east the cliffs are rapidly wearing back by the action of the sea, thus destroying the old beach. The action of the sea on the coast was here explained, and the influence of groynes pointed out. The shingle along this coast, under the influence of the prevailing south-westerly winds, travels from west

to east. Groynes are run out at right angles to the shore, or nearly so, which arrest the shingle. When a succession of groynes are constructed, as is the case along the front of Brighton, the shingle accumulates and protects the shore, or would do so if allowed to travel; but the shingle is, to a large extent, stopped at Worthing by excessive groyning, and again at Shoreham Harbour, so that the full supply is not received at Brighton. The large groyne at the Black Rock, at the east end of Brighton, is constructed to catch as much shingle as possible, consequently very little shingle passes on to the east, the cliff is robbed of its natural protection and is rapidly wasting away.

The Coombe Rock above the old beach has given rise to much discussion. It is composed mainly of weathered chalk, but contains some layers of loam, sand, and dirty gravel. It is apparently well stratified in places, and when seen in section, looking east or west, is often strangely contorted. These contortions are less evident when looking along the cliff face. It contains land shells and mammalian remains, chiefly of elephant—whence its name of “Elephant Bed.” By some it has been considered to be a sub-aqueous deposit, by others as formed by subaërial action. Mr. Clement Reid has recently discussed the question,* and he considers the Coombe Rock to have been formed at a time when the Chalk area north of it was perpetually frozen beneath the surface, and was therefore impervious to water. The winter’s snow would melt in summer, and the water being unable to percolate through the chalk, would drain rapidly down the dip-slope to the south, carrying chalk *débris* with it.

From the Black Rock the walk was continued along the top of the cliff to Rottingdean. Here, again, there are groynes, built to collect the shingle.

On returning to Brighton the party again collected at the Museum, and were then joined by Mr. Willett, who described his fine collection of Chalk fossils, chiefly from the Brighton and Lewes districts. Dr. G. J. Hinde made some remarks on the flints and sponges from the Chalk, in which the collection is rich. The large collection of cores and fossils from the Sub-Wealden boring was then referred to; and the general arrangement of the Museum was described by Mr. E. Crane, F.G.S.

* “On the Origin of Dry Chalk Valleys and of Coombe Rock.” ‘Quart. Journ. Geol. Soc.’ Vol. xliii, p. 364.

Tuesday.—The party started by train for Newhaven, where they were met by the Harbour Master, Capt. R. G. White, R.N., who kindly took the train on to the harbour and then conducted the Members over the new works, carried out under the direction of Mr. A. E. Carey, M.Inst.C.E. A breakwater (which is to be 2,800 feet long) is being carried from under the Castle Hill on the west side of the harbour, and is built of bags of concrete, each weighing 100 tons. The old mouth of the Ouse, until the time of Queen Elizabeth, was under Seaford Head, $2\frac{1}{2}$ miles east of the present outlet, it having been driven eastwards by the travel of shingle from the west. The old course of the river can still be seen behind the sea-wall, extending from Newhaven to Seaford. As the breakwater is extending the local tides are altering, and shingle is accumulating on the east of the harbour mouth. Shingle does not accumulate to any great extent on the west side of the breakwater.*

Some members of the party climbed the Castle Hill to examine the Tertiary outlier, the best exposure of the lower Tertiary beds in Eastern Sussex. The section has been several times described, successive writers giving fuller sections as the cliff was gradually cut further back. The earliest account, by Webster, in 1814, gave only part of the Woolwich and Reading beds; a capping of London Clay is now seen.†

Again taking train, the party was conveyed to Seaford. Proceeding to the shore and then turning eastwards, the lowest Eocene beds were seen lying upon the Chalk with a rather steep southerly and south-westerly dip. Ascending the cliff, the walk was continued as far as the River Cuckmere, where the deflecting influence of travelling shingle upon a river mouth can be well studied. The shingle carries the outlet eastwards, and an artificial cut is made to let out the water.


The absence of Mr. Willett from the party in the field was much regretted, but he had with much forethought made all necessary arrangements, and had most generously provided a luncheon at Newhaven and a meat tea at Seaford.

* These particulars are taken from descriptions on the spot by Capt. White and from a paper by Mr. Carey—"Harbour Improvements at Newhaven, Sussex." 'Proc. Inst. C. Eng.,' Vol lxxxvii, p. 92, Plates 3 and 4; 1887.

† A full description is given by Mr. Whitaker, 'Quart. Journ. Geol. Soc.,' Vol. xxvii, p. 263; 1871.

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 The Papers marked * are reprinted in this work.