

## EXCURSION TO PORTISHEAD

*(Report by PROF. REYNOLDS)*

During their stay at Bristol some of the members made an unofficial excursion to Portishead. The first spot visited was Fore Hill, where the relation of the Carboniferous Limestone to the Old Red Sandstone is difficult to understand, and several varying interpretations based on faulting have been suggested. The party then proceeded to Battery Point, which is formed of limestone (hor.  $\beta$ ). A short distance to the south the *Cleistopora* beds (K), which are finely exposed and very fossiliferous, are thrown into a series of small flexures probably owing to a reversed fault which brings lower beds (hor.  $\alpha$ ) over them. At this point the party divided, some proceeding *via* the limestone quarries of the Portishead and Clevedon road, the others by the coast path which displays a splendid series of unconformities between the Old Red Sandstone and Dolomitic Conglomerate. The two sections reunited at Walton Castle, near Clevedon, and after a visit to Coles' Quarry, where the superficial deposits are of much interest, and a small cave has yielded many bones,\* drove back to Bristol.

The President during the course of the excursion took the opportunity of thanking in turn the various Directors for the great interest that the excursion had afforded to the members.

## EXPLANATION OF PLATE IV

FIG 1 — Mass of oolitic limestone embedded in basalt. The margin of the limestone has been baked by the hot lava. The basalt also shows veins and strings of infiltrated calcareous matter.

FIG 2 — Spheroids of amygdaloidal basalt embedded in Tuff. The latter has flowed out in a fragmental condition, carrying lumps of basalt with it.

EXCURSION TO THE CUCKMERE VALLEY,  
SEAFORD AND NEWHAVEN.

SATURDAY, JUNE 1ST, 1907

*Director*: J. VINCENT ELSDEN, B.Sc., F.G.S.*Excursion Secretary*: MARK WILKS,*(Report by THE DIRECTOR)*

IN spite of threatening weather, a party of ten met the Excursion Secretary at London Bridge Station and travelled by the 9.45 a.m. train to Berwick Station on the L. B. & S. C. Railway. Here attention was drawn to a section in the railway cutting near the

\* Some of these bones were exhibited by Dr. H. C. Male at the conversazione in November last.

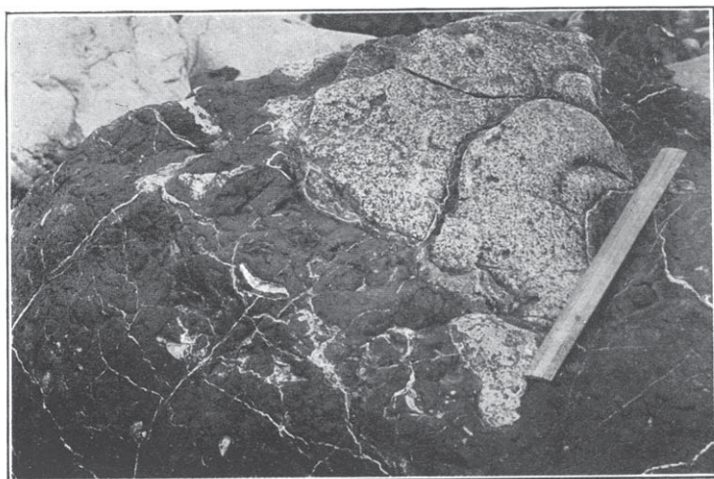


FIG 1—LIMESTONE MASS IN BASALT, SPRING COVE

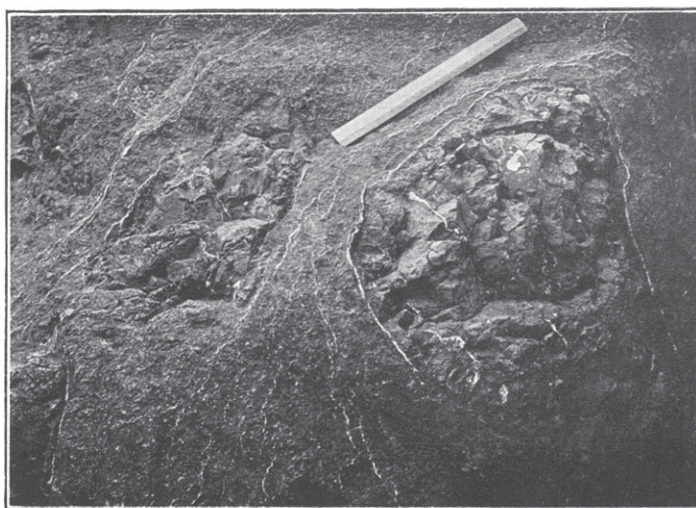


FIG 2—SPHEROIDS OF BASALT IN LUFF, SPRING COVE

*Photos by S. H. Reynolds.*

station, where a covering of coarse gravel rests upon Lower Greensand on the 100 ft contour and more than 70 ft above the level of the Cuckmere river. A brickyard on the north side of the line is on Weald Clay, so that the junction here is not far from the railway cutting. The examination of this feature, not being included in the day's programme, the party set out along the field path to Selmeston, near which place a sand pit shows some fifteen feet of ferruginous sand in the top-most part of the Lower Greensand. The junction with the Gault was not seen in this pit, but was formerly exposed near the church close by, in a sand-pit now disused. A search was here made for the Gault basement-bed, but without success, as the section was obscured by slips and overgrowth. Clayey sands, possibly from the base of the Gault, were seen in places on the east side of the pit, but on the west side Lower Greensand is alone exposed. This pit has a special interest as being the supposed locality whence Mantell procured from the Gault basement-bed the specimen of *Zamia* (*Pinites*) *Sussexiensis*, described by Mr. Carruthers as unique.\*

Bristow's description of the section formerly exposed here is as follows

GAULT	} Dark olive-green clayey sand Grey and ferruginous sand with phosphatic nodules and fossil wood = basement bed 6 inches
LOWER GREENSAND	
	Greenish-white sand, with green grains, weathering ochreous brown

The Director called attention to the fact that when he examined this section in 1886 there was exposed a large pocket of coarse gravel, similar to that seen near Berwick railway station. This is figured in a paper published in the *Quarterly Journal of the Geological Society*.† These gravel patches are frequently found occupying the higher contours in the southern margin of the Weald, and in this area are almost on the watershed between the valleys of the Cuckmere and the Ouse. They form part of the angular flint drift first described by Murchison,‡ and similar deposits have been noted on the watersheds of all the river basins of the southern Wealden area. Their precise age and origin remain still somewhat obscure.

The walk was continued along the road towards Alciston, and it was noted that stiff clays, presumably Gault, had been thrown up out of roadside trenches between the "Barley Mow" Inn and the sign-post. The width of the Selbornian outcrop is scarcely more than a mile at this place, and at Alciston the boundary between the Upper Greensand and the Chalk is reached.

\* *Geol Mag*, vol. iii, p. 547.

† J. V. ELSDEN "On the Superficial Geology of the Southern Portion of the Wealden Area" *Quart Journ Geol Soc*, vol. xliii, p. 647 (1887).

‡ *Quart Journ Geol Soc*, vol. vii, p. 349.



At Alciston some large boulders of greywether sandstone were noted. They are at an altitude of 172 ft. O.D., and their origin will be discussed below.

Rain had so far been falling freely, and the walk from Alciston to Alfriston, along the base of the chalk escarpment, was accomplished under conditions of considerable discomfort, during which the marly character of the surface was disagreeably evident. The absence of hard beds from the Upper Greensand in this locality renders its outcrop much less noticeable from surface contours than is usually the case farther to the west, where a conspicuous terrace exists. It is noteworthy, also, that the hard beds of malmstone reappear in the Upper Greensand at Eastbourne, where they have, in the past, been quarried for building stone for local use.

At Alfriston, after a short halt at the famous "Star" Inn, a visit was paid to the Church, where the Vicar, the Rev. C. Doughty, met the party and very kindly pointed out several features of geological, architectural, and antiquarian interest. The Church is a fine specimen of squared flint architecture. It is a cruciform structure of the 14th century, showing a transition between the Decorated and Perpendicular styles. There are piers and dressings of sandstone from the Eastbourne quarries referred to above. The same stone seems to have furnished the shaft of the old market cross, which is noteworthy as being the only example, except that at Chichester, still remaining in Sussex.

At Alfriston a considerable number of greywethers occur, and are apparently often in their natural positions. Those previously seen at Alciston appear to have been moved for the purpose of forming boundary stones. These greywethers, sarsen or Druid stones, are fairly plentiful either upon or near the chalk in certain localities, and are generally admitted to be relics of Lower Tertiary beds. It is, therefore, especially interesting to determine to what extent they occur *in situ*, and how far they may be taken to indicate the former extension of Tertiary strata. Their present distribution is distinctly sporadic, and their nearest occurrence in any number in this neighbourhood is near Brighton and Falmer. It has been suggested that the Ancient Britons may have regarded these hard sandstones with superstitious veneration, since they employed them largely for temples, sepulchral monuments, altars, and for other purposes. It must not be forgotten, also, that in places where hard stone is scarce they may have been used for various economic purposes, and many have probably been broken up for mending roads. These stones afford a striking example of the close connection which often exists between geology and archæology, for neither science is in a position to draw accurate conclusions as to the significance of the distribution of these stones without the help of the other. If, therefore, it is admitted that the Alfriston boulders, which are

often of large size and weigh several tons, are nearly *in situ*, they must be taken to indicate a former considerable extension of the Lower Tertiary beds \*

From Alfriston the party proceeded by the road towards Seaford, along which are several chalk pits, which were only hastily examined. The large quarry beneath the windmill first claimed attention. This shows chalk without flints, in well-marked bands of solid chalk, alternating with soft marly seams. The only fossils found were *Rhynchonella reedensis*, Eth., and a very imperfect *Terebratula*. The quarry is probably in the Middle Chalk, since a little farther along the road flinty chalk crops out by the roadside. Patches of gravel occur here in places, and from their position appear to be terrace gravels of the Cuckmere river. They are about fifty feet above the present river level.

In a dip about half a mile farther on there is a small roadside quarry in flinty chalk, as well as a good exposure in the road-cutting, where well-marked bands of tabular flint are seen. The Director stated that he had previously obtained here the following fossils, which had been kindly determined by Mr H. A. Allen, of the Geological Survey: *Micraster precursor*, Rowe, *Cidaris clavigera*, Koenig, *Cidaris sceptrifera*, Mant., *Echinocorys scutatus*, Leske, *Porosphaera globularis*, Phil., *Porosphaera pileolus*, Lam., *Spondylus spinosus*, Sow. This assemblage scarcely fixes the zone with certainty, but it would seem to indicate a low horizon in the Upper Chalk. It may be incidentally mentioned here that in the Upper Chalk of Alfriston there have been found rhombohedral crystals of calcite of remarkable whiteness and purity, closely resembling Iceland spar, and differing from the yellow columnar variety known popularly as "sugar candy," so often met with in the chalk.

Ascending the hill to Hindover, a fine view is obtained of the whole Cuckmere gorge from the chalk escarpment to the sea, where the river mouth has been strongly deflected by the easterly drift of the shingle. A reference to the physiographical features of this area and the denudation of the Weald had been contemplated here, but rain was again falling, and the time having already been considerably shortened by stress of weather, the party pressed on towards Seaford. Near the cemetery a large quarry in the chalk was passed, and the Director enumerated the following fossils which he had recently obtained from it: *Crania egnabergensis*, Retz, var. *striata*, *Pecten*, sp., *Rhynchonella*, sp., *Ostrea*, sp., *Carinophyllia cylindracea*, Reuss, *Spondylus latus*, Sow., Bryozoa and ossicles of star fish. Mr Allen had again kindly made the determinations of these fossils. The chalk here is soft and flaky, with many large flints. The exact horizon is not certainly in-

\* For details of the occurrence of greywethers in other localities, see Prestwich, *Quart. Journ. Geol. Soc.*, vol. x, pp. 75 *et seq.*, also Whitaker, *ibid.*, vol. xviii, pp. 271 *et seq.*





of Chalk, capped by flint gravel, and presenting a markedly corroded surface

Crossing the harbour by the ferry, the ascent of Castle Hill soon brought into view the ancient British earthworks, in which are exposed good sections of the Tertiary outlier, resting upon Chalk of the *Actinocamax quadratus*-zone. The full succession is as follows

POST TERTIARY.	Coarse red gravel and sand, about 15 ft. thick
LONDON CLAY	<div> <div>Clay, about 10 ft thick, consisting of brownish clays and loams, with a basement-bed, about 1 ft. thick, of sandy clay with flint pebbles</div> <div>Laminated bluish-grey clays, about 5 ft thick</div> <div>Shell beds, with oyster bed, passing into shelly clays, about 6 ft thick.</div> <div>Light-coloured sands and clay, about 6 ft thick</div> <div>Laminated clays and marl, about 10 ft. thick, with thin shell beds</div> </div>
WOOLWICH AND READING BEDS.	<div>Thin beds of sandy clay with lignite, 6 in. thick.</div> <div>Bluish clay and marl, weathering brown, with selenite, 12 ft thick.</div> <div>Sand, 20 ft thick, yellowish-green or mottled</div> <div>Flint breccia, about 2 ft thick, with green-coated and iron-stained flints, embedded in green sand and often cemented to a hard projecting band</div> <div>Clay, varying in thickness, not more than 1½ ft containing selenite and Websterite locally</div>
CHALK.	Chalk of the <i>Actinocamax quadratus</i> -zone

Owing to many slips and falls of the cliff the sequence in this section is difficult to see. Mr. Whitaker's diagram (Fig. 18) shows why later observers have recorded beds higher in the series. The basement bed of the London Clay was first noted by Prestwich in 1854. The junction with the Chalk is especially difficult to examine *in situ* at all times, and was impossible on this occasion in the slippery state of the cliff after so much rain. It is a ferruginous, flinty conglomerate, somewhat like that seen at Seaford, but containing much selenite, often in large crystals, and also the hydrous sub-sulphate of alumina, known as Websterite, or Aluminite. This occurs in massive form, often tabular, and is dull white in colour, with an earthy fracture. With it is sometimes found friable masses of aluminium hydrate, resembling magnesia in appearance. These minerals result from chemical reactions in the strata, in which the oxidation of pyrites and liberation of sulphuric acid are the primary factors. Aluminium sulphate and selenite are then formed, and the basic salt is probably a result of hydrolysis. Good specimens can often be got from the fragments of conglomerate lying at the base of the cliff. The fossils found in the Woolwich and Reading beds here include *Ostrea bellovacina*, *Melania inquinata*, *Cyrena*, *Cerithium*, *Melanopsis*, *Cypris*, *Unio*, as well as fish teeth and plant remains. The London Clay

PROC. GEOL. ASSOC., VOL. XX, PART 3, 1907.]

occupies a very small area on the cliff top in this particular exposure, and on the present occasion was not recognised in the cliff section. It was formerly exposed in the castle moat, now bricked up, and will probably be better seen when the cliff has receded farther

A thick coating of flint gravel covers the top of the hill at an altitude of about 180 ft. above sea level. This is probably the equivalent of the "Head" or Elephant Bed covering the Brighton raised beach, in which case it would be classified as Coombe Rock, of which there are numerous patches scattered, at various elevations, over the chalk area in this neighbourhood. The term Coombe Rock is of purely local origin, and was first used geologically by Mantell\*. The deposits have been described in detail in recent years by Mr Clement Reid. It is believed by

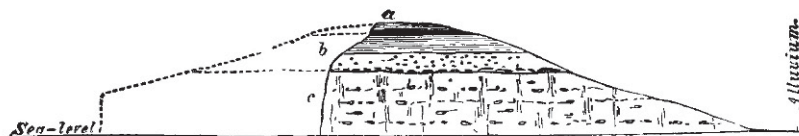


FIG 18.—DIAGRAM SECTION OF THE CLIFF A QUARTER OF A MILE WEST OF NEWHAVEN HARBOUR—H Whitaker.

<i>a</i> London Clay.	<i>c</i> Chalk
<i>b</i> Woolwich and Reading Beds.	Gravel omitted

The dotted lines show the former continuation of the various beds.

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him to have been the result of tundra conditions during the glacial period, when the surface drainage was disturbed by the impermeability of the frozen soil. The stones in this gravel consist largely of angular flints, with some fragments of ironstone, which latter may have been derived from Tertiary beds. It is evidently of tumultuous origin, and its distribution seems to possess but little relation to existing lines of drainage.

After passing some time in the examination of the Castle Hill section the party proceeded to the Sheffield Hotel, where tea was provided. The chair was occupied by the President, and, after the customary vote of thanks to the Director, a start was made to the railway station for the return journey to London

Bad weather greatly marred an excursion which would otherwise have afforded much enjoyment on account not only of the variety of the geological features, but also of the attractive scenery along the route.

\* "Geology of the South-East of England," p 31 (1833)



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## EXCURSION TO CROWBOROUGH.

SATURDAY, JUNE 8TH, 1907

*Director*: THE PRESIDENT (R. S. HERRIES, F.G.S.).

*Excursion Secretary*. A H WILLIAMS.

(*Report by THE DIRECTOR.*)

THE members, 18 in number, left London Bridge Station by the 12.25 train, arriving at Crowborough at 2.16. Here they were met by one of the staff of the Crowborough District Water Company, who had been kindly sent by Mr. Middleton, the resident engineer and manager. As there was not time for the party to visit the Waterworks, Mr Middleton had sent for their inspection the cast of the footprint of a large Iguanodon, which had been discovered some time previously during the progress of excavations there. The footprint was in the roof of the excavation, and had been subsequently cut out and sent to the Brighton Museum. The cast was examined by the members with much interest, and a special vote of thanks was passed to Mr Middleton for his kindness in sending it for the party to see