

EXCURSION TO GUILDFORD AND CHILWORTH.

JUNE 1ST, 1872.

Directors:—Professor T. RUPERT JONES, F.R.S., F.G.S., Hon. Memb. Geol. Assoc., &c., and C. J. A. MEYER, Esq., F.G.S.

(*Report by Professor T. Rupert Jones.*)

The Members, headed by Mr. Meyer and the Secretary, met Professor Rupert Jones and friends from the Royal Military College, Sandhurst, at the Guildford Railway Station, and at once proceeded to examine the section of the Woolwich and Reading Beds just north of the station. This section was described by Mr. Prestwich in 1850 (see Quart. Journ. Geol. Soc., vol. vi., p. 260, fig. 6), not long after it had been exposed by the railway-cutting. A year ago it was laid bare afresh when widening the railroad, but already the slipping of the clays has obliterated some points of interest. Traces of the shell-beds, with *Cyrena* and *Ostrea*, below the representatives of the "Oldhaven Beds," are to be found at the base of the telegraph post, 100 yards south of the road-bridge, and the underlying mottled clays, with a dip of 4° to the north, are easily recognized for about 190 yards to the south, where a small valley (about 50 yards across) has been formed by denudation out of the sands and lowest green sandy clays resting on the Chalk, which forms the northern foot of the Hog's Back or Surrey range. Here the Chalk is seen to be traversed in every direction with fissures, often slickensided; some empty, some filled with vein-flint, and some with loamy stuff. Nodules, and occasional thin laminae of flint, follow the dip of about 6° to the north, and many are in a crushed condition. Bands of marly Chalk also lie on the same plane. Some Echinoderms were met with.

Mr. Godwin-Austen, F.R.S., of Chilworth, now joined the party, who next visited the much larger excavation of the Chalk at the entrance of the railway tunnel. Here the dip, well marked by flints and marly bands, is about 12° to the north. Fossil sponges, echinoderms, *Inocerami*, &c., abound in this pit. The usual chalcædonic and quartzzy interiors of hollow flints attracted notice, and Professor Rupert Jones drew attention to facts that seemed to him to bear evidence of flint being a pseudomorph after Chalk. Leaving this instructive section, and following the pretty suburban road out of Guildford towards Godalming for nearly a mile, the

party turned off to the right along a country road parallel with the Chalk-range, but separated from it by the deep valley cut along the strike of the soft Gault. This led them to a quarry in the Lower Greensand on the escarpment overlooking the pathway to Losley. In this section of those Neocomian beds known as the Bargate-stone, the waterworn sand of quartz, ironstone, lydite, and hard green silicates is so largely mixed with calcareous fragments (the *débris* of shell-beds, polyzoan reefs, &c.), that it is here and there cemented together hard and compact enough to serve as a building-stone and for road-metal. Mr. Meyer, working here as a geologist for years from time to time, has made this quarry "classic ground" for his scientific brethren, as his publications prove, and on this occasion he kindly pointed out the several species of *Terebratula Avicula*, *Polyzoa*, and other fossils that are peculiar to this formation, or that link it with that at Upware and other places. Especially he directed attention to the horizon at which he obtained an unrolled tooth of *Iguanodon*, indicating the existence of this great Dinosaur at perhaps the latest period to which any of its remains are as yet known to belong. The "false-bedding" of the sands, due to the southward set of prevalent tides and currents, and the probable origin of their materials from the "old palæozoic ridge or shoal," as taught by Mr. Godwin-Austen, who first made out its existence and history, and who knows every stratum of the country, were also studied. The formation of the escarpment, with the correlative parallel cracks and fissures of the strata, was also noticed by Mr. Meyer and his interested followers. Leaving the fascinating lessons of the quarry, and the beautiful woodland views of the neighbourhood, the geologists retraced a portion of the pleasant route until they crossed the Portsmouth-road at the foot of St. Catherine's Hill, and then went down to the ferry, where St. Catherine's Spring issues beneath the hill from a little cave in the red orange-tinted sand, draped with deep green mosses. The ferryboat placed them in view of the suddenly picturesque cliff of rich-tinted sand, bearing St. Catherine's ruined shrine a-top, on the right hand, whilst the flat alluvial valley of the Wey, grassy and wooded, led away towards the white cliffs of quarried chalk opposite, and the tapering church spire of Shalford, the river windings, the villas, old Guildford Castle, and other signs of the past and present, suggested thoughts of mingled hue.

Nor did the geologist forget to dive below the surface and tell

how, for 30 feet at least, the Guildford gap has been found by boring to be occupied by bouldered chalk, and other detritus, due to the destructive and yet conservative agencies of nature. Threading the grassy paths of Shalford Park, the tourists came to the turnpike-road, and entered a lane on the soft irony beds of the Lower Greensand, and followed their strike along the woods, with the red-yellow sands of the hill on the right, and the Gault valley on the left, for about a mile, until a short field-lane, crossing the Gault and Upper Greensand, led into the Chalk-marl quarry below Warren Farm. There, as Mr. Meyer explained, the loss of the clay-beds (Gault) from below by their having been squeezed out along the southern side, had allowed the hard marl-rock to subside inwards, suddenly, at the escarpment, and to rest at a high angle (70° and more), whilst the Chalk of the hill-range above dips only five or six degrees. As the hard rock-bands here quarried for lime are followed end-on along the "strike" open to day, the backs of lower beds form one side of this deep, narrow pit; and the truncated edges of these somewhat bent and much fissured strata warn the instructed eye of the danger of standing either below them or above them, lest either rain or drought should detach their clinging surfaces on the sloping bed plane. The down-turned edges of the strata, under the sward of the hill-side, are also observable, having been bent over and downwards by the combined action of rain, frost, and snow, on the slope of the hill. Large ammonites and nautili are the chief fossils met with here; but *Pecten Beaveri* and *Terebratula* are also found. In an old excavation in the lane *Siphonia* has been found in the representative of the Upper Greensand, which is overlain by dark green sandy clay and Gault, turned up at a high angle (and probably squeezed out) in the breadth of a few yards, before the iron-sands are reached on returning to the hill-side.

Once more continuing the walk along the woods, and crossing the picturesque transverse slopes and gullies leading down into the fertile Gault valley on the left, the party came to the foot of St. Martha's-hill, or St. Martyr's-hill, for martyrs (Mr. Godwin-Austen told us) were burnt on the hill by the pagan Saxons; and St. Martha was one of these Romano-British sufferers. Before

of sands and calcareous sandstones with fuller's-earth bands and pebbly beds, similar to that in the quarry on the other (western) side of Guildford.

On the hill-top is St. Martha's Church, enshrining (it is said) the spot of martyrdom, and involving some of the structure of the Roman watch-tower. But undisturbed by melancholy thoughts of the past, nor looking out for mortal foes coming from the south, whether bearing Saxon spear, Norman cross-bow, or Prussian needle-gun, the geologists, blest with fine weather, delighted in the wide stretch of "London Tertiaries" on the north, and the broad expanse of Wealden on the south, and thought of far older inhabitants than even Celt or Teuton, of whatever race, and of greater physical changes than ever Roman or Norman brought about. On this elevated ground, and amidst the rustic graves which surround the ancient shrine, Professor Rupert Jones spread his diagrams and maps of Jurassic and Cretaceous seas and lands, whilst Mr. Godwin-Austen, at home in his own well-wrought geological field of research, and in courteous compliance with the assembly's request, told how the underground structure of south-eastern England is connected with that of the Boulonnais, Belgium, the Ardennes, and Westphalia; and how the folds and ridges of palæozoic rocks which, in those countries, bear up, either at the surface, or just beneath the Chalk or the attenuated Oolites, valuable coal-beds, are continued through, in a broad sweeping line, underneath parts of Surrey, Kent, and Sussex, until visible again near Frome, in the Bristol coal-area, in North Devonshire, South Wales, and the South of Ireland. The old faults and fissures affecting this linear tract of old strata had long before the Coal-period raised and depressed the lands and sea-beds; and as a great spur of the old Scandinavian lands, this tract afforded ground for the littoral growth of the jungles that formed the coal on its oscillating borders, and in its lagoons, now shut up by bars, and now losing their marsh features by influx of the sea. Succeeding ages still brought oscillations and changes, until the Jurassic seas crept over this old ridge or shoal, and the Cretaceous seas quite buried it, at first in sands and clays, and ultimately by the calcareous ooze of oceanic depths.

But again another contracting crush of the earth's crust operated on the old weak lines, and the buried ridge slowly uprose, and its coatings of thick strata were worn off by sea and rain, making

pebbles and sands for the Lower Tertiaries ; and, still rising, it was at length laid bare in the Franco-Belgian and the Bristol areas, whilst our Wealden valley of elevation, and those of Kingsclere, Shal-bourn, and Pewsey, show where its uneven back approaches near the soil.

Mr. Godwin-Austen fully explained the views and operations of the subscribers to the "Sub-Wealden Exploration Fund," mainly planned and conducted by Mr. Henry Willett, of Brighton, actuated by his enthusiastic love of science, and by an honourable wish to invest Brighton with the credit of good work and scientific enterprise on the occasion of the British Association Meeting.

The basis of the research rests on the following data :—

"1. That, if the Oolite exists, it is probably not of greater thickness than 700 feet, as in the Boulonnais district, in France.

"2. The Oolite may possibly, but not probably, be absent altogether, as in Belgium.

"3. The Mountain-limestones have been reached near the surface at Hécourt, in a district physically a counterpart of the Wealden Formation.

"4. The boring should be made in the Lower Ashburnham Beds.

"5. To use Mr. Austen's own words :—

"‘A boring to the base of the Wealden Series, and through the Secondary strata which underlie, cannot fail to have its practical application in the knowledge of the direction in which the true Coal-measures may be met with.’

"6. The uncertainty takes the problem out of the sphere of an experiment likely to prove remunerative in a commercial sense, while it adds to its interest as a question of pure science."

The place for the experimental boring is near Brightling, in Sussex, not far from Robertsbridge, where the lowest known beds of the district come up to or near the surface. It is to be distinctly borne in mind that the exploration has been commenced, not so much to seek for coal commercially as to prove the order of strata, and to learn what is the real structure of this part of England. Even if the Carboniferous strata be met with, they may be unproductive of coal ; and they are certainly as much crumpled and distorted as those of Belgium and Westphalia, and thus greatly deteriorated at whatever depth they may be found. (See the Report of the Royal Commission on the Coal-supply of Great Britain.)

After Mr. Godwin-Austen's lecture, and turning from the fine series of maps and diagrams around which they had been gathered, the geologists stood at the edge of the small plateau, and looking southward over the great Wealden area, listened to Professor Rupert Jones while he explained the beautiful and complex valley of the Weald, and pointed out the many Lower-Greensand hills and knolls which fringe the northern edge of the valley, and give to this tract of country its far-famed picturesque beauty.

Professor Rupert Jones clearly showed that the hills and vales coincide with the harder and softer strata "brought up," to use his own words, "by grand but gentle curves, in orderly arrangement, round a long elliptic dome, reaching from Alton on the west to Hastings and, beyond the Straits, to France, and worn down by natural agencies, of long continuance, from a high broad ridge to the present comparatively low series of lesser ridges, and drained by rivers, following the radiating cracks of the raised ellipse, which have still kept their outward course through sandrock and chalk downs, deepening the widened rifts, until the Pluvial Period was overpassed, and now meander slowly among the gravel beds and alluvial flats, till they reach the Thames on one side, and the Channel on the other."

Descending by a charming walk through the woods on the steep hill-side, the party entered the grounds of Mr. Godwin-Austen and re-assembled at his residence, Chilworth Manor, an ancient hall, beautifully situated on the southern slope of the hill, where welcome rest, pleasant discourse, an elegant repast, and the courteous hospitality of Mr. and Mrs. Godwin-Austen crowned the fine day's work. At the conclusion of the dinner, Mr. Lobley, the Secretary, took occasion to offer the thanks of the Association to their entertainers, and congratulated the Members present on the interesting and successful character of the day's proceedings, which had afforded them an opportunity of learning, under most favourable conditions, the views of two such eminent authorities as Mr. Godwin-Austen and Professor Rupert Jones on one of the most important geological questions of our time.

After some time spent in inspecting a collection of fossils, and enjoying the antique gardens around the fine old mansion, the Members were escorted through pleasant lanes to the Chilworth Station on their return to London.