8.—Greenish-grey pointed implement, with thick butt partly crusted, sharp edges. Chelles type, common in Barnfield pit, but from the neighbouring locality, Ingress Vale. L. 3 in.

9.—Variegated sub-triangular implement, twisted in the usual direction; cutting-edge all round, but notched (by use?) near the point; slightly rolled. St. Acheul. L. 2.9 in.

10.—Lustrous brown cordate implement, barely patinated, with yellow knots, and sharp edges, interrupted by diminutive platform in centre of base; sides practically straight. St. Acheul II. L. 2.5 in.

11.—Grey-white cordate implement, with pronounced twist (reversed S), cutting-edge all round, only interrupted by natural cavities; thickest near the base; slightly rolled. St. Acheul. L. 3.4 in.

REPORT OF AN EXCURSION TO WEST SOMERSET.

JUNE 20TH TO 24TH, 1913.

BY THE PRESIDENT (J. W. EVANS, LL.B., D.Sc., F.G.S.)
L. RICHARDSON, F.R.S.E., F.L.S., F.G.S., AND E. C. MARTIN,
B.Sc., A.I.C., *Directors of the Excursion.*

THE official party travelled from Paddington by the 4.15 p.m. train and arrived at Minehead at 8.55 p.m. Here a number of Members from other parts joined the party. Headquarters were at the Hopcott Hotel.

Mr. A. H. Williams acted as Excursion Secretary.

The main objects of the excursion were (a) to study the classic sections of Upper Keuper, Rhætic and Lower Lias beds at Blue Anchor Point, St. Audries Bay and Lilstock, under the guidance of Mr. L. Richardson, and (b) to visit sections of fossiliferous Devonian rocks at the northern end of the Quantock Hills.

The Members also took the opportunity of ascending Dunkery Beacon and of visiting Dunster Castle, Cleve Abbey and a section of the Bunter Pebble-Beds in Woolston Quarry, near Williton.

JUNE 21ST.

The Members left Minehead at 9.25 a.m. and arrived at Blue Anchor Station at 9.36 a.m. From here they walked to "The Point."

Just before arriving at "The Point," the Director, Mr. L. Richardson, drew attention to a fault on their right by which the Rhætic Beds had been let down so as to be brought into juxtaposition with the Keuper, and also to the anticlinal arrangement of the beds in the headland. He said that the old line of

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weakness, of which this fold was evidence, could be traced from Blue Anchor into the western end of the Polden Hills and thence to the inlier of Upper Keuper and Rhætic Beds at Sparkford Hill; while subsequent movements were shown by the geographical distribution of the Corallian and Kimmeridgian in the neighbourhood of Wincanton and the disposition of the Cretaceous beds to the east.

"If this axis is traced on a geological map, the suggestion presents itself that it is connected with the series of folds of which the Mendip Hills is one, such an equidistance therefrom does it preserve."*

The Director reminded the Members that the Rhætic Series was divisible as follows:—†

UPPER	{	Watchet Beds	7 ft. 7 in., at Blue Anchor.
RHÆTIC		White Lias (Langport Beds)	20 ft. 8 ins., at Queen Camel.
	{	"Upper Rhætic" (Cotham Beds)	7 ft. 8 in. at St. Audries Slip.
LOWER		Black Shales	32 ft., at Lilstock.
RHÆTIC	{	Sully Beds	13 ft. 1 in., at Blue Anchor.

In order to avoid confusion he said he had suggested the use of the term "Cotham Beds" for the "Upper Rhætic" of some authors (that is, the beds that contain *Lycopodites* and *Estherie* in the Bristol district), and "Langport Beds" for the true White Lias.

Some of those present would recollect that in certain sections in the Midlands authors had been disposed to regard beds which were equivalent to the Cotham Beds as contemporaneous with the Somerset White Lias (Langport Beds), but he reminded them that even in Warwickshire both Cotham and Langport Beds were present.‡

On arrival on the foreshore it was found that most of the beds so clearly exposed a few years ago when the photograph reproduced in Plate ii of the *Quarterly Journal of the Geological Society* for 1911 was taken, were covered with sea-weed.

The junction of the Black Shales with the Sully Beds, however, was not obscured, and numerous little pebbles of the latter were noticed embedded in the basal portion of the former, which is rich in fish-remains.

A few ill-preserved specimens of *Pteromya crowcombeia*, Moore, were obtained; crowds of examples of *Isocyprina* (*Schizodus*), and innumerable examples of *Pleurophorus elongatus*, Moore.

The Bone Bed is a massive grit, usually poor in recognisable vertebrate remains, but *Ceratodus* teeth have been obtained and help to prove that this Bone Bed—although comparatively widely

* *Quart. Journ. Geol. Soc.*, vol. lxvii (1911), p. 32.

† A detailed account of the Rhætic and contiguous deposits of West Somerset will be found in the Director's paper, *op. cit.*, p. 1.

‡ L.R., "The Rhætic Rocks of Warwickshire," *Geol. Mag.*, 1912, pp. 24-33.

[Photo by T. W. Reader.]

VIEW OF ST. AUDRIES SLIP AND THE NORTHERN END OF THE QUANTOCK HILLS.

The position of the Rhætic section is at the extreme right of the picture.

To face page 98.

separated from the Tea-green Marls—is on the same horizon as the main Bone Bed of Aust and Garden Cliffs in Gloucestershire.*

From the foreshore section the Members walked past the gypsum workings, where that mineral is being dug for use in the manufacture of paper and for manure, and the section depicted in Plate iv. of the *Quarterly Journal of the Geological Society* for 1911, to the trackway leading up past the lime-kilns. On the way along the beach a number of very well-preserved specimens of *Cardium cloacinum* Quenstedt were picked up. They come from a bed (5b) near the top of the Lower Rhætic.

From the Sully Beds from somewhere between the Warren Farm Section and Watchet, Prof. Boyd Dawkins obtained the historic *Microlestes* tooth, now unfortunately lost.

After a bread-and-cheese meal in Watchet the Members continued their walk. On the wharf were seen numerous packages of paper from the Watchet Mills.

At Doniford the brook that drains the northern portion of the picturesque valley that lies between the Quantock and Brendon Hills was crossed. A steep climb followed, and on arrival at the top of the hill comment was made on the fact that the gravels around Rydon Farm (290 ft above ordnance-datum) were coloured similarly to those more than 200 ft. lower down at Doniford.†

By kind permission of Lord St. Audries the Members were allowed to walk through the Park down to the old sea-battered “slip” or landing-stage. Particularly fine spikes of *Orchis pyramidalis* Linn. attracted the attention of the botanists and the beauty of the district the notice of all.

Arrived at the commencement of the old slip the Members saw in front of them the fine cliffs of Keuper, Rhætic and Lower Lias, which were so carefully studied by Bristow and Etheridge (see Plate 17).

Mr. J. W. Tutchet in company with the Director have paid particular attention to the section, studying the curious development of the beds in the neighbourhood of the junction of the Black Shales with the Cotham Beds. The indistinct line of demarcation between the Rhætic and Liassic Series was the cause of considerable comment. While at Blue Anchor Point the Watchet Beds are mainly marls, here their presumed equivalents are mostly laminated shales, difficult to separate from the overlying Paper Shales of the Lower Lias. Specimens of *Cardium cloacinum* Qu. were found on the beach.

Some time was spent here and, before leaving, the Director made some general remarks on the section.

He drew particular attention to the great thickness of “Grey

* Mr. J. W. Tutchet states that subsequent to the publication of his paper (*Proc. Bristol Nat. Soc.* for 1907-9, pp. 5-21) he found portions of *Ceratodus* teeth in the Bone Bed exposed in the railway cutting at Charlton, near Filton, near Bristol.

† “The Geology of the Quantock Hills, etc.” (1908), pp. 78-79. *Mem. Geol. Surv.*

and Tea-green Marls" (measuring, according to Bristow and Etheridge, 115 ft.), which come between the Red Marls and the Black Shales.

The Members then walked back to Williton Station, returning to Minehead by the 6.25 p.m. train. [L.R.]

JUNE 22ND.

On June 22nd, most of the Members availed themselves of the opportunity of ascending Dunkery Beacon—some by brake, others on foot.

The weather was ideal, and valley and moorland were seen at their best. From the heap of stones on the summit (1707 ft.) the Members saw in a north-easterly direction the western end of the Mendips; in a northerly direction—across the Channel—the Glamorgan coast; westwards, south-westwards and in a southerly direction the rolling partly cultivated moorland of Exmoor; while beyond, in the south-west, was the dark outline of the higher ground of Dartmoor. Eastwards, the view was over the country the party was investigating—over Dunster, Minehead and Blue Anchor—to the distant Quantocks.

Mr. Whitaker called the attention of those present to the fact that the summit and slopes of the Beacon were covered to a considerable thickness with angular fragments and that the rock was nowhere seen *in situ*. At the foot of the eastern slope near Wotton Courtney some of the Members visited a quarry excavated in an outlier of the New Red Sandstone, and were able to examine the spoil heaps of old hæmatite mines in rocks of the same age.

Dr. Evans pointed out a number of typical cirques (rounded recesses) on the southern slopes of North Hill and Braggist Hill, west and south of Minehead. He attributed them to frost action (*Proc. Geol. Assoc.*, vol. xxiv, pp. 251-2, 1913), facilitated by small streams from a covering of snow on the rounded summits of the hills, when the climate was colder than at present. The action was more effective on the southern slopes because they were exposed to the direct rays of the sun, and suffered a daily alternation of frost and thaw during a great part of the year.

Mr. A. H. Williams and Mr. E. C. Martin, who returned by way of Porlock, visited a small quarry in the Foreland Grits in Horner Wood, about half a mile south of Horner, on the west side of the road that follows up the Horner Water. Here they found plant-remains which were submitted by Dr. Smith Woodward to Mr. W. N. Edwards, of the British Museum (Natural History), who referred them to the Lower Old Red Sandstone genus *Psilophyton*. Plant remains were also found in rock fragments on the southern slope of the Beacon, but proved to be indeterminable. [J. W. E.]

[Photo by T. W. Reader.]

LILSTOCK BAY, WEST SOMERSET.—VIEW OF CLIFFS FORMED OF UPPER KEUPER MARLS AND RHÆTIC BEDS, CAPPED HERE
AND THERE WITH LOWER LIAS.

JUNE 23RD.

The members left Minehead by the 9.25 a.m. train for Watchet.

Heavy rain had fallen in the early morning, and it was still drizzling when the members commenced the drive to Lilstock. The weather, however, had improved by the time Rydon Farm was reached, and sunlit patches on the Brendon Hill suggested a fine day and clear atmosphere.

Between Quantoxhead and Kilve, Dr. Evans pointed out Smith's Combe, where Mr. W. A. E. Ussher found plant-remains, some of which are referred by Mr. R. Kidston to the "corduroy plant" characteristic of the Middle Old Red Sandstone of the north of Scotland, and others might belong either to the Lower Old Red Sandstone genus *Psilophyton* or the Middle Old Red *Ptilophyton*.* [J. W. E.]

At Kilve Court the main road was left for the up and down bye-road to the coast. At a farm the brakes were left, and the members proceeded on foot down to Lilstock Bay (Plate 18.)

The untenanted cottages, the disused lime-kiln, and the decaying landing-stage, together with cliffs traversed by faults with tumbled masses of rock at their base, instilled a feeling of desolation.

Some way along the beach the Director stopped in front of an unfaulted portion of the cliff at the top of which were seen the basal deposits of the Lower Lias, and at the bottom the massive marlstones of the Sully Beds.

Pieces of Lower Lias limestone at the foot of the cliff were found to be crowded with specimens of *Pleuromya crowcombeia* Tate. Associated with them were *Modiola minima* Sow., and *Ostrea liassica* Strickland. This limestone bed overlies the Paper Shales, and these in turn the Watchet Beds, similar to those at St. Audries Bay.

Owing to a recent fall, the bluish-grey marls and very subordinate bands of impure limestone that compose the Cotham Beds were seen (Plate 19) very sharply marked off from the overlying White Lias and underlying Black Shales. From a fallen piece of *Pecten*-Bed, evidently of bed 7 or G, Mr. C. D. Sherborne procured a very good specimen of *Orbiculoidea townshendi* Davidson.

The Sully Beds were naturally the object of much attention and some large pieces of rock, practically made up of shell débris (amongst which specimens of *Pteria contorta* and *Myophoria* were recognised), were selected for transportation to London.

In one portion of the faulted cliff seen across the bay, true Tea-green Marls were visible at the base, then the dirty yellow looking marls composing the Grey Marls and Sully Beds, with the conspicuous Black Shales above.

* *Mem. Geol. Surv., Expl. Sheet 295, pp. 11, 16, 17, 1903.*

The Director said his view was that at Aust Cliff and sections further north those Grey Marls and Sully Beds were not represented and that the Bone-Bed at Aust rested non-sequentially upon the Tea-green Marls. [L. R.]

The sections at Lilstock proved particularly interesting and time encroached upon had to be made up in the cross-country drive to Holford on the north-east flank of the Quantock Hills, where Dr. Evans acted as Director. A quarry south of the village on the west of the road to Nether Stowey, where it turns from south to south-east, west of Woodlands, was first visited. Here, fossils of Ilfracombe age were collected. The Director explained that the Quantocks formed an anticline pitching to the north-west and consisted, in that direction, of the Hangman Grits, flanked in places by the Ilfracombe Beds, while the latter made up the whole of the south-eastern portion of the ridge.

The Hangman Grits, like the Foreland Grits and Pickwell Down Sandstones, were lithologically of the Old Red Sandstone type, and like them appeared to have been laid down under continental conditions. At the summit however of the Hangman Grits there was evidence of littoral marine conditions and the fauna of the succeeding Ilfracombe Beds must have lived in comparatively deep water. He believed that the Hangman Grits were of Middle Devonian age while the Ilfracombe Beds were partly uppermost Middle Devonian and partly lowest Upper Devonian.

In the sides of the lane leading from the quarry to Holford Combe, the upper beds of the Hangman Grits containing innumerable casts of *Myalina*, *Natica* and *Spirifer* were well seen.

The party next visited a quarry in the angle between the streams from the Holford and Hodder's Combes, nearly opposite the gate leading to Alfoxden (or Afloxtan), where there is a bed containing numerous casts of gastropods.

These exposures have been described by the Rev. H. H. Winwood (*Proc. Bath Nat. Hist. and Antiq. Field Club*, vol. ii, pp. 429-432, 1873, and *Proc. Geol. Assoc.*, vol. xiv, p. 381, 1896) and by Mr. W. A. E. Ussher, *Mem. Geol. Surv.*, expl. sheet 295, pp. 14 and 23):

A few of the Members descended into Holford Glen (by the kind permission of Mrs. Archer, the proprietor of Alfoxden), and obtained specimens of the volcanic ash in the rocks of the river bed, which are believed to be of Ilfracombe age, and are described by Mr. Ussher (*op. cit.* p. 24).

The party then made their way up Holford Combe, passing on their left a quarry in massive grits, in which no fossils have been discovered. A little further up the combe, Dr. Evans called the attention of the party to the steep sides and flat floor of the valley. Both were covered by more or less angular rubble, which apparently filled the centre of the valley to some depth. He thought that this rubble was of the same nature as the

[Photo by T. W. Reader.]

DETAILED VIEW OF THE TOP PORTION OF THE CLIFF AT LILSTOCK BAY.

¹ White Lias proper.

² Cotham Marble, *Estheria*-, *Lycopodites*- and associated beds of the Bristol district.

"head" of the coast. This consists of rock fragments, largely the result of from action, which seems to have moved slowly down the slopes under conditions such as prevail in climates similar to that of Spitzbergen at present, where similar movements occur. (*Proc. Geol. Soc.*, vol. xxiv, p. 257, 1913.)

On after emerging from the hills the streams from Holford and Hodder's Combes unite in Holford Glen which is deep and narrow, and extends down to the bed rock. Presumably this too was at no remote date largely filled with rubble like Holford Combe, but has been since re-excavated. Similar relations occur at other places further west on the same coast and may be best explained by the supposition that the rivers are now actively cutting their way back through the accumulations that fill their valleys.

Mr. Whitaker pointed out the frequent occurrence of springs in the slopes of the Quantocks, a result, no doubt, of the accumulation of water below the surface rubble.

From Holford Combe the party ascended by the "Old Devil's Galloping Path" to the moorland of bracken and heather that extends along the summit of the Quantocks, and descended the south-western slope (by the kind permission of the Hon. Mrs. Trollope) through the beautifully wooded Crowcombe Park, which occupies a finely shaped cirque. Its rim forms a nearly complete circle, broken only by the narrow gorge by which the stream that drains it escapes.

After tea at the "Carew Arms," and an inspection of the church and the mediæval crosses in the churchyard and village green, the members made their way to Stogumber Station, past the Heddon oak where, after the Monmouth rebellion, George Gillard, John Lockston, and Arthur Williams were hanged by the orders of Lord Jeffreys on the great branches that stretch nearly horizontally above the road. [J. W. E.]

JUNE 24TH.

On Tuesday most of the members left the hotel at 9.30 a.m. and drove to Dunster.

Here there is a quaint gabled Yarn Market, a broad thoroughfare flanked by houses often with curious constructions, while the village is dominated by the imposing castle which crowns a knoll to the south.

By the courtesy of Mrs. Luttrell, the members were allowed to see more of the castle and grounds than is customary. Palm trees in flower, and a lemon tree bearing large-sized fruit were of special interest.

From Dunster the drive was continued to Washford, and a visit paid to Cleve Abbey. The church has long been demolished, but the conventual buildings for the most part

remain, and as one wanders from one room to another it is not difficult to form an idea of life in a Cistercian Abbey. The guide books say that there are only two other groups of Cistercian conventual buildings to compare with those at Cleeve, namely, those at Beaulieu in Hampshire, and Fountains in Yorkshire. Cleeve Abbey was founded in 1188 by one William de Romara. [L. R.]

After leaving Cleeve Abbey, a small party, seven in number, proceeded to Williton by the 1.25 p.m. train from Washford, in order to examine, under the direction of Mr. E. C. Martin, the fine section in the New Red Series exposed in an old and exceedingly picturesque quarry on the north side of the railway at Woolston.

From Williton Station the party crossed some fields into the Taunton road, from which the quarry was reached by taking a turning on the right just short of the railway bridge. The section at the west end of the quarry (Plate 20) shows Upper Sandstones (20 to 25 ft.) resting on Conglomerate (about 60 ft.), while the presence of water held up in a pond at the east end of the quarry suggests the proximity of the Lower Marls. The Conglomerate is the middle member of the New Red Series, and is represented in East Devon by the Budleigh Salterton Pebble-bed; it is generally considered to be of Bunter age, and contains numerous pebbles of Carboniferous Limestone as well as a fair proportion of grit and quartz stones, which have probably been derived from Devonian or Old Red rocks. Many of the limestone pebbles were found to be fossiliferous, and one containing *Lithostrotion* was noticed; others with *Productus* and *Spiriferids* have been recorded from this quarry by the Director (see *Geol. Mag.*, 1909, pp. 160-5). Several beds of sandstone were noticed in the upper part of the Conglomerate, and much interest was excited by the jointing, to which the quarry owes much of its picturesqueness.

After returning to Williton for tea, the party proceeded by the 4.41 p.m. train to Taunton, where the members separated, most of them returning to London by the 6.20 p.m. train. [E. C. M.]

EXPLANATION OF PLATE 20.

A.—Upper Sandstones. *a.* Irregularly jointed rubbly red sandstone 10-15 ft. *b.* Massive red sandstone. 10 ft. shown.

Bunter Conglomerate. *c.* Dark brown conglomerate splitting into impersistent even beds 15 ft. *d.* Massive conglomerate with pebbles of Carboniferous Limestone, giving the rock a grey tint about 50 ft., the upper part only being shown.

B.—Near view of part of the conglomerate *d.*

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[Photo by T. W. Reader.

A.—SECTION IN THE TRIAS AT WOOLSTON, NEAR WILLITON.

[Photo by T. W. Reader.

B.—BUNTER CONGLOMERATE, WITH NUMEROUS PEBBLES OF CARBONIFEROUS LIMESTONE, WOOLSTON, NEAR WILLITON.

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REPORT OF AN EXCURSION TO BISHOP'S STORTFORD.

SATURDAY, JUNE 21ST, 1913.

BY THE REV. A. IRVING, D.Sc., AND PERCY A. IRVING, B.A.,
Directors of the Excursion.

THE writers of the present Report were assisted in the direction of the Excursion by Mr. H. G. Featherby, and Mr. Douglas Leighton acted as the Excursion Secretary.

The party, which numbered sixteen, was first conducted to the gas-pit, where prehistoric mammalian remains have been found under the alluvium of the Stort, overlying glacial shingle with Chellean (?) implements. (See *Proc. Geol. Assoc.*, vol. xxii, p. 264, 1911.) In London Road the line of the sewer-trench was followed, where Pleistocene mammalian remains* had been met with in the glacial shingle. (See *Rep. Brit. Assoc.*, Portsmouth, 1911, p. 521.) A fine section of "rubble" (12 ft.) was exposed two years ago at the south end of the sewer-

* Including *Elephas antiquus*, *Hippopotamus*, *Bos primigenius* (three molars, mandible, and metatarsal), and bones (fragments) of *Cervus megaceros* (?) as determined at the Brit. Mus. (Nat. Hist.). These and other specimens illustrating the geology of the district were afterwards exhibited at Hockerill Vicarage.